Fundamentals of Epidemiology and Medical Statistics

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PREFACE

The fundamentals of epidemiology and biostatistics are crucial for comprehending and planning a research endeavor. The word "epidemic" is derived from the Greek words "epi" (meaning amid), "demos" (meaning people), and "logos" (meaning study). The term is exceedingly ancient, having originated in the third century BC. By definition, epidemiology is "the study of the distribution and determinants of health-related states or occurrences in specific populations and the application of this knowledge to the control of health issues," according to John M. Last. Clinical epidemiology applies epidemiology's basic concepts to the examination of diagnostic and treatment approaches used in clinical practice. Status, which in Greek means "state" or "position," is where the term statistics originate. The advancement of statistical theory and techniques and their application to the biological sciences is the focus of biostatistics. According to the International Epidemiological Association (IEA), epidemiology has three primary goals:

- to outline the scope and dispersion of health and illness issues affecting human populations,
- to determine the pathophysiology of the disease's etiological causes,
- to give information necessary for the organization of priorities among those services and the planning, execution, and evaluation of services for the control, prevention, and treatment of illness.

The study of a disease's natural history and the measurement of illness frequency in terms of the severity of the issue are both made possible by our understanding of epidemiology. Additionally useful are community diagnoses, etiological diagnoses, and risk factor identification. It is useful for determining a person's risk of contracting a certain disease, recognizing symptoms, creating a plan of action, assessing the quality of the healthcare system, and doing research. Biostatistics is used for a variety of purposes, including as conducting clinical trials, assessing various degrees of therapy, giving uniform metrics of clinical procedure accuracy, and forecasting the course of common psychiatric conditions. Additionally, it aids in determining the community's mental health, developing and observing various mental health initiatives for particular demographic groups, ultimately determining their success or failure, and advancing mental health legislation.

-Author

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Mapping and Prevalence of Malaria Falciparum Patients with ACT Failed Therapy, in Hanura Public Health Center, Pesawaran, Lampung, Indonesia

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Abstract

Malaria is a public health issue that can cause death. According to the Indonesian Health Profile, in the year 2010, an estimated 45% of Indonesia's population live in malaria-endemic areas. Pesawaran District is one of the malaria-endemic areas in Lampung province, whose Annual Parasite Incidence in 2010 and 2011 were 2.77 and 4.76 respectively. One of the factors that may inhibit the malaria control is Plasmodium resistance to antimalarial drugs. This study aims to conduct a mapping study and see the prevalence of ACT treatment failure, in Pesawaran District, Lampung Province, Indonesia. Data collection was performed at the Primary Health Centers (PHC) Hanura. A total of 69 samples according to the inclusion and exclusion criteria, the microscopic examination serially for 28 days was done. Microscopic examination performed on D0, D1, D2, D3, D7, D14, D28, and a complaint is found outside the schedule. Coordinates of patient house, determined using GPS. Based on observations, microscopic examination and spatial analysis, the prevalence of ACT treatment failure in patients with falcipaum malaria was 11.59%. The malaria falcifarum patient spread around the coast, that were near vector breeding places. There were five clusters of malaria falciparum patients and one cluster of malaria falciparum patient with treatment failure that were formed. Only one significant cluster of malaria falciparum patient (P = 0.0027, radius 0 km) is found, while the other cluster is not statistically significant. The cluster of malaria falcipa-

*Corresponding author.

rum patient with treatment failure was not statistically significant (P = 1.000, radius 0.15 km), but this cluster is located in the area of the suspected vector breeding place. The cluster formation means that people living within a radius of these clusters have a greater risk to get malaria infection.

Keywords

Malaria Falciparum, Late Parasitological Failure, Mapping of Malaria Falciparum Patient, Artemisinin Combination Theraphy

1. Introduction

Malaria is an infectious disease caused by *Plasmodium* sp. *Plasmodium* sp., is an intracellular parasite, which is transmitted by the bite of the female Anopheles mosquito. There are five species that can infect humans, namely: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale* [1]-[6] and *Plasmodium knowlesi* [6]. The species most commonly found in Indonesia is *P. falciparum* and *P. vivax* [6]. Malaria is a public health issue that can causedeath, especially in high-risk groups such as infants, toddlers, and pregnant women. According to the Indonesian Health Profile, in 2010, an estimated 45% of Indonesia's population live in malaria-endemic areas and 80% of districts/municipalities are malaria endemic area [7].

Lampung Province is one of the malaria-endemic areas in western Indonesia. Anual Parasite Incidence (API) of malaria in Lampung Province at 2007 until 2010 were reported 0.33; 0.33; 0.78 and 0.32 per 1000 population respectively [7]. This API value is still below the national average rate in 2010 (1.96 per 1000 population). Referring to the endemicity category issued by the Ministry of Health of the Republic of Indonesia, Lampung Province overall was a low endemic area [7]. However in several locations and districts, it still showed moderate to high endemicity such as Rajabasa subdistrict, South Lampung district and Padang Cermin and Punduh Pidada subdistrict, Pesawaran district [7]-[9]. Pesawaran District is one of the malaria-endemic areas as with moderate category in Lampung province. API values for Pesawaran District, in 2010 and 2011 respectively, are 2.77 and 4.76 [8]. Geographic conditions of Pesawaran District is an area of the coast, that had many puddles, and suitable for the breeding of Anopheles mosquitoes.

The persistently high incidence of malaria in several locations in Indonesia, including in Pesawaran District is very closely related to several factors, namely changes in the environment; high population mobility; climate change; nutritional status of the community; control programs and the factors of resistance to anti-malarial drugs [9]. These factors either individually or collectively affect the transmission of malaria.

One of the factors that may inhibit the malaria control is Resistant of Plasmodium to antimalarial drugs. Indonesian Government was made a new policy in malaria treatment since chloroquine resistance spread to all region in Indonesion. Indonesian Health Ministry was used the Artemisinin Combination Therapy (ACT) as a standard of malaria treatment. ACT was used since 2004 and now had been implemented throughout the all province in Indonesia, include Pesawaran District [7]. Over time, the use of ACT in the Pesawaran District has demonstrated the possibility of *P. falciparum* resistance to the drug. Currently it has found patients who showed no clinical and laboratory improvement after treatment. In accordance with the WHO criteria in 2006, the treatment of malaria categorized into adequate clinical and parasitological response, early treatment failure and late treatment failure [10].

Mapping patterns of disease, based on a region, had often done to determine the areas as a point source of infection. Spatial analysis with geographical information systems approach (GIS) has been widely applied in various studies to control malaria. Abdullah (2008), Mendrofa (2008) and Sulistiowati (2011) [11]-[13], have been conducting research on spatial analysis of malaria patients on the environment in various regions in Indonesia. These studies had been mapped malaria patients and its relationship with environmental factors affecting the incidence of malaria. Mapping method that has been widely used can also be applied to mapping, malaria patients who failed therapy, so will facilitate monitoring of the patient.

This study aimed to determine the prevalence and mapping of malaria patients who experienced treatment failure of ACT, in Pesawaran District, Lampung Province, Indonesia.

2. Methods

2.1. Study Site and Sample

This study was conducted at PHC Hanura, Padang Cermin subdistrict, Pesawaran district, which is a high malaria endemic areas, at the Pesawaran district. The population in this study were all patients with malaria, that were treated at PHC Hanura during 2012-2013. The study sample is a part of the population which in accordance with the inclusion and exclusion criteria. Inclusion criteria: 1) fever (temperature > 38˚C) over 2 days with or without chills; 2) positive falciparum malaria, based on microscopic examination of malaria; 3) more than 1 year old; and 4) be willing to follow the study by signing the informed concern. Exclusion criteria were 1) access to the patient's home, it is not possible to do; 2) have received anti-malarial treatment 1 - 2 weeks before; and 3) suffered from malaria complications/severe malaria/cerebral malaria that was not treated with ACT. In this study, the minimum sample size was calculated based on a sample size calculation formula and obtained the minimum sample size is 49.90 (55 samples) [14].

2.2. Data Collection and Analysis

Sampling was done at PHC Hanura, Pesawaran District, began in November 2012 until August 2013. Microscopic slides and microscopic examination were made and carried out in the Clinical Laboratory of PHC Hanura and confirmed in the Laboratory of Parasitology, Faculty of Medicine Gadjah Mada University.

The preparation of thin and thick blood smear, was made with reference to a standard peripheral blood collection. Thick and thin smears are allowed to dry at room temperature and then stained by Giemsa solution. Thin smears was done carefully fixation with absolute methanol (not to fixation of thick smear), then stained by 5% Giemsa for 30 minutes. After the staining is complete, the microscopic examination can be performed, with the objective lens 100× [15] [16].

Blood sampling for thin and thick smear performed serially for 28 days on D0, D1, D2, D3, D7, D14, D28, or when the patient was raised complaints/symptoms of malaria outside the predetermined schedule [15]. After taking the blood at D0, patients received treatment with standard drugs ACT. Response of therapy was assessed from the results of microscopic examination performed serially with reference to the WHO criteria, 2006 [10].

Microscopic examination aims to find P. falciparum, in the patient's blood and determined the density of Plasmodium per mL of blood. Parasitaemia counted per 200 leukocytes, and then times by the number of normal leukocytes (8000 leukocytes per µL of blood). parasitemia is the percentage of parasites (asexual stage) per 200 leukocytes [15] [16]. During the blood collection process, the identity of of patients, chief complaint, additional complaints, history taking of disease, treatment history, results of microscopic examination and other laboratory examinations, as deemed necessary, are recorded in patient medical record.

To taking coordinate point the study sample, carried out by using a GPS device. This tool will determine the coordinates of patient house, consisting of latitude and longitude. Place to take a coordinates, at a open area in front of the house and not blocked or not inside the room or under a roof. GPS device will read the coordinates, when it is connected to the satellite. The results, then stored for later use.

To determine the clinical condition or clinical symptoms were felt and complained, we made anamnesis, which recorded in the patient medical record. The chief complaint, additional complaints and history taking of disease of the patients were presented in frequency distribution table.

The data from the study are presented in descriptive, qualitative analysis and quantitative analysis. The analysis was done with the computer device. Grouping based on territorial and mapping, analysis with spatial analysis approach, using ArcGIS 10.1 software and Sat Scan software.

2.3. Ethical Clearance

This study has obtained the ethical approval (ethical clearance) for medical research from Health and Medical Research Ethics Committee, Faculty of Medicine, Gadjah Mada University. The respondents who participated in this study have also been given an explanation of the procedures that must be followed during the study and had also requested voluntary consent of the respondent at the beginning of its participation in this study.

3. Results

The research location is the southern area, in Pesawaran District, Lampung Province with an altitude of less than

50 meters above sea level. The position coordinates of the location of the study is 05029'53.666" to 0.315 05032'01" south latitude and 105014'20.944" to 0.516 105015'47" east longitude (**Figure 1**).

From all the data collected, 69 samples according to the inclusion and exclusion criteria. All of sample stayed in the Sukajaya Lempasing village, Padang Cermin subdistrict, Pesawaran district. Based on gender, the male is the largest group (57.97%), the age more than 5 years old up to 25 years old is the largest group (66.66%). For the clinical symptoms, the chief complaint most widely perceived by the respondents are fever (84.06%). Various places that can potentially become Anopheles mosquito breeding places, were found around the residence of the respondents (**Figure 2**). A total of 84.06% of the sample, have a The distance between houses with mosquito breeding places are very close, which is 5 - 10 meters.

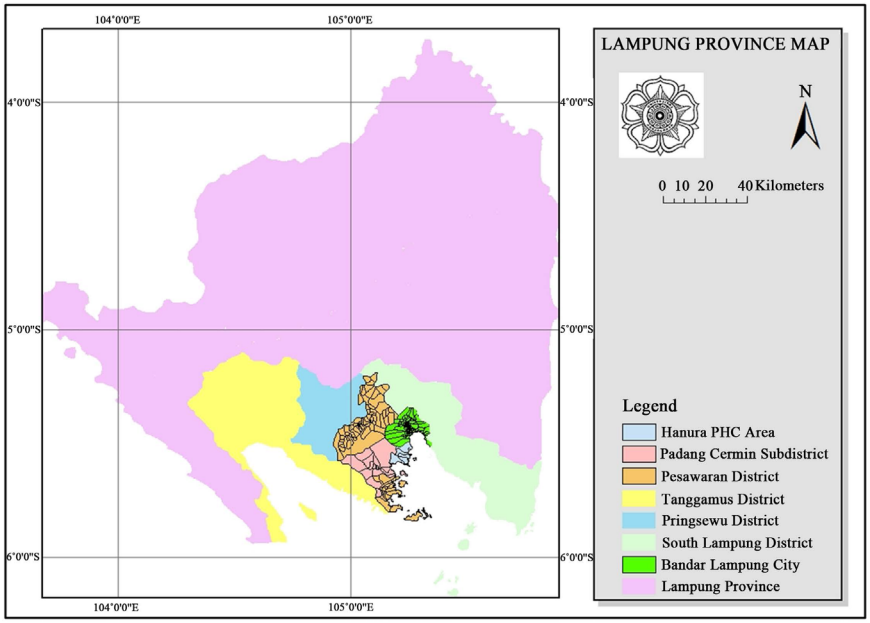

Figure 1. Map of study location in Padang Cermin subdistrict, Pesawaran district.

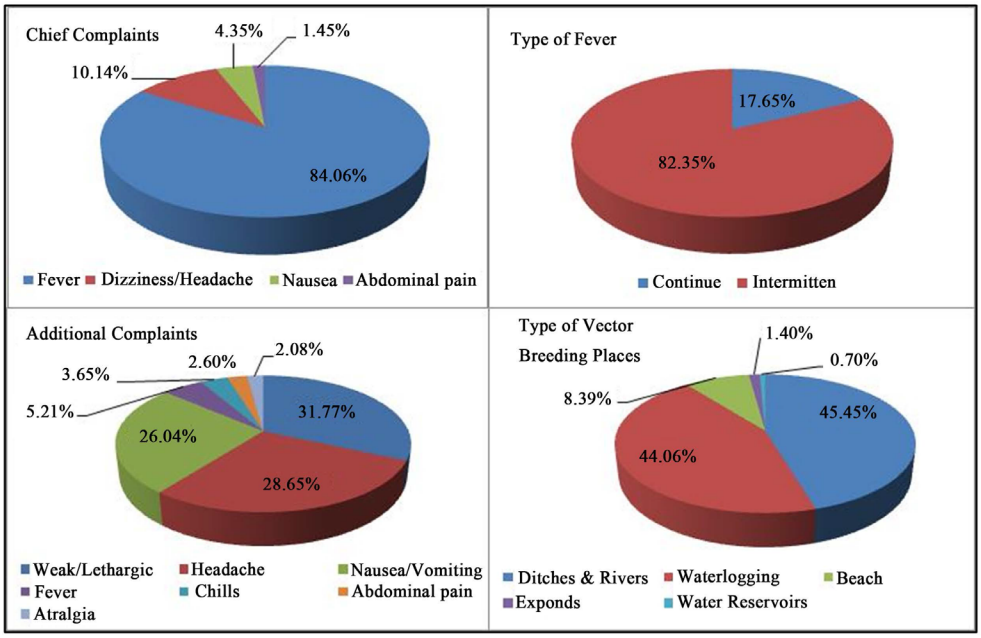

Figure 2. Clinical feature of malaria falciparum patients and type of potentially vector breeding place.

Microscopic examination showed parasite density varies greatly, began from 16 to 11,440 parasites/µL of blood. This parasite density is the density of parasites on microscopic examination of D0 by only counting asexual stage. There is only 1 respondent who found only gametocytes on microscopic examination. This parasite density tends to decrease throughout the day after treatment on D0. Based on WHO criteria, 61 respondents (88.41%) in the category of Adequate Clinical and Parasitological response (ACPR). Early Treatment Failure (ETF) are not found in this study sample (**Figure 3**). Eight samples (11.59%) were found positive return on microscopic examination in H14 (6 persons) and H28 (2 persons) who are classified as Late Parasitological Failure (LPF).

The starting time disappear asexual stage parasites in the blood occurred since D1 until D3 post-treatment. Disappearance of asexual stage parasites at 62 samples (89.86%), occurred in D1 (**Figure 3**). Sexual stage (gametocytes) was found in 15 samples (21.74%). Of the 15 samples found gametocytes, as much as two samples (13.33%) persistent until D14, one sample (6.67%) persistent until D7 and twelve samples (80%), gametocytes had disappeared on day 3 (H3).

Figure 4 shows the distribution of the sample based on location of residence and buffering pattern. People were living within the buffer area, will be high risk for contracting malaria from existing patients. As it is known that the Anopheles mosquitoes had flight range distance until 3 kilometers. In this radius, the mosquitoes will fly and it was possible to transmit Plasmodium from one patient to the other man.

Clustering analysis performed using the software SatScan. Results of clustering analysis in patients with malaria, showed 5 clustering detected (**Table 1**). **Figure 5** shows the location of the clusters and satellite image of this clusters.

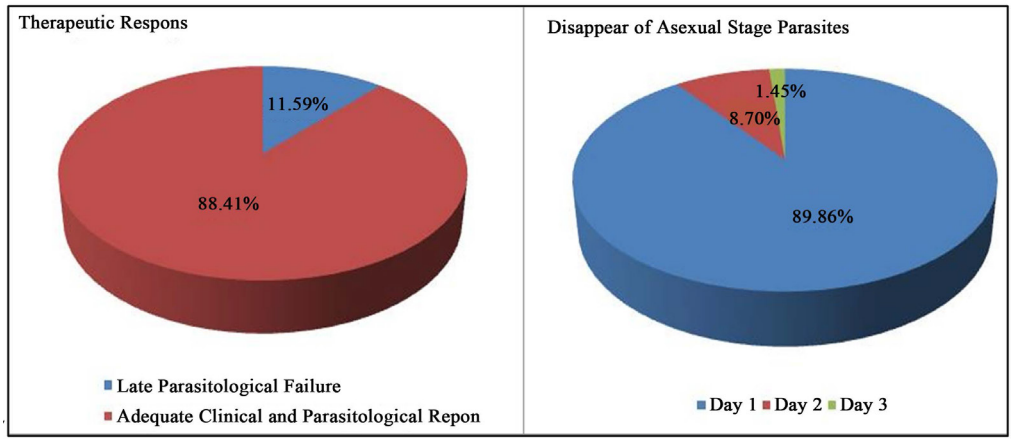

Figure 3. Therapeutic response and disappear of asexual stage parasites.

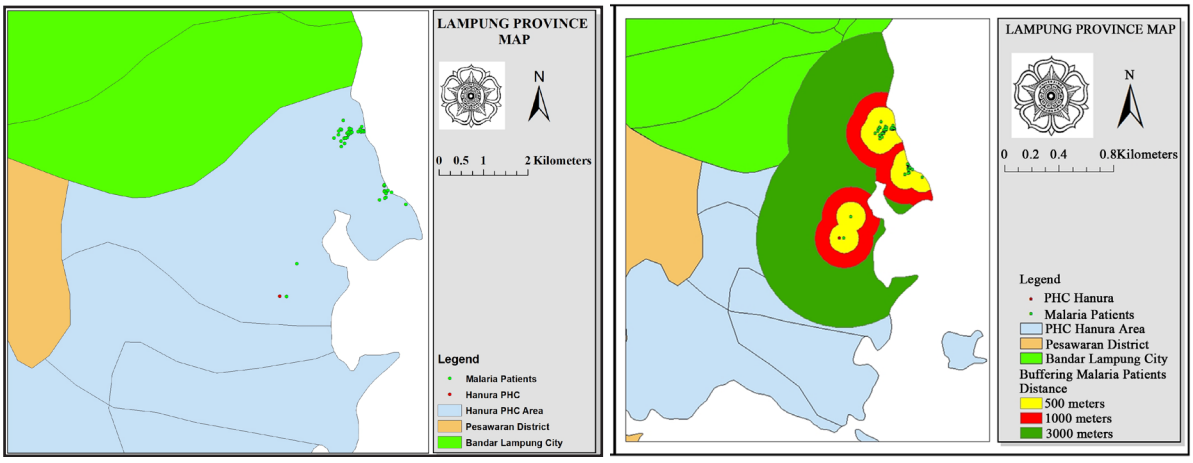

Figure 4. Distribution and buffering of malaria falciparum patients.

Table 1. Results of clustering analysis in malaria falciparum patients.

No	Cluster	P value	Coordinates	Radius	Period
1	1	0.0027	S 5.512458, E 105.258865	0 km	December 2012 until January 2013
2	2	0.3030	S 5.500311, E 105.254631	0.023 km	April 2013
3	3	0.6160	S 5.500377, E 105.249702	0.022 km	May 2013
4	4	0.8940	S 5.500832, E 105.252098	0.061 km	March 2013
5	5	0.9450	S 5.500112, E 105.251854	0 km	February until March 2013

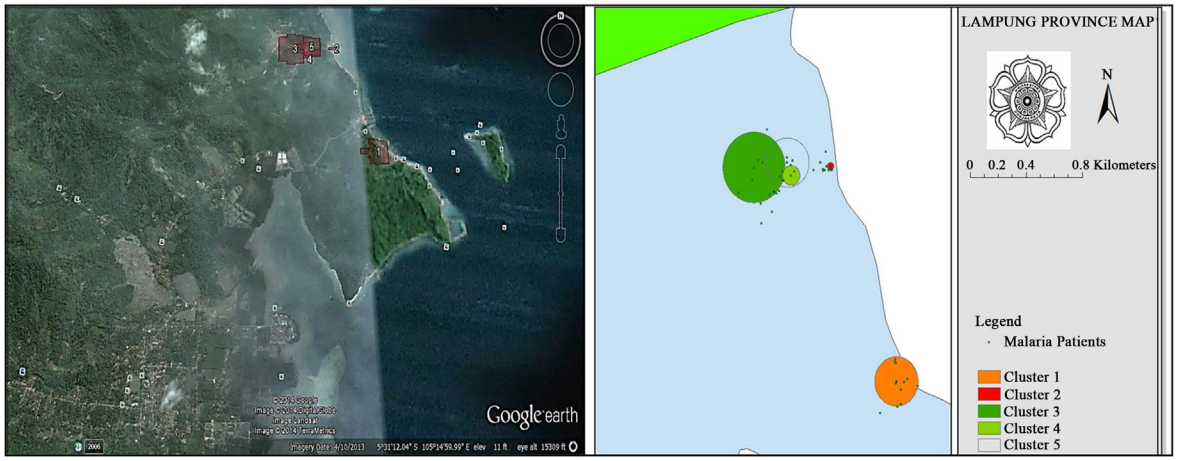

Figure 5. Clustering of malaria falciparum patients.

Distribution of patients with ACT failed therapy and the buffering pattern were shown in **Figure 6**. The buffering distance used the vector mosquito flight range (1 - 3 KM).

Results of clustering analysis at patients with ACT fail therapy showed only one cluster (**Figure 7**). The cluster has P = 1.000, with a radius of 0.15 km and located at coordinates S 5.500099, E 105.250258, which occurred during the period in May 2013.

4. Discussion

Patients with LPF category, most of the parasites appeared on day 14 and day 28. Absence of parasites on the examination day 2, 3 and 7 and appears again on day 14 and or 28, suggesting that the persistence of the parasite in blood, but the parasite density decreases so as not to be detected in microscopic examination. *Plasmodium falciparum* takes 24 - 72 hours to develop from the ring stage to a mature schizont stage. As is known, concentration of artemisinin (DHP or artesunate) in the blood will decrease rapidly after the third day of treatment. This is because, the half-time of artemisinin and its derivatives, only about 1 hour. Single treatment with artemisinin group was not less than 7 days or 3 days if given with combination long-acting antimalarial drugs [17]. Decreased of antimalarial concentration after the third day of treatment will provide sufficient time for the parasite are left to perform the process schizogony so in about 10 days already can be found parasites on microscopic examination.

The goal of radical therapy of malaria, is eliminating the asexual stages and sexual stages (gametocytes) from blood. As it has been known that gametocytes had an important role in the transmission of malaria infection. Gametocytes are infective Stadium to continue its development in the mosquito. The presence of gametocytes in the blood of patients showed there is still a source of infection. In this study there were 15 samples containing gametocytes, on microscopic examination. From follow-up found 2 patients, who gametositnya remained persistent until day 14.

Artemisinin, in previous studies [18], showed activity to decrease number of sexual stage (gametocytes) in the blood but not effect on mature gametocytes, so not all of gametocytes can be removed only by artemisinin ther-

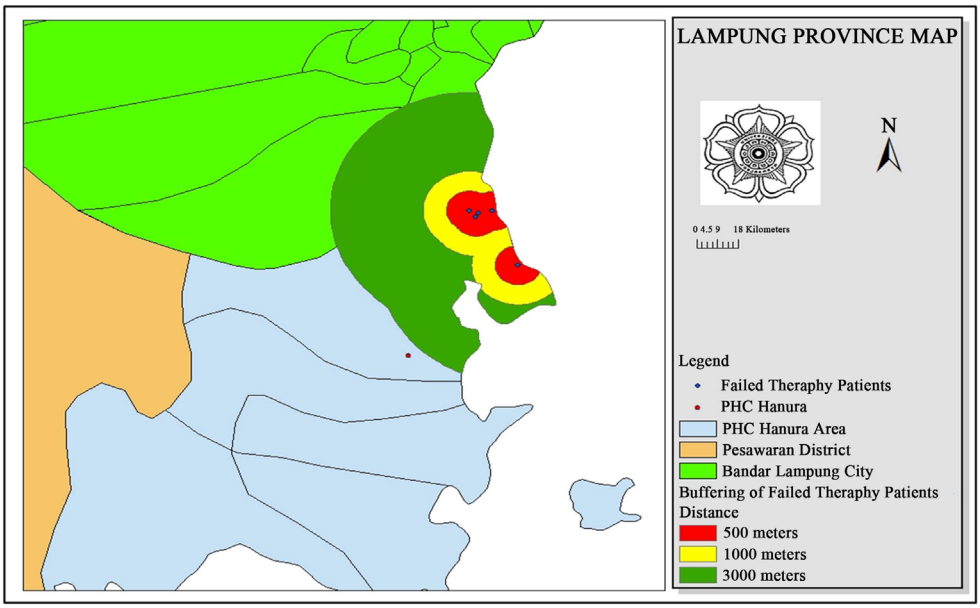

Figure 6. Buffering of malaria falciparum patients with treatment failure at Sukajaya Lempasing Village.

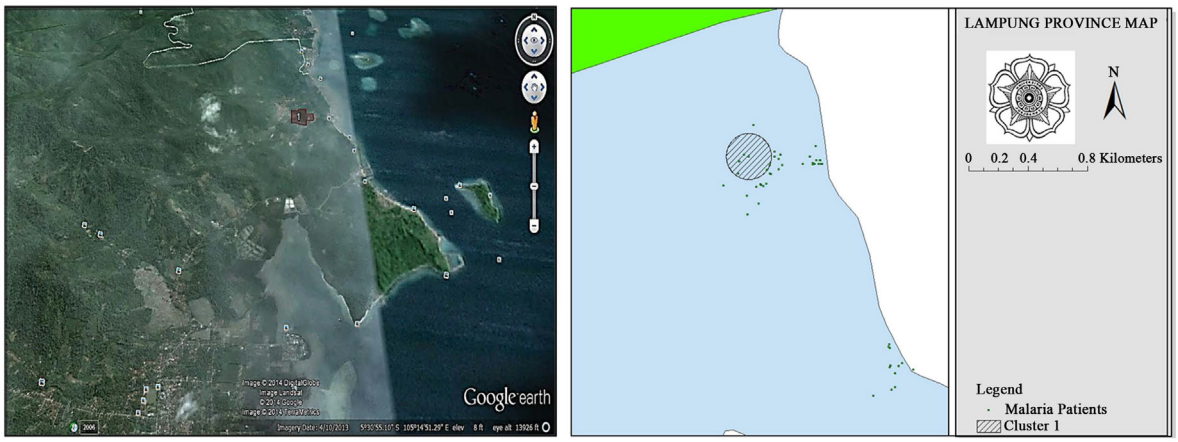

Figure 7. Clustering of malaria falciparum patients with treatment failure at Sukajaya Lempasing Village.

apy. The use of a single dose of primaquine 0.75 mg base/kg was needed to eliminate the sexual stage. Primaquine is one 8-aminoquinoline synthetic derivative, which effective against gametocytes and liver stage of P. falciparum, but not in the blood stage. Mechanism of action of this drug is associated with primaquine conversion into a reactive oxygen (reactive oxygen species) and toxic metabolites on intracellular parasites. Mechanism of action of primaquine is also related to impaired function of ubiquinone, which is an essential electron carrier in the respiratory chain, in mitochondria [17] [19] [20].

Geographical conditions of Hanura health center area, was a coastal and hilly areas. On the east and southeast is an area of Lampung Bay. at West area was a plateau, mountain chain that separates this area from the district capital. In this region, there was several small estuaries and brackish water ponds, which were potential breeding places for the mosquito vector. Most malaria vectors found in the southern coast of Lampung is sundaicus Anopheles [21].

Distribution of malaria patients in this study as shown in **Figure 4**, most of the spread on the coast, in the village of Sukajaya Lempasing. There were only 2 cases, which residence did not near the coast. Location of residence of patients was an area with a dense population, the distance between the house less than 10 meters. Although, research conducted by Sulistyawati (2012) in Purworedjo did not showed significant relationship between the incidence of malaria with population density [22].

The buffer that formed on spatial analysis was shown in **Figure 2**. Buffer is an area with a risk of malaria transmission. As it is known that malaria transmission is very dependent on the presence of malaria vectors. Female mosquito of *A. sundaicus* can fly quite a distance, which is a maximum of up to 3 km [23]. Based on the distance of vector flight can be determined of buffer area of the source of infection. Shown in **Figure 2**, the location of the buffer extends, until out of the district Pesawaran. These conditions often lead to the transmission of the malaria is becoming widespread. As it is known, that the southern coastal areas of Bandar Lampung and Pesawaran are the malaria endemic spot area in Lampung province [24]. From these results, it is necessary to make cross-border planning so that it can control the spread of malaria in the south coast of Lampung Province.

In this study also seen the spread of malaria patients which failed therapy. From results of spatial analysis, it was found that the distribution of patients with treatment failure, are in areas with a high number of malaria patients. Buffer area looked extends, outside the Pesawaran district.

Buffer areas that form in **Figure 2** and **Figure 4**, had an area that contained a pool of brackish water, ex ponds, rivers do not flow well, and a pool of sea water as a potential vector breeding places. *Anopheles sundaicus* is a mosquito, which had breeding places, in coastal areas and brackish water [23] [25]. This study was consistent with research Sulistiowati (2011) [13] which states that the spread of malaria in Sosoh Buay Rayap Sub district be close to the location of the vector mosquito breeding places. Research conducted by W. Zhang *et al.* (2008) [26] also showed that the spread of the malaria can be detected. The places of the risk of transmission can be predicted by using a spatial approach. SatScan analysis results, obtained 5 cluster of malaria distribution and 1 cluster of patients distribution with failed therapy. Only 1 cluster significant was found at distribution of malaria patients ($P < 0.005$). This suggests that there has been a strong malaria transmission process in these cluster.

The results of the spasial analysis and mapping of malaria patients will be used as the basis of planning to prevent the spread of malaria infection in Lampung Province. The potential for the spread of malaria which can across administrative boundaries, environmental factors associated with vector breeding place, malaria patients as a source of infection, the mobility of people and many other factors, requires comprehensive malaria control planning, involving cross-sectoral and cross-border. This condition needs to be a concern of policy makers in malaria control, especially in Lampung Province and Indonesia in general.

5. Conclusion

The prevalence of ACT treatment failure in patients with falciparum malaria was 11.59% in PHC Hanura, Pesawaran, Lampung Indonesia. Five clusters of malaria falciparum patients and one cluster of malaria falciparum patients with failed therapy are found in PHC Hanura, Pesawaran, Lampung, Indonesia. Malaria patients clustered along the coast and located near the area as suspect vector breeding places.

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The Epidemiology and Spatial Analysis of Stroke in Trinidad and Tobago in the First Decade of the 21st Century (2000-2009)

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Abstract

Objective: To investigate the pattern and distribution of stroke in Trinidad and Tobago from 2000-2009. To identify the prevalence of co-morbid conditions among new stroke patients during the period under surveillance. Methods: Data were collected from May 2010 to July 2010 from the clinic of 728 new persons treated stroke at one of the main treatment centers. Variables measured included age, gender ethnicity, smoking status and co-morbid conditions. SPSS (Version 17) for Windows and ARC GIS version 9.3 were used to facilitate both descriptive and inferential data analysis. Results: Of the 728 new hospital admissions for the period January 2000-December 2009 for stroke, 369 (50.7%) were males and 359 (49.3%) were females. 59.8% were South-East Asian; 30.5% were African and 9.7% were mixed ethnicity. The predominant age group was 60 - 69 years (n = 215, 29.5%) while less than 1% were under 30. Ischemic stroke accounted for 352 (48.4%) of all new cases for the period; Hemorrhagic stroke accounted for 14.6% (n = 107), with 37% (n = 269) classified as other unspecified condition (including unknown). Of the 728 cases examined, 171 patients died before being discharged and 552 were treated and discharged. Information of 5 cases was not available. Using this data, the overall case fatality ratio was calculated as 23.5%, with the case fatality ratio for males being 23.2% and the equivalent ratio for females being 22.9%. Using a standard classification, the majority, (n = 389, 53.4%), of cases were classified as mild; 246 (33.8%) were deemed moderate, and 93 (12.8%) were severe cases. Hypertension was clinically diagnosed in 80.9% of the cases; 56.3% were diabetic, and 21.7% were classified as smokers having been either past or current smokers. Other lifestyle risk factors such as obesity and exercise were not examined due to the lack of the relevant data. The most frequent cardiovascular risk factor was chamber enlargement being present in 33.2%, while the second most frequent was left

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ventricular hypertrophy, 26.9%. The other cardiovascular risk factors examined included Ischemic heart disease, atrial fibrillation and previous myocardial infarction. All of which were present in less than 15% of the patients. Conclusion: The incidence of stroke in Trinidad and Tobago continues to be an important public health challenge as we complete the first decade of the 21 century. We provide important evidence on the changing epidemiological patterns of the disease, providing the first attempt to describe a possible stroke belt in the southern half of the island.

Keywords

Stroke; Epidemiology; Hypertension

1. Introduction

The first global estimate on the burden of 135 diseases was provided by the 1990 Global Burden of Disease (GBD) study which showed that cerebrovascular diseases ranked as the second leading cause of death after ischemic heart disease [1]. In 2001, it was estimated that cerebrovascular accident (CVA/stroke) was the second leading cause of death globally, accounting for 5.5 million deaths worldwide, or 9.6% of all deaths, with approximately 70% occurring in low and middle income countries [2]. More recent the GBD study 2010 showed that although age-standardised rates of stroke mortality have decreased worldwide in the past two decades, the absolute number of people who have a stroke every year, stroke survivors, related deaths, and the overall global burden of stroke (DALYs lost) are great and increasing [3]. It is remarkable that there are very few stroke studies outside of the developed world when data are indicating that the majority of strokes are occurring in developing countries. High quality health statistics are essential for planning and implementing health policy in any country. In this regard, WHO developed an international stroke surveillance system called the "STEP wise" approach to stroke surveillance (STEPS-stroke) [4]. This approach forms a framework for surveillance and data collection for all WHO Member States. The first (step 1) of the three steps is the collection of information on stroke patients admitted to heath facilities. The benefits of this activity include providing evidence of the magnitude of stroke, identification of segments of the populations at risk and monitoring trends over time. In respect to the latter, the last study to report on CVA from Trinidad was for the period 1994-95 by Mahabir *et al.* [5]. They reported 1105 hospital admissions with the diagnosis of stroke for the one year period. In addition, the hospital case-fatality rate was 29%. The median length of stay was 4 days, with an interquartile range of 2 to 9, and accounted for approximately 9478 beds per annum, thus emphasizing that stroke in Trinidad in the 1990's was a major public health challenge. Several modifiable risk factors were also identified and the need for effective preventative strategies was recommended.

Many risk factors for stroke have been described. These risk factors may be classified as biological (e.g. age and gender), physiological (e.g. high blood pressure), serum cholesterol, and fibrinogen levels, lifestyle behaviours (e.g. smoking, diet, alcohol consumption), and physical inactivity as well as social and environmental factors (e.g. education, social class and geography) [6]. Epidemiological research has shown that elevated blood pressure is the single most important risk factor for ischemic stroke with a population attributable fraction of 50% [7]. Further anti-hypertensive treatment has been shown to reduce stroke risk by 38 % [8] [9]

The aim of this study therefore is to determine the changing pattern of stroke in Trinidad and Tobago over the first decade of the 21st century. In addition, we investigated demographic factors, subtype of stroke, cardiovascular risk factors, and geographic distribution of patients presenting with stroke at the San Fernando General Hospital during the period 2000-2009.

2. Methods

WHO defines stroke as ""rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin" [10]. By applying this definition transient ischemic attack (TIA), which is defined to last less than 24 hours, and patients with stroke symptoms caused by subdural hemorrhage, tumors, poisoning, or trauma will be identified and excluded from the analysis. However for the purposes of this study, stroke was clinically defined as the

sudden onset of a focal neurological deficit of a presumed vascular etiology and lasting more than 24 hours. This was the single important entry criterion for the study. Accepted standards that are predated were used to diagnose stroke and stroke subtypes that included clinical, laboratory and non-invasive imaging and vascular studies, cardiac evaluation and information from autopsy studies. This included all ischemic and hemorrhagic strokes. The two ischemic stroke subtypes used are: atherothrombotic brain infarctions (ABI) and cardioembolic infarctions (CE), and the two hemorrhagic stroke subtypes are: intra-cerebral haemorrhages (ICH) and subarachnoid haemorrhages (SH). The neurological deficits found while examining an acute phase of stroke while it occurred was used to define the severity of the stroke. This definition was then broken down into four categories: none (no deficit), mild (deficit present in visual, motor, sensory or language domains but without functional impairment), moderate (deficit requiring assistance in one of the domains mentioned above), and severe (deficit requiring assistance in at least two of the domains). The 28-day case-fatality is a common parameter for the short-time survival in stroke patients [11]. Stroke patients who died within 29 - 180 days from the beginning of a stroke defined the long term case-fatality rate.

We used a retrospective incident case series design. The population for this study is all patients admitted to San Fernando General Hospital for the period 2000-2009 with a physician diagnosis of stroke. We aimed to achieve a sample size of approximately 1000 stroke patients. The San Fernando General Hospital was specifically chosen to allow comparison with the study reported by Mahabir and colleagues in 1998. The starting point of the study was a review of admission log books from all the respective wards admitting patients with stroke. All patients identified through this method had their unique hospital identification number, name and date of admission extracted. This information was used to retrieve all patients' medical records. Each medical record was carefully reviewed by two independent investigators to ensure that all patients met the entry criterion. All socio-demographic and clinical data were then extracted from the patient's medical record. All data was stored and password protected using a pin available only to investigators in SPSS version 16.Means and SDs were used to describe patients' characteristics. Categorical variables were compared using the χ^2 test and a 2-tailed $P < 0.05$ was considered statistically significant.The protocol for the study was approved by the University of West Indies Ethics Committee.

3. Results

During the period 2000-2009, 798admissions with a diagnostic label of CVA, Cerebral hemorrhage, TIA and brain stem infarct were carefully reviewed. Using the definition for TIA by the joint American Heart Association/American Stroke Association Stroke CouncilAmerican and other societies [11], 70 patients were classified as having a TIA and were subsequently excluded from the analysis. Thus, 728 patients (369 males and 359 females) were classified as having a first-ever stroke. All patients were crossed checked to ensure that only the first event for stroke was recorded, and that repeated admissions over the period were not counted as an event.

The mean age of occurrence of a stroke was 66 ± 12.4 years; there were marginally more males (51%) females. Ischemic stroke was the most frequent subtype (48%) followed by intracerebral hemorrhage (15%), and undetermined stroke (37%), **Table 1**. TIA which was not included in the analysis represented 8.7% of admissions. The largest proportion of patients (30%) was seen in the age group 60 - 69, **Figure 1**. Case fatality rate (using the MONICA definition: the proportion of events that are fatal within 28 days of onset) was 23.5% [12].

In Trinidad there are two major ethnic groups Africans and South East Asians (SEA) each representing 40% of the population. There was a significant (χ^2, $p < 0.05$) ethnic disparity in the occurrence of stroke among SEA (53%) compared to Africans (27%). Further analysis **Table 2**, shows hospital admission rates according to age, gender and the number of strokes in each ethnic group. For every age group among men the admission rates were higher in SEA than in Africans. Similarly for every age group except ≥ 80 years stroke occurred more frequently among SEA than Africans. The admission rate for those of mixed ethnicity was significantly lower than those for SEA and Africans, for both male and female cases within all age groups. The highest number of first time stroke cases in African males was 33 while in South-East Asian males it was 60, both occurring in the age group 60 - 69 years. In African females, the largest number of first time stroke cases was 30, occurring in the age group ≥80 years, while the equivalent for SEA women was 59, occurring in the age group 60 - 69 years.

The trend in stroke admission over the 10 year period 2000-2009 is displayed in **Figure 2**, apart from the years 2005 and 2006 labeled red there was an overall increase of stroke with time. In fact there was more than a 50% increase in cases in 2000 compared to 2009.

The major risk factors associated with stroke are listed in **Table 3**. Hypertension and Diabetes were the major

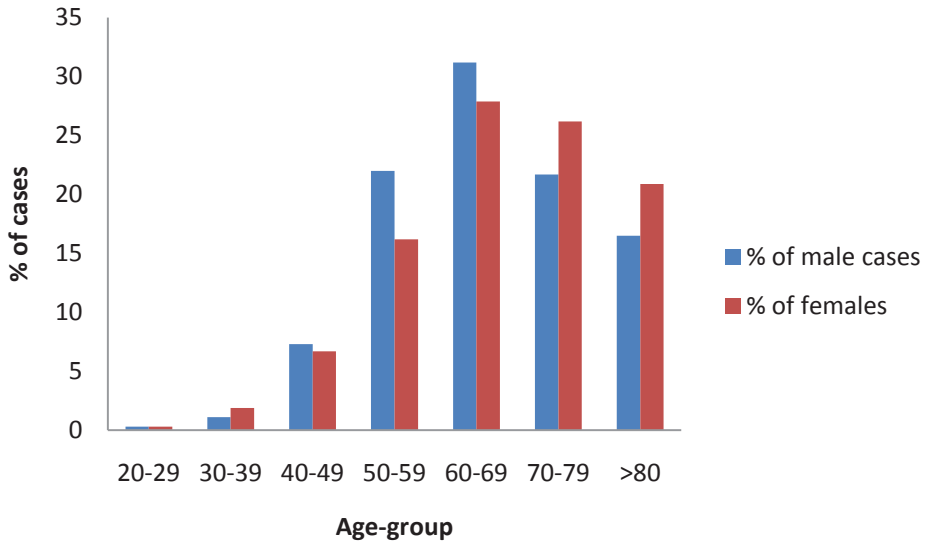

Figure 1. The percentage distribution of stroke cases by age-group and gender.

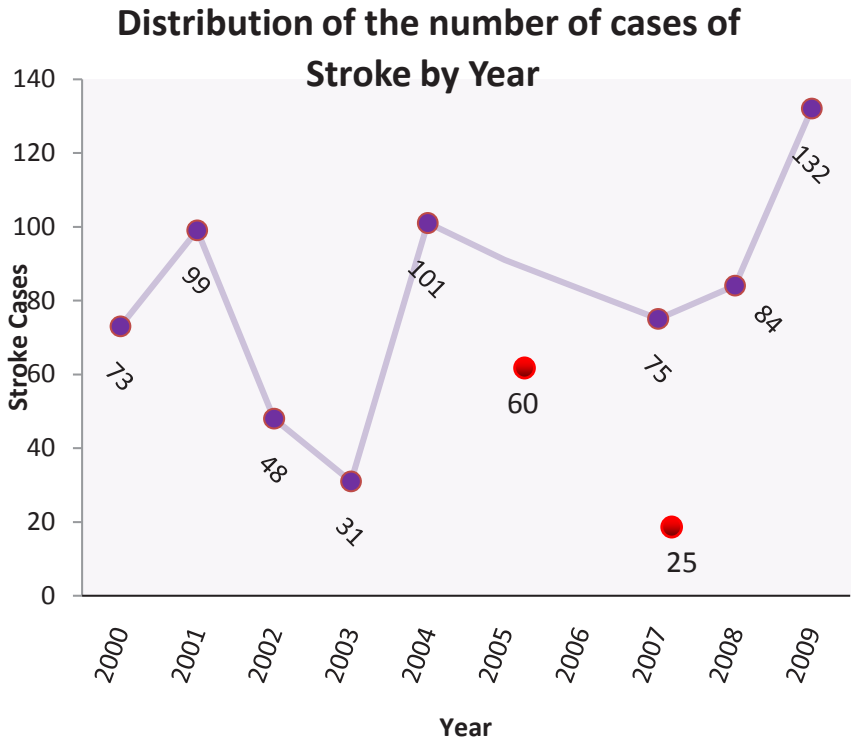

Figure 2. The distribution of the number of cases of stroke by year.

comorbid conditions associated with stroke patients. They account for approximately 50% of all patients admitted, irrespective of gender and ethnicity. Smoking in our setting continues to be a major contributor of stroke, since as much as 20% of people who experienced a stroke smoked.

The most common cardiovascular complication was chamber enlargement closely followed by left ventricular hypertrophy. Both of which were present in approximately 25% of patients at the time of the stroke. Atrial fibrillation was associated with about 7% of patients who had stroke. Previous myocardial infarction (MI) was the least prevalent risk factor, occurring in only5% of patients presenting with stroke.

Table 1. Characteristics of patients admitted to the san fernando general hospital, by gender.

	Males (n = 369)	Female (n = 359)
	(%)	(%)
Age Group		
20 - 29	1(0.3)	1(0.3)
30 - 39	4(1.1)	7(1.9)
40 - 49	27(7.3)	24(6.7)
50 - 59	81(22.0)	58(16.2)
60 - 69	115(31.2)	100(27.9)
70 - 79	80(21.7)	94(26.2)
>80	61(16.5)	75(20.9)
Total	369(100)	359(100)
Ethnic Groups		
Africans	101(27.4)	96(26.7)
South-East Asians	193(52.3)	193(53.8)
Mixed	32(8.7)	31(8.6)
Unknown	43(11.7)	39(10.9)
Total	369(100)	359(100)
Survival to Discharged		
Yes	281(76.2)	271(75.5)
No	85(23.0)	86(24.0)
Unknown	3(0.8)	2(0.6)
Total	369(100)	359(100)
Type of Stroke		
Ischemic	164(44.4)	188(52.4)
Hemorrhagic	42(11.4)	65(18.1)
Unknown	163(44.2)	106(29.5)
Total	369(100)	359(100)

Table 2. Hospital Admission rates for stroke cases by age, gender and ethnic group.

	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	≥80
Men(n = 316)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
African	0(0)	0(0)	5(11.4)	22(17.5)	33(18.6)	25(15.8)	16(13.6)
South-East Asian	1(50)	3(30)	16(36.4)	48(38.1)	60(33.7)	40(25.3)	25(21.2)
Mixed	0(0)	0(0)	2(4.5)	4(3.2)	8(4.5)	9(5.7)	9(7.6)
Total	1	3	23	74	91	74	50
Women(n = 320)							
African	0(0)	1(10)	4(9.1)	17(13.5)	23(12.9)	21(13.3)	30(25.4)
South-East Asian	1(50)	4(40)	14(31.8)	30(23.8)	59(33.1)	55(34.8)	30(25.4)
Mixed	0(0)	2(20)	3(6.8)	5(4)	5(2.8)	8(5.1)	8(6.8)
Total	1	7	21	52	87	84	68
Total(Men & Women)	2(100)	10(100)	44(100)	126(100)	178(100)	158(100)	118(100)

Since hypertension was the predominant risk factor occurring in 80.8% of patients, using the JNC 7 classification for hypertension [13], we classified the stage of hypertension of the patient at the time of the stroke **Figure 3**. Over three-quarters of the patients were in stage 1 and 2.

The neurological deficits found on clinical examination during an acute phase of stroke were used to define the severity of the stroke. Specifically, the extent of the stoke was separated into 4 categories; (1) none = (no deficit), (2) mild = (deficit present in visual, motor, sensory or language domains but without functional impairment), (3) moderate = (deficit requiring assistance in one of the domains mentioned above), and (4) = severe (deficit requiring assistance in at least two of the domains). Using a cut point of 60 years were compared the severity of stroke in patients ≤ 60 years and ≥ 60 years, **Table 4**. More than 50% of the stroke cases were classified as mild s in both age groups. However persons ≥ 60 years had twice the risk of developing a stroke with severe deficit than those under the age of 60.

All incident cases of stroke in which the residence of the patient was identified were used in a preliminary enquiry into the geographic distribution of stroke in the southern half of the island, thus allowing only a crude analysis**.** The map generate disdisplayed in **Figure 4**. The nonrandom distribution of stroke across the southern region, the large magnitude of the difference between high- and low-rate areas, the similarity of the distribution for different race-gender groups, and the lack of delimitation by administrative or political boundaries, together suggest that the pattern of excess stroke is not an artifact of different diagnostic and reporting practices. These preliminary findings hint of a possible stroke belt around the inner cities of this region. On the other hand different methodological approaches to describing a Stroke Belt and temporal changes in this region greatly influence interpretation. Hence a more detailed analysis is required to confirm if in fact a stroke belt exsist in this region.

4. Discussion

This study provides an epidemiological description of stoke in a Caribbean island. The main finding was the increasing prevalence of stroke in the first decade of this millennium. During the period 2000-2009, 728 patients

Table 3. Risk factors assessed in stroke patients.

Risk Factor	African n = 197(30.5)		South-East Asians N = 385 (59.7)		Total n = 582
	Male n = 101	Female n = 96	Male n = 193	Female n = 192	
Hypertension	79(78.2)	80(83.3)	149(77.2)	162(84.4)	470
Diabetes Mellitus	49(48.5)	48(50.0)	109(38.3)	123(64.1)	329
Smoker	33(32.6)	12(12.5)	74(38.3)	14(7.3)	133
Previous MI	1(1.0)	3(3.1)	15(7.8)	8(4.2)	27
Ischemic Heart Disease	8(7.9)	17(17.7)	30(15.5)	34(17.7)	89
Atrial Fibrillation	11(10.9)	7(7.3)	11(5.7)	13(6.8)	42
Chamber Enlargement	46(45.5)	26(27.1)	56(29.0)	42(21.9)	170
Left Ventricular Hypertrophy	39(38.6)	30(31.3)	39(20.2)	61(31.8)	169

Table 4. Severity of stroke based on neurological deficit by Age.

	Age	
Severity	≤60	≥60
	n = 202 n(%)	n = 518 n(%)
None	8(4.0)	24(4.6)
Mild	117(57.9)	272(52.5)
Moderate	63(31.2)	143(27.6)
Severe	14(6.9)	79(15.3)

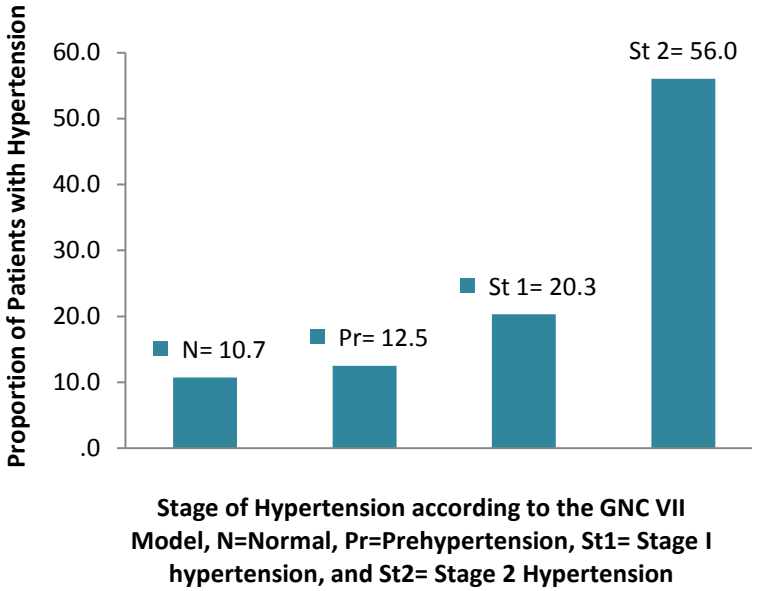

Figure 3. Stages of hypertension in stroke patients.

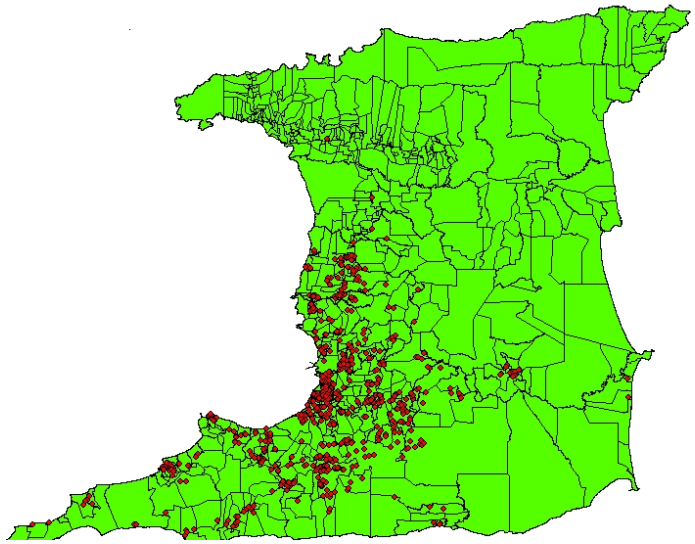

Figure 4. Map of the distribution of incident stroke cases in the southern half of the island.

had a confirmed diagnosis of first-ever stroke on admission to hospital. The prevalence more than doubled from 4.63 per 100,000 in 2000 to 10.7 per 100,000 in 2009. Therefore, unlike developed countries such as the US which has experienced a decline in stroke over the past 20 years, stroke continues to rise in Trinidad. The age-specific prevalence rate showed a general increase with the age group 60 - 69, which shows the highest occurrence of stroke (29.2%) unlike what was reported by Mahabir *et al.* where most stroke cases were seen in patients over the age of 75 [5].

Furthermore, we found a case fatality rate of 23.5% which is less than the 29% reported by Mahabir *et al*. Mortality from stroke has been declining in most industrialized countries [14]. The reason for the decrease has not been fully explained; possible causes include better treatment, a shift toward milder strokes and changes in risk factors over time [15]. In our setting, better treatment is a plausible explanation for the decrease in case fatality rate.

The occurrence of stroke was approximately the same in both men (369/728) and women (359/728). The two

major Diaspora on the island are South-East Asians (SEA) and Africans representing 40.3% and 39.5% of the population respectively according to the 2010 population census. Stroke overall was almost twice as common in SEA (385, 53.0%) than Africans (197, 27.1%). Mahabir *et al.* reported in 1998 that the occurrence of stroke was 46% in Africans and 38% in SEA. Our findings now differ from that of Mahabir *et al.* in which the previous ethnic gap in the occurrence of stroke has not only closed but changed direction. However in the USA, Black and Hispanic people are at a greater risk of stroke than white people [16]. The importance of this finding should now aim to reduce the risk and consequences of stroke among racial and ethnic groups most vulnerable. Particularly to understand the risk factors such as inadequately controlled hypertension, hypercholesterolaemia, and diabetes; people in these racial and ethnic groups are also less likely to use emergency medical services after a stroke, especially the case in Trinidad where many patients use alternative care and also receive drugs for secondary prevention.

Diabetes was found to be relatively more significant in SEA (60.3%) than Africans (49.2%). This finding concurred with that of Mahabir *et al.* where a clinical diagnosis of diabetes was more common in SEA (37.9%) than Africans (25.5%). Smoking was present in 20% of the stroke patients indicating that current smoking cessation strategies continued to be poorly implemented.

In concurrence with the study by Mahabir *et al.*, we also found that hypertension was the predominant risk factor (80.8%) for stroke. In fact, 56% of strokes occurred in patients with stage 2 hypertension. Data from observational studies involving more than 1 million individuals had indicated that death from both IHD and stroke increased progressively and linearly from levels as low as 115 mmHg SBP and 75 mmHg DBP upward [17]. It had been estimated that a 5 mmHg reduction of SBP in the population would result in a 14% overall reduction in mortality due to stroke [18]. To correct and to ensure that, undiagnosed, untreated, or uncontrolled hypertension is optimally managed clearly which places a substantial strain on the health care delivery system. Therefore, partnerships between the client and the health care provider, with the client driving the process have to be considered as an alternative approach for developing countries, for example, a modified DOTS model.

The severity of stroke was assessed and classified. Among all the age groups, mild strokes were most prevalent having an occurrence of over 50% in both males and females. In both genders, moderate strokes were almost as common and severe strokes were seen to be more present on males than females but in low incidences (less than 20%). Since most of the stroke cases were classified as being mild, the functional prognosis would improve with the implementation with proper diagnostic and management procedures.

Our study was restricted to San Fernando General Hospital. As a result, our data may not reflect the entire stroke population in Trinidad and Tobago. We were unable to obtain all the Ward Admission books on the relevant wards. In particular, there was a difficulty in obtaining information for the years 2005 and 2006. Another issue of importance for measurement of stroke incidence in a population is the accuracy of the diagnosis. We have acknowledged the possibility of misdiagnoses since we relied solely on the information recorded by medical staff in the patient files. However, the symptoms and signs are often easy to elicit such that misclassification is not a major problem in this study.

In conclusion, we provide evidence important for planning regarding stroke medical and rehabilitative care and preventive activity. In addition, we report the frequency and rate of occurrence within a defined community during the first decade of the 21 century. Furthermore, we identify the sort of persons who fall victim to such attacks, the extent to which they are affected (and survive), and their exposure to facilities where diagnostic and specialist care is available and utilized.

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List of Abbreviations and Acronyms

CVA: Cerebrovascular Accident
WHO: World Health Organization
MONICA: Monitoring Trends and Determinants in Cardiovascular Disease
TIA: Transient Ischaemic Attack
SEA: South East Asians
MI: Myocardial Infarction
DOTS: Directly Observed Treatment, Short-Course

3

Study on Chronic Diseases Comprehensive Intervention in Baoji of Shaanxi Province in China

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Abstract

Background: There is very limited data available about the epidemiology trial on chronic diseases comprehensive intervention. The aim of this study was to assess the effect of comprehensive intervention on chronic diseases in Baoji and provide basis for the improvement of chronic diseases intervention measures. Methods: Using four stages stratified random sampling method, comprehensive intervention measures were implemented on intervention group (575 individuals) respectively aimed at three crowds of whole population, high risk population and chronic diseases patients. The control group (782 individuals) did not receive special treatment. Two groups were evaluated effect after one year observation. Results: The chronic diseases prevalence rate of whole population in intervention group was lower than that in control group ($P < 0.05$), the blood pressure level and smoking proportion of high risk population in intervention group were lower than in control group ($P < 0.05$), and the blood pressure, blood glucose control rate of chronic diseases patients in intervention group were higher than in control group ($P < 0.05$). Conclusion: Comprehensive intervention could prevent the rise of chronic diseases prevalence. The intervention is effective in reducing or halting risk factors of high risk population, particularly in controlling blood pressure, blood glucose of patients. We should establish government leading, department cooperation, social participation, longtime and classified comprehensive intervention mechanism of chronic diseases. We believe that whole population should control the risk factors, high risk population should early diagnosis and treatment, chronic diseases patients should normalized management, and it could be applied in other counties.

Keywords

Chronic Diseases, Comprehensive Intervention, Randomized Control, Trial

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1. Introduction

With the development of society and economy, great changes have taken place in human disease spectrum pattern, population structure, lifestyle and environmental factors; chronic disease has become the main factors threatening the human health and become public health problem all over the world [1]-[3]. In recent years, government in China has taken chronic diseases prevention and control as the focus of health work, and actively constructed the chronic diseases prevention and control system covering urban and rural areas.

Domestic and international experiences show that, chronic diseases can be effectively prevented and controlled. Chronic diseases intervention for whole population can prevent and reduce the occurrence of chronic diseases, intervention for high risk population can make this part of population transfer to healthy people, and intervention for patients can control the disease progress, reduce the complications, and improve the quality of life for patients.

Comprehensive intervention research for chronic diseases has important significance for preventing and controlling chronic diseases from the long term perspective. Age, sex, culture degree, marriage, employment status and income per month are influence factors of chronic diseases KAP level [4], so we should provide targeted dietary improvement, health education, intervention techniques and measures, and policy support in view of the characteristics of the western rural areas, in order to promote the formation of healthy dietary and lifestyle for rural residents [5].

Baoji city of Shaanxi province belongs to Chinese western city, an underdeveloped area. By the end of 2012, its resident population of 3.74 million, local financial income of 6485 million yuan, the annual per capita disposable income of urban residents 25,777 yuan, per capita consumption expenditure of urban residents 17,499 yuan; per capita net income of farmers 7373 yuan, per capita consumption expenditure of farmers 5934 yuan. In 2012, a sample survey of chronic diseases in Baoji City showed that, chronic diseases prevalence rate of the city's population over 15 years was 36% calculated and standardized according to the number of patients, and patients total medical cost per hospitalization was 5927 yuan. According to the calculation on total annual medical expenditure per patient of chronic diseases as 1000 yuan, the whole social medical expenditure due to chronic diseases was up to 1330 million yuan each year of the total city. If Baoji city can take effective intervention measures, each one percentage point falling in the chronic diseases prevalence rate, can reduce the whole medical expenditure of 37 million yuan. Therefore, to carry out comprehensive chronic diseases intervention is very urgent, and its effect is worth further study.

2. Materials and Methods

2.1. Study Population

We selected four counties (Fengxiang County, Feng County, Mei County, Qianyang County) residents as the research objects, which similar in economy, culture, customs and habits, population size, not adjacent in geographical distribution, good in organizational leadership and funding conditions in our city. Inclusion criteria: age over 15 years old, residence in Baoji city for more than six months, participated in the study voluntarily; exclusive criteria: age less than 15 years old, non residents and can't match with it. According to the administrative division, Mei County and Qianyang County were intervention groups, conducting comprehensive intervention for three population, and Fengxiang County and Feng County were control groups, no intervention measures. Age distribution and socioeconomic status of four counties is approximately representative of the overall population of Baoji.

Using four stages stratified random cluster sampling method (cluster random sampling for towns - cluster random sampling for villages and committees - systematic random sampling for households - Kish Grid method sampling for one person in each household), we extracted 80 households per village from plain counties (Fengxiang County and Mei County), 50 households per village from mountain counties (Qianyang County and Feng county) (because that mountain counties have less people), finally a total of 575 individuals in intervention group, and 782 individuals in control group. One sample village was selected from one town by cluster random sampling method in intervention and control group each other, and all the study subjects of this village were collected fasting vein blood for lipid testing, finally 130 objects in intervention and control group each other.

2.2. Intervention Measures

Comprehensive intervention measures were implemented on intervention group aimed at whole population, high

risk population and chronic diseases patients respectively in three aspects of risk factors control, early diagnosis and treatment, and normalized management, in accordance with the national chronic diseases prevention and control work criterion. Risk factors control for whole population: through policy advocacy, environmental construction, technical support, health education and health promotion activities, build a healthy lifestyle supporting environment, and promote the national health lifestyle culture. High risk population: through health education, active monitoring their indexes changes, promote lifestyle self adjustment to the population with any one high risk characteristic; however, to the population with three or more high risk characteristic, they would be taken in management by medical and health institutions, regular follow-up index, carrying out intensive intervention, intervention content mainly including reasonable diet, reducing sodium intake, proper activity, alleviate psychological pressure, avoid excessive drinking. Patients with chronic diseases: detected hypertension and diabetes patients were carried out normalized management, improving the awareness rate, treatment rate and control rate, guiding the healthy lifestyle, knowing the monitoring methods of blood pressure and blood sugar, improving the compliance behavior of patients and self management ability. The control group did not receive special treatment. Two groups were evaluated effect after one year observation.

2.3. Questionnaire Assessment Content and Analysis Index

Questionnaire content before and after intervention consisted five parts of general situation, health status and health behavior factors, body measurement, dietary survey and blood test. Dietary survey used food frequency questionnaire, and blood test included fasting peripheral blood glucose determination, fasting blood lipid series etc. Pre intervention survey screened high risk population and high blood pressure, abnormal blood glucose patients. The main indexes assessing effect included: chronic diseases risk factors of whole population in intervention group compared with control group, comparison of five high risk characteristics between two groups, and comparison of control rate of blood pressure and blood glucose for patients between two groups.

2.4. Diagnosis Standard

The fasting blood glucose screening abnormal: this study used America Diabetes Association (ADA) 2012 guidelines for the diagnosis and treatment of diabetes [6], fasting blood glucose value ≥ 5.6 mmol/L as fasting blood glucose abnormal. Overweight, obesity and abdominal fat gain reference Chinese adult overweight and obesity prevention and control guide [7]: Body Mass Index (BMI) was calculated as weight divided by the square of height (kg/m^2), BMI <18.5 as low weight, 18.5 ≤ BMI ≤ 23.9 as normal weight, 24.0 ≤ BMI ≤ 27.9 as overweight, BMI ≥ 28 as obesity. Blood lipid: Chinese adult lipidemia prevention and control guide [8], cholesterol (TC) > 5.18 mmol/L, high density lipoprotein cholesterol (HDL-C) < 1.04 mmol/L, low density lipoprotein cholesterol (LDL-C) > 3.37 mmol/L, triglyceride (TG) > 1.70 mmol/L, any kind of these four situations was judged as blood lipid abnormal.

Smoking: refers to continuous or cumulative smoking for six months or more, now still smokers, except for one year or more quit smoking. Passive smoking: exposure to tobacco smoke no less than one time weekly, one time no less than 15 minutes. Drinking: drinking of liquor or beer, wine, yellow wine, average one or more times weekly. High risk population of chronic diseases: defined as the presence of one following risk factors: blood pressure 130 - 139/85 - 89 mmHg, now smoker, 6.1 ≤ fasting plasma glucose < 7.0 mmol/L, 5.2 ≤ TC < 6.2 mmol/L, waist circumference > 90 cm in men or >85 cm in women.

2.5. Quality Control

We adopted methods such as training step by step, testing step by step, sending quality controllers step by step, on-site guidance and evaluation, data double entry, sampling follow-up to control quality in the research process, to ensure the quality of project investigation and data, providing basic guarantee for this study. Anthropometric measurement and blood lipid test were conducted in fasting state, using unified model measurement tools. All the collected blood samples by centrifugation were sent to Baoji city CDC in low temperature within two hours for unified detection, with automatic biochemical analyzer on four blood lipids (TG, TC, LDL-C, and HDL-C). There was some potential measure and reporting bias that could not be avoided, future two years or longer trial is warranted to verify our findings.

2.6. Statistical Analysis

Epidata3.1 was used to double input data, and database was analyzed with SPSS17.0 software after check. We descript measurement data by mean + standard deviation, used t test, chi-square test and ANOVA statistical test, and all analyses were performed with $P < 0.05$ considered statistically significant.

3. Results

3.1. Subjects Situation

In survey objects there were 575 individuals in intervention group, male 62.26% (358/575), female 37.74% (217/575), mean age 45.70 ± 15.31; 782 individuals in control group, male 50.00% (391/782), female 50% (391/782), mean age 43.20 ± 16.54. According to the 5 kinds of high risk population characteristics, after intervention there were respectively 315, 115, 245, 78, 305 individuals of high risk population in intervention group, and respectively 282, 156, 352, 88, 512 individuals in control group. After interventions there were 205, 270 individuals of hypertensive patients in two groups, and 217, 265 individuals of fasting blood glucose screening abnormal patients. In blood collection objects there were 130 individuals in intervention group, male 51.54% (67/130), female 48.46% (63/130), mean age 48.11 ± 14.11; 130 individuals in control group, male 36.15% (47/130), female 63.85% (83/130), mean age 50.97 ± 11.65.

3.2. Comparison on Risk Factors Control of Whole Population

Prevalence rate (**Table 1**): In intervention group, the prevalence rate of hypertension, fasting blood glucose screening abnormal rate, LDL-C, HDL-C and total blood lipid abnormal rate were all lower than control group, and the difference above was statistically significant; there was no significant difference in TC and TG abnormal.

Chronic diseases risk factors (**Table 2**): The smoking rate in intervention group was lower than that in control group, the daily smoking frequency in intervention group was lower than control group (the effective number of smoking frequency data were respectively 105, 199 individuals in intervention and control group); the drinking rate in intervention group was lower than control group, the proportion of weekly drinking more than three times in intervention group was lower than control group; LDL-C level group in intervention group was lower than control group, HDL-C was higher than control group. The difference above all had statistical significance. There was no significant difference of TC and TG change level.

Food intake (**Table 3**): The intake of cereals, vegetables, eggs, fish, beans in intervention group was all higher than that in control group, the intake of oil and salt in intervention group was lower than control group, all with statistically significant difference; The difference of fruits, poultry meat and milk intake had no statistical significance between two groups. The intake of cereals, beans in two groups, eggs, poultry meat in intervention group reached to the requirement of Chinese residents balance diet pagoda, fruit, fish, milk did not reach the requirement, and oil and salt intake in two groups exceeded the standard.

The nutrient intake (**Table 4**): Average daily nutrient intake of subjects showed that, the intake of energy, protein, carbohydrate, vitamin B1, B2, B6, folic, niacin, calcium, phosphorus, potassium, magnesium, selenium in intervention group was all higher than that of control group, the intake of vitamin A and sodium was lower than control group, all with statistically significant difference; there had no significant difference in fat, vitamin C, E, iron, zinc, copper, manganese intake between two groups. The intake of proteins, carbohydrates, vitamin B1, C, E, phosphorus in two groups, energy, niacin, magnesium in intervention group reached the recommended intake requirement, the intake of vitamin A, B2, B6, folic, calcium, potassium, iron, zinc, selenium, copper, manganese in two groups did not reach the requirement, and sodium intake in two groups exceeded the standard.

Nutritional status: BMI nutritional status of two groups showed that, low weight rate of intervention group (3.3%) was lower than that of control group (4.7%); normal weight rate of intervention group (63.8%) was higher than in control group (59.0%); overweight rate of intervention group (25.4%) was lower than in control group (29.7%); obesity rate of intervention group (6.0%) was lower than in control group (8.0%).

3.3. Control Effects of Main Index of High Risk Population

According to the 5 kinds of high risk population characteristics, after intervention there were respectively 315, 115, 245, 78, 305 individuals of high risk population in intervention group, and respectively 282, 156, 352, 88,

Table 1. Comparison on blood pressure, blood glucose, blood lipid abnormal rate between two groups.

Index		Intervention (%)	Control (%)	χ^2	*P*
Blood pressure	normal	458 (79.65)	574 (73.40)	7.11	0.008
	hypertension	117 (20.35)	208 (26.60)		
Fasting blood glucose screening	normal	451 (78.43)	577 (73.79)	3.90	0.048
	abnormal	124 (21.56)	205 (26.21)		
TC	normal	105 (80.77)	95 (73.08)	2.17	>0.05
	abnormal	25 (19.23)	35 (26.92)		
TG	normal	84 (64.62)	86 (66.15)	0.07	>0.05
	abnormal	46 (35.38)	44 (33.85)		
LDL-C	normal	93 (71.50)	51 (39.20)	27.46	<0.05
	abnormal	37 (28.50)	79 (60.80)		
HDL-C	normal	83 (63.80)	35 (26.90)	35.75	<0.05
	abnormal	47 (36.20)	95 (73.10)		
Total blood lipid abnormal rate	normal	56 (43.08)	17 (13.08)	28.97	<0.05
	abnormal	74 (56.92)	113 (86.92)		

Table 2. Comparison on smoking, drinking, blood lipid between two groups.

Risk factors		Intervention (%)	Control (%)	χ^2	*P*
Smoking	Yes	105 (18.26)	199 (25.45)	9.845	0.002
	No	470 (81.74)	583 (74.55)		
Smoking frequency	Every day	79 (75.24)	176 (88.44)	11.83	0.001
	Occasional	26 (24.76)	23 (11.56)		
Drinking	Yes	66 (11.48)	124 (15.86)	5.276	0.022
	No	509 (88.52)	658 (84.14)		
Weekly drinking frequency	More than three times	42 (63.64)	86 (69.36)	4.82	0.028
	Less than three times	24 (36.36)	38 (30.61)		
	Blood lipid	mean + standard deviation, mmol/L		t	P
	TC	4.39 ± 0.86	4.61 ± 0.95	1.77	>0.05
	TG	1.57 ± 0.86	1.55 ± 0.82	0.20	>0.05
	LDL-C	2.96 ± 0.77	3.63 ± 0.99	6.09	<0.05
	HDL-C	1.12 ± 0.46	0.67 ± 0.48	7.76	<0.05

Table 3. Comparison on average daily intake of dietary between two groups.

Food	Recommended intake (g)	The actual intake (g)			t	*P*
		Average (n = 1357)	Intervention (n = 575)	Control (n = 782)		
Cereals	250 - 400	467.2	569.1 ± 288.0	392.3 ± 205.4	12.6	<0.05
Vegetables	300 - 500	240.8	270.3 ± 206.1	219.2 ± 199.2	4.6	<0.05
Fruits	200 - 400	113.7	109.2 ± 152.1	117.1 ± 206.3	0.8	>0.05
Eggs	25 - 50	28.5	31.3 ± 32.1	24.7 ± 31.1	3.8	<0.05
Fish	75 - 100	3.8	5.1 ± 21.1	2.1 ± 7.5	3.7	<0.05
Poultry meat	50 - 75	49.3	51.3 ± 66.7	46.6 ± 55.9	1.4	>0.05
Beans	30 - 50	69.3	85.0 ± 90.0	48.0 ± 68.7	8.6	<0.05
Milk	300	41.5	44.5 ± 81.8	37.4 ± 98.6	1.4	>0.05
Oil	25 - 30	49.4	44.1 ± 40.4	53.4 ± 36.8	4.4	<0.05
Salt	<6	8.7	7.1 ± 6.1	9.9 ± 8.8	6.9	<0.05

Table 4. Comparison on average daily intake of main dietary nutrients between two groups.

Nutrients	Recommended nutrient intake	The actual intake			t	*P*
		Average (n = 1357)	Intervention (n = 575)	Control (n = 782)		
Energy (kcal)	2000 - 2700	2070.8	2380.3 ± 1159.1	1843.2 ± 828.5	9.5	<0.05
Proteins (g)	70 - 80	83.5	95.8 ± 44.7	74.4 ± 35.2	9.5	<0.05
Fat (g)	55.6 - 75	43.7	43.5 ± 26.6	43.9 ± 27.5	0.3	>0.05
Carbohydrates (g)	300 - 405	352.6	421.7 ± 213.0	301.9 ± 146.3	11.6	<0.05
Vitamin A (μgRE)	700 - 800	211.9	167.1 ± 152.0	244.9 ± 553.5	3.7	<0.05
Vitamin B1 (mg)	1.3 - 1.4	2.4	2.8 ± 1.4	2.0 ± 1.1	12.0	<0.05
Vitamin B2 (mg)	1.2 - 1.4	0.7	0.7 ± 0.4	0.6 ± 0.4	2.4	<0.05
Vitamin B6 (mg)	1.2 - 1.5	0.4	0.5 ± 0.3	0.4 ± 0.3	6.4	<0.05
Folic (μg)	400	98.4	111.6 ± 64.0	88.7 ± 88.3	5.3	<0.05
Niacin (mg)	13 - 14	11.7	13.5 ± 6.7	10.4 ± 5.1	9.5	<0.05
Vitamin C (mg)	100	160.6	151.7 ± 217.5	167.2 ± 278.4	1.2	>0.05
Vitamin E (mg)	14	15.5	15.2 ± 7.9	15.7 ± 9.4	1.0	>0.05
Calcium (mg)	800 - 1000	420.0	441.2 ± 240.6	404.5 ± 236.4	2.8	<0.05
Phosphorus (mg)	700	1070.1	1210.8 ± 571.4	966.6 ± 458.6	8.4	<0.05
Potassium (mg)	2000	1495.9	1608.3 ± 814.9	1413.2 ± 822.6	4.3	<0.05
Sodium (mg)	2200	6241.3	5327.5 ± 4162.5	6913.2 ± 4606.0	6.6	<0.05
Magnesium (mg)	350	323.2	369.4 ± 183.3	289.3 ± 156.6	8.5	<0.05
Iron (mg)	15 - 20	14.8	14.3 ± 10.6	15.1 ± 15.7	1.1	>0.05
Zinc (mg)	11.5 - 15	6.6	6.6 ± 3.8	6.6 ± 3.8	0.2	>0.05
Selenium (μg)	50	43.4	49.0 ± 23.3	39.3 ± 18.7	8.2	<0.05
Copper (mg)	2.0	1.3	1.3 ± 0.8	1.3 ± 0.9	0.5	>0.05
Manganese (mg)	3.5	2.4	2.3 ± 1.5	2.4 ± 1.6	0.5	>0.05

512 individuals in control group. After intervention, the blood pressure, smoking rate in intervention group was lower than in control group, with statistically significant difference, and there was no significant difference in other high risk characteristics (**Table 5**).

3.4. Control Effects of Chronic Diseases Patients

After interventions there were 205, 270 individuals of hypertensive patients in two groups, and 217, 265 individuals of fasting blood glucose screening abnormal patients. After intervention the control rate of blood pressure, glucose screening in intervention group was higher than in control group, with statistically significant difference (**Table 6**).

4. Discussion

Through one year's intervention control trial, we found that, chronic diseases intervention effect did not need a long time cycle as people often imagine. Research shows that, a lot of intervention measures in chronic disease prevention, such as the measures recommended in "Framework Convention on tobacco control" and combination therapy with a variety of drugs for high risk population of cardiovascular disease, were very economical and effective [9]-[11]. Moreover, the control effect usually appeared in much shorter time than expected. The latest evidence from Britain suggested that reducing smoking and exposure to secondhand smoke can quickly produce health and economic benefits, decrease cardiovascular disease rate in a short one year time, and also reduce the medical costs; in Finland, to eliminate the cause of chronic diseases risk factors after 2 to 7 years you can see significant results, even for the aged population, these measures can also take effect [12] [13].

Table 5. Comparison on main index of high risk population between two groups.

High risk characteristics		Intervention (%)	Control (%)	χ^2	*P*
Blood pressure	Yes	62 (19.68)	76 (26.95)	4.422	0.035
	No	253 (80.32)	206 (73.05)		
Smoking or not	Yes	21 (18.26)	40 (25.64)	9.845	0.002
	No	94 (81.74)	116 (74.36)		
Fasting blood glucose	Yes	25 (10.20)	48 (13.64)	1.586	0.208
	No	220 (89.80)	304 (86.36)		
Serum total cholesterol	Yes	18 (23.08)	25 (28.41)	0.613	0.434
	No	60 (76.92)	63 (71.59)		
Waist circumference	Yes	83 (27.21)	148 (28.91)	0.270	0.603
	No	222 (72.79)	364 (71.09)		

Table 6. Comparison on control rate of blood pressure and blood glucose between two groups.

Index		Intervention (%)	Control (%)	χ^2	*P*
Blood pressure	Controlled	106 (51.71)	88 (32.59)	17.621	<0.05
	Uncontrolled	99 (48.29)	182 (67.41)		
Fasting blood glucose screening	Controlled	104 (47.93)	69 (26.04)	24.842	<0.05
	Uncontrolled	113 (52.07)	196 (73.96)		

The prevalence rate of hypertension in poor women was higher [14], and the lower socio-economic status in Japanese women was their risk factor of cardiovascular disease [15]. The prevalence rate of diabetes mellitus in a higher urbanization area was higher than that in a lower area [16]. Baoji city is a heavy industry base of Shaanxi Province, is building to the Deputy Center of Guanzhong and Tianshui Economic Development Zone, with rapid urbanization, the hypertension, impaired fasting glucose, diabetes patients may have increased gradually in future, so the prevention and control of chronic diseases should be paid enough attention by the government. This study has several limitations. Firstly, there was some potential recall, measure, reporting and lost of follow up bias that could not be avoided. Secondly, one year's observe seemed a little short for some index.

In this study, the change of LDL-C, HDL-C abnormality rate and blood lipid level was most obvious, hardly of TC and TG change, it showed that the comprehensive intervention measures probably had effective short-term effects on LDL-C, HDL-C abnormality rate and blood lipid decrease, however, effects on TC and TG will need long-term observe. We found the comprehensive intervention measures mainly by health education and healthy behavior promotion has a certain application value for lipidemia prevention and control of the city.

The intake of glutamic acid, arginine, lysine, tyrosine and cysteine from food plays an important role in hypertension [17]. Among dietary factors, carbohydrates, sodium are risk factors for hypertension, and animal protein, riboflavin, niacin, calcium, phosphorus, zinc, magnesium, potassium, animal iron [18], potassium [19] are protective factors for hypertension. In the reasonable range dietary protein intake increased or carbohydrate decreased may help control blood pressure [20]. Dietary fiber may play an important role in reducing glycated hemoglobin levels [21]. There are more and more diabetes, impaired glucose tolerance of rural residents with more total energy intake, more carbohydrates intake, less dietary fiber intake [22]. The study found that the nutrition and health status of residents in intervention group was obviously improved manifest in diet structure unreasonable situation relieved, the average daily intake of grain, vegetables, eggs, fish, beans increased, oil and salt were preliminary controlled, but still need to continue to increase the intake of fruits, fish, milk, reduce oil and salt. Normal weight rate of people increased, and low weight, overweight, obesity rate all decreased. The unreasonable dietary structure probably because the intervention measures cannot obtain ideal effect in the short term, so we should further implement the comprehensive intervention measures, in order to consolidate and improve the control effect.

The international community has achieved some consensus of a series of effective policies choice and intervention contents for chronic diseases, and this consensus is derived from different countries accumulated expe-

rience [23] [24]. Chronic disease is closely linked with the economic and social development, chronic diseases prevention and control work has been beyond the health sector, so adopting a comprehensive and integrated action at the national level is the key to success [25]. According to the experience from home and abroad, combined with our actual, we believe that whole population should control the risk factors, high risk population should early diagnosis and treatment, chronic diseases patients should normalized management, and it could be applied in other counties. Our specific proposal is as follows: 1) health goal strategy. All levels of government, relevant departments, health system and social related aspects should cooperate closely around the core of "residential health", according to the division of their respective duties, and take comprehensive measures to prevent and control chronic diseases; 2) organization ensure strategy. Chronic diseases comprehensive prevention and control leadership team should be established at all levels of government, the principal government leaders or leaders in charge for the head of, to coordinate and solve important problems in actual work; 3) health service model transform strategy. Transform from the "treatment first" health service model to the "prevention first" model, in this regard, America and Britain have provided useful references from positive and negative aspects for China [26] [27]; 4) life cycle strategy. To gradually implement the whole life intervention strategies, mainly as the basic public health service subjects currently being implemented in China; 5) Chinese characteristics prevention and control strategies. Fully develop the health advantages of traditional Chinese medicine and Chinese traditional classical culture in effective prevention and control of chronic diseases.

5. Conclusion

In conclusion, comprehensive intervention could prevent the rise of chronic diseases prevalence. The intervention is effective in reducing or halting risk factors of high risk population, particularly in controlling blood pressure, blood glucose of patients. We should establish government leading, department cooperation, social participation, longtime and classified comprehensive intervention mechanism of chronic diseases throughout country as soon as possible, so as to effectively reduce their harm.

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Ethical Approval

This work was approved by Baoji Center for Disease Control and Prevention Academic Ethics Board, and all participants gave informed consent prior to participation.

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Competing Interests

None declared.

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4

Determining the Quality of Management and Structural Elements of the Epidemiology and Biostatistics Department in Tehran University of Medical Sciences

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Abstract

Introduction: The system of quality in higher education requires a systematic evaluation of all of its different aspects. Different patterns of evaluation reveal the strengths and weaknesses of the programs and facilitate the informed decisions. Objectives: The objectives of the present research are as follows: 1) Determining the quality of the structural elements of the Epidemiology and Biostatistics Department; 2) Determining the strengths, weaknesses, opportunities and threats to improve the quality of activities in the department under research. Design: In this research, the efficiency of the department was studied based on the internal self-evaluation. For this purpose, pre-determined indices with relative modifications were used. This study was conducted with the collaboration of the head of the department, faculty members, all of the students (residents, Ph.D. and M.S. students) and the graduates. Through a pilot study the initial rates of the areas under research were first determined by the opinion poll carried out among all the faculty members, then through proper tests, unrelated data were identified and omitted and the final rates were extracted. Results: The mean of the areas under study was 59.8% of which the minimum (37%) was related to the area of aims and objectives and the maximum (72.6%) related to area of the graduates. Conclusions: The graduate domain is one of the key areas under study in the internal evaluation of this department which received a good score.

Keywords

Quality of Management, Evaluation, Academic Department, Epidemiology and Biostatistics, Tehran

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1. Introduction

The issue of quality in higher education has attracted a lot of attention [1]. Quality improvement has earned competitive advantages for organizations like higher education which attracted a lot of interested researchers to this area [2]. The system of quality in higher education requires a systematic evaluation of all of its different aspects. Different patterns of evaluation reveal the strengths and weaknesses of the programs and facilitate the informed decisions [3]. The educational activities of each country can be considered as an investment by one generation for the other. The main purpose of this investment is human development. In this regard, the evaluation of educational organizations, programs, staff and their services can have an effective role in improving the quality of education [4].

Martin believes that establishing a system of process evaluation in institutions and their programs is considered as a routine. That's why various methods of evaluation for accurate assessment of performance in higher education were developed [3]-[5]. Regardless of rules and regulations related to performance evaluation in countries and the limitations set for it, the necessity of the assessment of performance in countries, the manager's actions and decisions and the performance of institutions seems obvious. In situations where governments are faced with the increasing economic and social demands of people because of deficient availability, meeting demand and achieving goals and objectives for development , and making balance between demand and community resource require a comprehensive and ongoing evaluation and monitoring from which the higher education is not an exception [3] [6].

Regarding the significance of the issue, it is worth mentioning that the Islamic Republic of Iran Constitution emphasized on utilizing sciences and technology, and also training experts based on the needs for the development and improvement of the country's economy [7]. Also in the Code of the fourth economic, social, and cultural development plan, Article 49, the ongoing evaluation of universities, higher education centers, and governmental and private research centers by the ministries of science, research and technology, and health with the collaboration of scientific institutes is emphasized [8]. In this regard the accrediting council of higher education has recognized a system of accreditation as having the following stage [9]:

1) Internal evaluation: The plan and/or the report on the institute's performance are compiled with the contribution of the members.

2) Peer review: The self-evaluation report is reviewed by the faculty members and their peers in the same profession and their comments and suggestions will be released.

3) Site visit: An outside organization or agent sends the visiting team. The self evaluation report of the institute is the main source for the visiting team.

4) Judgment by accrediting organization: The intended plan of an organization or an institute is judged by the agents or the boards of the same institute or organization. This judgment is done based on three levels of: not accepted, conditional accrediting and accrediting.

5) Ongoing external review: Institution or plans are reviewed continuously within the range of 5 to 10 years and in some cases even less. It should be mentioned that the internal self evaluation report is reviewed just as before.

Considering the fact that there are controversies over the stages of accreditation and that there has been a thorough review in the related literature, one can infer the consensus and strong emphasis on internal and external evaluation from most of the texts in literature [9]-[19], while an increasing number of universities in the world have accepted the self evaluation method as their first step [12].

According to Lacino *et al*. (2004), international evaluation is the process of systematic gathering of data, asking question from and interviewing with the students, graduates and professors which leads to the self-evaluation report [13].

In internal evaluation, the aim is that those involved in planning should obtain more information on the objectives, and the issue concerning their achievements, then evaluate the ways to meet those objectives in order to improve the quality in future [1]. This type of evaluation will help the authorities to know how far they are from the desired situation and what plans they should consider in order to achieve the objectives and improve the quality [14].

According to what was mentioned above, we can conclude that for the ongoing improvement in the system of universities, establishing an efficient system of evaluation which both improves and promotes the scientific quality considering the improvement of the entire system of universities is required based on the needs and specificities of the system. The results of the pervious experiences on evaluation approaches have shown that internal evaluation for this purpose is desirable [15]. Furthermore, in order for the government's fourth development plan to be realized, internal evaluation is considered as the first step.

The evaluation and accreditation plan of the universities of medical sciences, have been approved in the government's third five year development plan of Iran. In this regard, both the Ministry of Health and Higher Education's priorities have been the objective oriented and the internal evaluation. Since 1996 the internal evaluation has started based on the objectives and in 2000 the external evaluation has been conducted in some of the universities of medical sciences [15]. Concerning what has just been mentioned, the internal evaluation in the Epidemiology and Biostatistics Department has started as an approved plan by TUMS Development Center in order to reveal the strengths and weaknesses, also threats and opportunities in addition to evaluating the quality [15].

2. Material and Method

This research is a descriptive, cross sectional and applied type of study. In order to gather the data, texts, dissertations, research plans, journals, documents and more important the internet were studied. The instruments used were note cards and questionnaires. The efficiency of the department was studied based on the internal self-evaluation. For this purpose, pre-determined indices with relative modifications were used.

This study was conducted with the collaboration of the head of the department, faculty members, all of the students (residents, Ph.D. and M.S. students) and the graduates. Through a pilot study the initial rates of the areas under research were first determined by the opinion poll carried out among all the faculty members, then through proper tests, unrelated data were identified and omitted and the final rates were extracted. In this evaluation 9 areas of 1) aims and objectives 2) organizational and management structure 3) faculty members 4) students 5) teaching and learning process 6) educational courses and curriculum 7) graduates 8) research and educational facilities and equipment and 9) research were studied using 61 criteria and 172 indicators. Five-point Likert Scale was used for the responses in the questionnaire (<50% = undesirable, 50% - 75% = rather desirable, 76% - 100% completely desirable). Finally the data were analyzed using descriptive statistics indices and the assessment software of the Educational Development Center of TUMS. The instruments used in this method included assessment software, interview, observation and self-prepared questionnaire which consisted of 7 questionnaires and 2 check lists.

The questionnaires were prepared separately for the subjects including the evaluation committee, head of the department, the faculty members, students and the graduates. TUMS Development Center and the Ministries of Health and Education have confirmed the reliability and validity of the items in the questionnaire performed by internal evaluation software.

3. Research Findings

The findings (**Table 1** and **Figure 1**, **Figure 2**) show that the desirability of the areas under study were as follows:

As shown in **Box 1**, **Box 2** educational evaluation council on educational group of Epidemiology and Biostatistics was developed educational strategies based on special objectives and educational indicators based on criteria. Average results from educational evaluation at educational group were represented at (**Table 1** and **Figure 1**, **Figure 2**). Strengths and weaknesses, opportunities and threats educational were analyzed on the basis of SWOTs pattern at the educational group (**Box 3**).

Research findings regarding each area in the Epidemiology and Biostatistics Department are as follows:

Aim and objectives: Considering the fact that the aims and objectives were recently set, the criterion related to the set objectives showed undesirable result. The generalizability and clarity of the objectives were relatively desirable. Considering the fact that the aims and objectives were set with the contribution of the members of the department with no official notification from the college, university or the Ministry, the criteria related to the involvement and contribution of the members in setting and clarifying the objectives (educational, research and

Table 1. The degree and continuum of desirability of factors which were evaluated in department of epidemiology and biostatistics, School of Public Health, Tehran University of Medical Science.

Evaluated factors	Degree of desirability	Desirability continuum
1. Aims and objectives	1.85 (37%)	Undesirable
2. Organizational and management structure	3.2 (64%)	Rather desirable
3. Faculty members	3.35 (67%)	Rather desirable
4. Students	2.72 (54.4%)	Rather desirable
5. Teaching and learning process	3.2 (66.4%)	Rather desirable
6. Educational courses and curriculum	3.38 (67.6%)	Rather desirable
7. Graduates	3.62 (72.6%)	Rather desirable
8. Research and educational facilities and equipments	3.02 (60.4%)	Rather desirable
9. Research	2.64 (52.8%)	Rather desirable

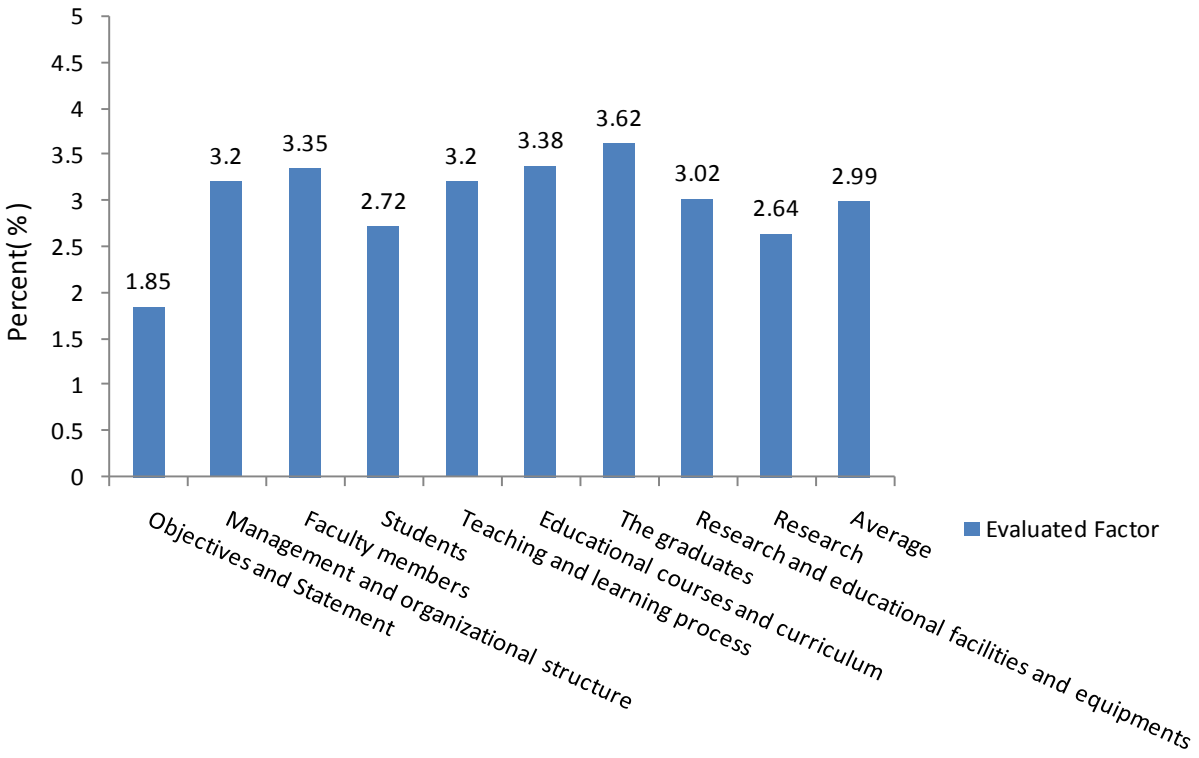

Figure 1. The desirability rate of the variables under evaluation based on Likert scale with total mean in the epidemiology and statistics departments, faculty of health in TUMS.

providing professional services) and the department's independence in setting and analyzing the objectives (educational, research and providing professional services) were desirable to some extent. Eventually, the findings show undesirable results for the achievement of the objectives. As a whole, the desirability of this factor was 37%. Thus it is suggested the following measures be taken:

1) Clarification of the objectives set by the department;

2) Developing methods to modify the objectives and aims of the department considering the timing and the scientific situation;

3) Setting the objectives of the department based on a time table;

4) Considering the students' comments in developing the objectives of the department;

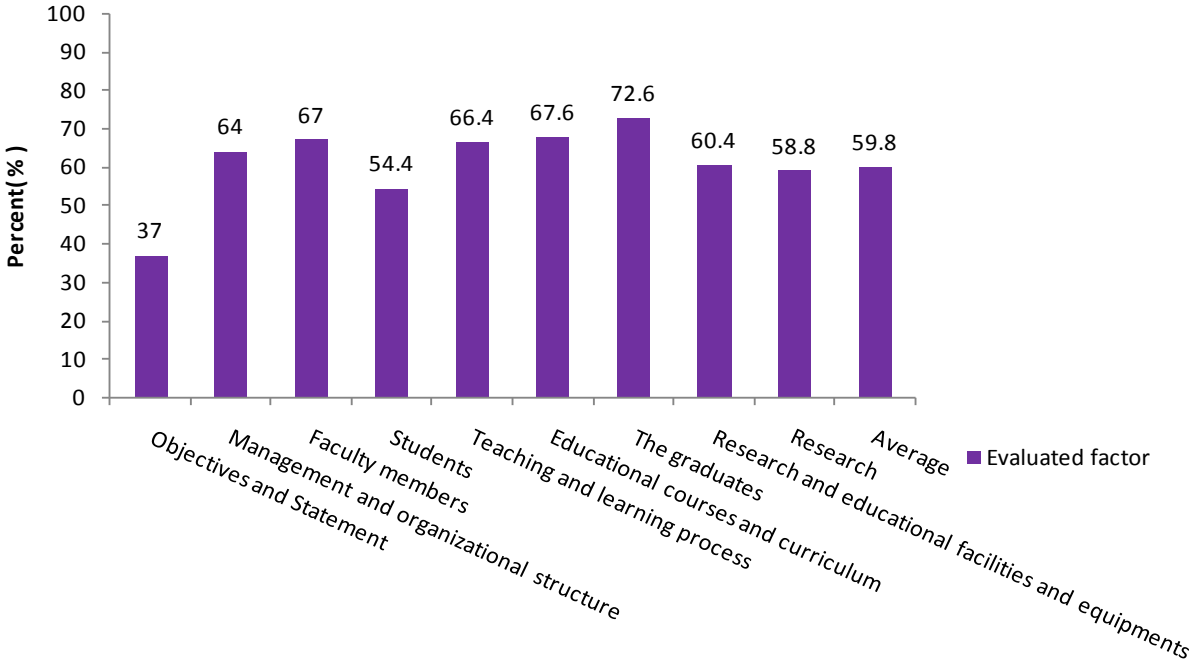

Figure 2. The desirability percentage of the areas under evaluation with total mean in the epidemiology and statistics departments, faculty of health in TUMS.

Box 1. Educational strategies based on special objectives.

Special objectives	Educational strategies
1) Improving and promotion of quality level and remedial hygienic research and educational program development conforming to society needs at university level.	1) Internal evaluation about educational programs quality.
2) Increasing the number of scientific board members and specialists in educational groups.	2) Present permanent system reviews in order to performance of desirable internal evaluation.
3) Knowledge development and achieving modern technologies.	3) Developing scientific relations with other universities and domestic and foreign authorized centers.
4) Training efficient human resources at remedial hygienic research and educational courses.	4) Promotion of short time educational courses qualitatively.
5) Promotion of scientific board members, facilities, equipment conditions and educational resources in laboratories and so on in this purpose, strategies were developed for above mentioned special objectives.	5) Promotion of remedial—hygienic research and educational materials and conditions qualitatively.

Box 2. Indicators based on criteria.

Criteria	indicators
Management	Management organizational structure, remedial research, service and educational performance function description, internal and external activities of members planning, management authorities.
Scientific board	Scientific board distribution, operational, remedial, hygienic research and educational activity information and experience.
Learners	Educational improving.
Learning teaching process	Applying educational technology by scientific board, educational improving, teaching methods and graduates.
Educational courses and curriculum	Educational courses quality, conforming courses to objectives, group courses content, conforming courses to mission, objectives, facilities and program evaluation.
Graduates	Capability, identification, relation between learners and their educational group after completing education, occupational future (destination) keeping education, management and planning service receivers' comments about learners occupation capabilities.
Equipment	Service remedial hygienic research and educational resources. Space, facilities, laboratory, library, computer, visual and audio.
Research	Research activities, study opportunities research programs compiling, group, gathering, text magazine research plans…
Satisfaction	Management, scientific board and learners satisfaction with all educational operational remedial hygienic and research aspects.

Box 3. SWOTs at educational group.

S Management & Organizing, Scientific board members, experienced and powerful experts, Students, manpower curriculum development and graduates	**W** Scientific board welfare, modern Technology, spaces of educational, research and health care equipment
O Health Care, research and educational validity of university and foreign students	**T** Powerful Scientific board retirement

5) Examining the ways to achieving the objectives and implementing methods for periodical assessment of the achievements.

Management and organizational structure: The findings show that the development plan of the department and the faculty concerning the short term, long term, and the middle term plans, offering new courses of study, and the faculty's satisfaction from the plans and the available documents, are at desirable level. Furthermore, the specific planning and the assessment of the activities of the department, in spite of the unavailability of the documents, and reports and absence of systematized planning and evaluation of the activities of the department, was at desirable level. Of course, the faculty members showed their satisfaction from the consistency in planning. The interdepartmental activities with the other faculties and departments were at satisfactory level. The criteria regarding the faculty's contribution in planning the activities of the department and their satisfaction, also the systematized method of evaluation were at desirable level. The head of the department's policies, characteristics, obligations, responsibilities, and authorities were also desirable. However, the coordination between the department's planning and the college and the university, besides the proportion of the manpower and the facilities of the department to its planning was relatively desirable. In addition, the meeting schedule of the department and the faculty members' attendance was absolutely desirable and the bylaws of the department and their execution were satisfactory. On the whole, the desirability of this area was reported as 64%. Thus considering the following points is required:

1) Setting the required plans for the development of the department and the preparation of appropriate timetable with the contribution of the faculty members and their continuing assessment;

2) Preparing specific by laws regarding the routines of the department;

3) Setting timetables regarding the development of human resources of the department;

4) Providing the facilities required for the assessment of the achievement rate of the objectives, performance of the department, and the annual reports;

5) Analyzing the needs of the manpower and the body resources of the department, and the necessary follow ups in meeting them.

Faculty members: The findings show that the composition and distribution of the faculty members are satisfactory and their educational activities and their documentation are completely desirable. Also, the faculty members' authorities and limitations in decision makings of the department were satisfactory and their presence in the department to counsel the students to was absolutely desirable. The faculty member's satisfaction from the department and its activities was absolutely desirable, and sharing of the experiences among the members was satisfactory. The faculty members showed their complete satisfaction towards the conveniences and the grants offered to them. Finally, the faculty members' knowledge of the latest findings in their own field of study and their relationships with the students and the colleagues were satisfactory. On the whole, the desirability of this area was reported as 64%. For improving this factor, the followings are suggested:

1) Providing the facilities and conveniences for boosting the educational and research activities;

2) Setting plans for taking courses and dissertations and for the teaching hours of the faculty members and their other educational activities;

3) Planning for the preparation of the texts and the lesson plans by the faculty members.

Students: In this area the criteria related to the students' admission, the relationships between the students and the faculty members, the students' comments on the programs and activities of the department, their awareness of the objectives of the department, and the proportion of the number of students to the department's resources were relatively satisfactory. The educational achievements of the students of the department were satisfactory. Also, the students' role in planning the activities of the department and their knowledge of their own rights and obligations were to some extent satisfactory. On the whole, the desirability of this area was reported as 54.4%. The following suggestions for improving the current situation are offered:

1) Providing a situation for increasing the authority of the department in admitting the PhD students and determining the general policies of students' admission;

2) Informing students when entering the university and during their studies and benefiting from their comments;

3) Implementing clear criteria for monitoring the students' educational progress and providing them with proper feedbacks.

Teaching and learning process: The criteria related to the faculty members' teaching methodologies and the assessment of the students' learning were relatively desirable. The rate of the faculty members' use of technology in their teaching was desirable. However, the feedback to the students on their learning achievements and the makeup programs and the pre requisite courses for improving the students' learning were unsatisfactory. On the whole, the relative desirability showed 66.4%. Thus, in order to improve teaching, learning, using teaching aids, make up and pre requisite courses, assessment and the feedbacks on the results of assessment of the students' achievements in education, the followings are suggested:

1) Holding workshops for the faculty members to share their ideas and experiences and also to advance their knowledge in implementing new teaching methodologies;

2) Appropriate planning to improve the quality of using information technology and teaching aides in the teaching process;

3) Holding meetings between the faculty members and the students and providing them with feedbacks;

4) Designing make up and pre requisite courses for the students based on their educational backgrounds and their needs.

Educational courses and curriculum: The educational level and the different disciplines of the department, conformity of the courses with aims and objectives, conformity of the courses with the facilities and the resources, and the departments' offering courses based on the principles of curriculum design, were reported as desirable. However, the comments of the members of the department (the head, the faculty members, and the students) on the quality of the courses, also the assessment of the course materials were relatively desirable. On whole, the desirability was reported as 67.6%. In this regard, the followings are worth considering:

1) Systematic planning and evaluation of courses, programs and the course materials, also considering the students' comments and ideas;

2) Improving the appropriateness and variety of the subjects and the quality of the courses through ongoing evaluation, although the results show that conformity of the courses with the facilities, resources and the objectives of the department and the composition of the subjects were desirable.

The graduates: The competence, attitudes, and the cognitive abilities of the graduates of the department, also the contacts of the graduates with the department after graduating from the university were relatively desirable. The scientific works of the graduates were also desirable. In addition to that, the graduates' comments on the management of the curriculum of the department and their careers were desirable. On the whole, the desirability was 72.6%. For improving the relationships of the graduates with the department and promoting the scientific activities, the followings are suggested:

1) Holding educational workshops for residents in order to enable them in compiling books and scientific journals;

2) Holding annual gatherings and calling on the graduates to improve the relationship and also to be informed about their careers.

Research and educational facilities and equipments: The criteria related to the space allocated for the office and education, library and information system, computer facilities and services, workshops and the labs of the department, and teaching devices were satisfactory and research facilities and equipments were relatively desirable. On the whole, the desirability level was 60.4%. Although the findings related to this area was desirable, the followings are suggested for improvements:

1) Providing technologically advanced equipments for the physical extension of the department in the college;

2) Providing specialized texts for the department and their copies for the library;

3) Assigning a technician permanently for the research and educational advanced technologies for better administration and more efficiency;

4) Providing teaching aids for holding seminars and journal clubs in the department using the department funds or with the faculty's contribution from the conducted projects.

Research: Setting the research programs of the department and planning for research, financial resources of research, sabbaticals of the faculty members, and also the seminars and gatherings held by the department were desirable to some extent. The scientific and research activities and findings of the faculty members and the stu-

dents were relatively desirable but the research contracts were desirable. On the whole, the area showed relative desirability (52.8%). For this reason, the following suggestions are offered for improving the situation:

1) Planning and assigning the facilities required for compiling and translation of books by individuals or groups by the department;

2) Providing opportunities for the faculty members in seminars inside and outside the country;

3) Setting and implementing documented plans on budgeting research expenses;

4) Investigating the reasons for declining the sabbaticals by the faculty members and taking the necessary measures to improve it;

5) Considering the importance of research, assigning a committee to investigate the causes and the necessary strategies to improve the research area.

The above findings show that the evaluation of the department on the areas of goals, objectives, teaching and learning process, and research is lower than the other areas. However, studying the areas, criteria, and the indicators, also determining the strengths and weaknesses and the recommendations, are worth contemplating. Considering these recommendations by the Evaluation Committee will lead to the increase in the benefits and the improvement of the quality of the department.

4. Discussions

The internal evaluation is potentially a valuable process [11] and there is a positive attitude towards it in education and research in clinical affairs [16]. Researchers conducted in this area are as follows:

Farzianpour *et al*. in educational evaluation of 15 educational departments of clinical and basic sciences in TUMS stated that with internal evaluation an attempt can be made in eliminating the existing weaknesses and help setting an efficient educational system [17]. Yousefi *et al*. in the internal evaluation of anatomy department in Semnan University of Medical Sciences, has emphasized on improving the strengths and continuing the assessment [18]. Yarmohammadian and Kalbasi, after the internal evaluation of the educational departments of the management and medical information science of Isfahan University of Medical Sciences have stressed on the importance of being in contact with the students in improving the quality of education and research [19]. The researchers after doing internal evaluation of the child nursing education department of Semnan University of Medical Sciences have claimed that the findings were desirable, but found the revision and changes necessary [20]. Rafiee *et al*. after the internal evaluation of the internal surgery nursing department of Rafsanjan University of Medical Sciences expected earning higher scores in later evaluations because of the correction of undesirable indicators [21]. In 2008 findings, the internal evaluation was reported to be a standard method for accreditation in universities [22]. Dehghanipudeh *et al*. claimed that the internal evaluation is the first step in university accreditation and an attempt in controlling and improving the quality of education [23]. Yamani *et al*. suggested that the internal evaluation is a step in improving the quality of educational programs in Isfahan University of Medical Sciences [24]. Farzianpour *et al*., in TUMS, recommended that the internal evaluation based on the international standards especially the international standards of WFME is a method of accreditation of universities in the world [25]. Farzianpour *et al*., in TUMS, stated that the evaluation of different aspects of educational programs in the departments of clinical and basic sciences seems necessary because management equipped with observation and control devices for the educational programs is required [26]. Sedaee *et al.* reported that the faculty evaluation is basically the assessment of the merits. On the other hand, improving the quality of education, research, health and finally rehabilitation is one of the most important obligations of the authorities of the universities [27]. Parsa *et al*. in the internal evaluation of Nursing and Midwifery faculty found that the internal evaluation is the best indicator that shows the rate of achieving the goals and also analyzes the quality of educational activities and that by internal evaluation one can obtain logical results [28]. Rabbani *et al*., in the internal evaluation of the faculty of child diseases, stated that internal evaluation is a systematic process for gathering, analyzing and interpretation of data for studying the rate of achieving the goals [29]. Olyaee *et al*. in internal evaluation believed that appropriate assessment and research in education are considered as practical devices for catching up with the developments to improve the quality in educations, research and health [29].

In this research, the mean of the 9 areas results as 59.8%, the minimum of which is related to the aims and objectives area as 37% and the maximum related to the graduates which was equal to 72.6%. The department of Epidemiology and Statistics, with the scientific management, experienced faculty and competent students will be able to catch up with the international standard of WFME through timely organization and planning, and also

play a dynamic and efficient role in higher education in the world. The novelty was in this research a self evaluation for quality improvement in system of teaching in Tehran University of Medical Sciences.

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5

Current Status and Correlates of Modern Family Planning Utilization in Hard to Reach Ethnic Minorities: The Case of Gumuz, Northwest Ethiopia

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Abstract

Cognizant of multifaceted challenge of unwanted pregnancy, Ethiopia strives to increase utilization of modern family planning across the nation. Therefore, update on the current status of family planning utilization especially in hard to reach ethnic minorities is critical. The objective of this study was to assess level, and correlates of modern contraceptive utilization in a hard to reach ethnic minorities. A community based study was conducted in Dangur District, Beneshangul Gumuz Regional State July, 2013. A total of 530 married women were included in the study. Structured questionnaire was data collection tool. Data was analysed using SPSS version 20 for windows. Possible association and their strength were measured using odds ratio at 95% CI. Family planning utilization was 18.7% while nearly 27% of study participants had ever used family planning methods. The following variables were predictors of family planning utilization: number of alive children [AOR: 3.31, 95% CI (1.41 - 7.20)], good knowledge [AOR: 2.18, 95% CI (1.35 - 3.52)] and positive attitude [AOR: 1.58, 95% CI (1.03 - 2.50)]. The most outstanding finding of this study was that more than 80% of study participants still believe that many children means high income, and nearly 60% of them believe that family planning utilization decreases confidence among couples. This study witnessed how successful Ethiopia is in addressing reproductive health service inequalities in hard to reach communities. However, misconceptions surrounding family planning, and culture associated desire to have large family size should be addressed in a culture sensitive manner so that this success would further bear fruits.

Keywords

Family Planning, Benshangul-Gumuz, Hard to Reach, Ethnic Minorities, Ethiopia

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1. Introduction

The twenty-third round of official United Nations population estimates and projections indicates that the 7.2 billion world population in mid-2013 is projected to reach 8.1 billion in 2025. This figure will increase to 10.9 billion by 2100 [1]. The major segment of the projected population growth will take place in low and middle income countries of Africa and Asia [2] [3]. Over half of the increase is expected to occur in only eight countries. Ethiopia is one of them [1].

Being the second most populous nations of Africa [4], Ethiopia is a prototype example of nations which has been facing multitudes of challenges following rapid population growth including environmental degradation, chronic food insecurity, high maternal, and child mortality [5]. It is surprising to notice that the population of Ethiopia has doubled itself between 1980 and 2011 [6] [7].

Population growth could worsen the current unacceptably high maternal and child mortality. It could also put further pressure on environment, and social services. Moreover, population growth increases global burden of disease, poverty, and conflict [1] [2]. Such situations can be even worse in countries such as Ethiopia where inequality is a serious concern. Ethiopia is a mosaic of nationalities and peoples, having more than 80 different spoken languages [8]-[10]. Addressing the issue of inequality has been a serious problem in Ethiopia. To address this serious concern, the country has established a decentralized federal structure with nine regional states and two city administrations supported with constitution [9]-[11]. The Government of the Federal Democratic Republic of Ethiopia strongly believes that inequality in any sector could be better addressed through a federal system [11].

Considering population growth as a serious challenge, the Federal Democratic Republic of Ethiopia has developed several modern policies, and strategies to culminate extreme poverty, to revive degraded environment, to reduce maternal and child mortality and finally to develop Ethiopia from the current lowest to middle income countries in the coming couples of decades [12].

In this regard, several achievements have been registered in the country in various sectors including the health sector. Making Family Planning accessible to all families across the nation has been one of the successful interventions in Ethiopia [13]. Family planning services began in the 1966 in Ethiopia with the establishment of the Family Guidance Association of Ethiopia (FGAE). Not until the 1980s, did the Federal Ministry of Health (FMOH) add family planning to its maternal and child health program. In the first national survey in 1990, the CPR was only 2.3% [6] [7].

Data on trends of family planning utilization in Ethiopia reveals that there is reduction in unmet need over the last 21 years as documented in 2000, 2005, and 2011 EDHS [13] [14]. However, level of family planning utilization and unmet need still varies from region to region in this Federal State [5]. Furthermore, most studies on level of family planning utilization and unmet need focus on regions with large population size such as Amhara [15], and Oromo [16] [17] while data on level of family planning utilization, and unmet need in emerging regions such as Benshangul Gumuz is scarce.

Therefore, the genuine struggle of the government to address inequality through decentralized government structure needs to be supported with current data. The finding of this study will help reflecting successes, and help depicting the remaining challenges of family planning services utilization in hard to reach ethnic minorities, for instance, Gumuz communities in Ethiopia.

2. Methods and Materials

Community based cross-sectional study was conducted in Danguar District of Benshangul Gumuz National Regional State in June, 2013. The Benishangul Gumuz National Regional state (BGRS) is one of the nine Federal Constituents of Ethiopia located in the Northwest parts of Ethiopia [11]. Benishangul-Gumuz Regional State consists of five ethnic groups: Gumuz, Berta, Shinasha, Mao and Komo. However, there are also other ethnic groups living in the region in which their composition is specified as follows: Amhara, Oromo, Shinasha etc. [18]. According to the 2007 Ethiopian National population and housing census report, the total population of the Region was estimated to be 670,847 [19].

The Region is divided into three Zones: Danguar District is one of the seven districts of Metekel Zone. This district is bounded by Pawe, Guba, Wombera & Bulen Districts of the region and Amhara National Regional State in the East, West, South and North, respectively. Admistratively, Dangur district is divided into 27 *Kebeles* (the smallest level of government administration). This district was selected because the majority of the target population—Gumuz communities—are living (**Figure 1**).

Based on the 2007 National population and housing census of Ethiopia, the population of the district is ap-

proximately 40,781. Of these, 20,232 were females. There are two health centers, 27 health posts in the district (25, 26). The target population constitutes all married Gumuz women in child bearing age.

Gumuz communities were selected for this study because of the following reasons: they are living in less urbanized, in scattered manner with low infrastructure. Hence, they have maintained their cultural heritages. Moreover, Gumuz people are the second native majority in the region.

The sample size was calculated using single population proportion formula. Since data was not available for the study area, a 50% proportion of family planning utilization was taken to get maximum sample size.

$$n = \frac{(Z\alpha/2)^2 \, p(1-p)}{W^2}$$

Where: n = the maximum sample size,

Z = standard normal distribution curve value for 95% CI which is 1.96,

P = Proportion (50%),

W = tolerable margin of sampling error= 0.05 and α = the level of significance= 0.05,

Non response rate = 10%.

Hence, $n = \frac{(Z\alpha/2)^2 \, p(1-p)}{W^2} = (1.96)^2 \times (0.5 \times 0.5) = 384(0.05)^2$

The above sample size is for an infinite population (n > 10,000). The estimated number of Gumuz married woman in the district was 4620. Therefore, the revised calculated sample size became

$$384/1 + (384/4620) = 355$$

These multiplied with and 1.5 design effect plus 10% non response rate, the final calculated sample size was 585.

The sample size was distributed to the sampled Kebeles proportionate to the size of the households in the respective selected 10 kebeles out of the 17 kebeles in the district. For households with more than one woman aged 15 - 49 years, only one was selected using lottery method. When the selected house hold was closed during

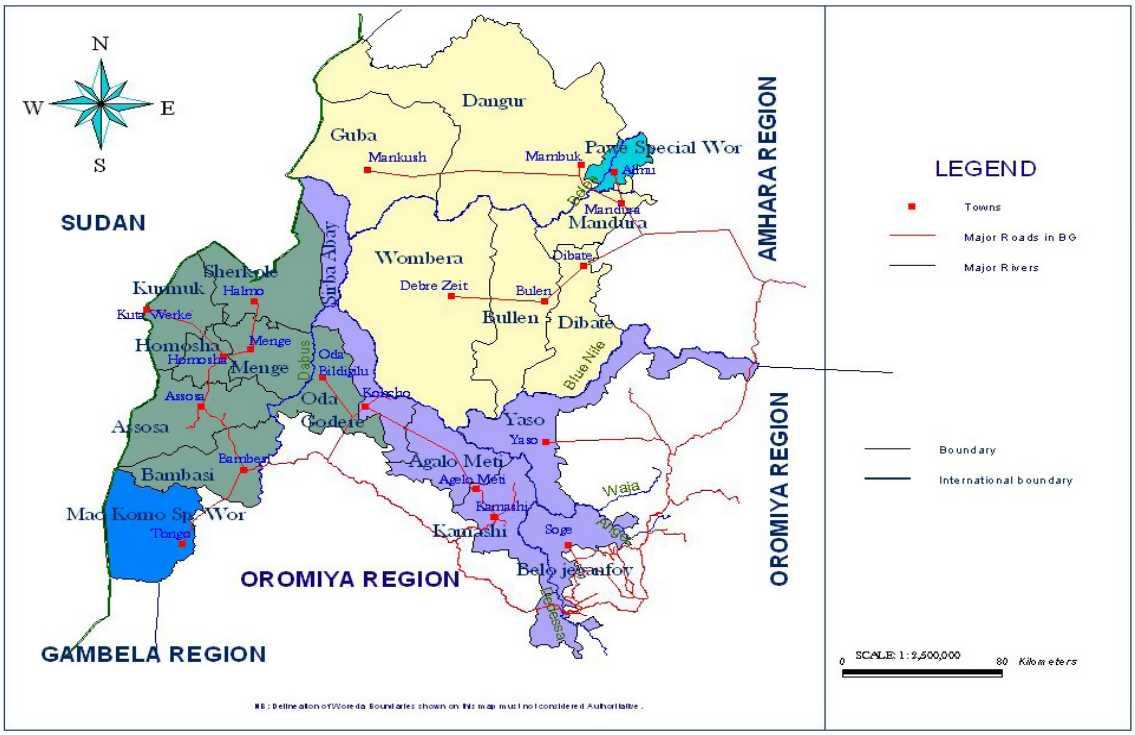

Figure 1. Administrative map of Benshangul Gumuz Regional State.

data collection, three attempts were made before the household was excluded from the survey. When a selected household did not have a woman in reproductive age group, the next nearest household was considered.

Data were collected using commonly utilized structured questionnaires in Ethiopia including questionnaires used by Ethiopian demographic surveys. The questionnaire was originally prepared in English and its final version were translated into Amharic, and then back translated to English. Then, pre-test was conducted outside the study area. One day training was given for data collectors and supervisors. The training was focused on ethical aspect of research including privacy, confidentiality, and cultural sensitiveness and as to how to overcome cultural barriers during data collection. The data collection process was regularly checked by the supervisor and one of the investigators. To reduce non-response or reporting biases, interviews were conducted in places where other people could not overhear.

Practically data collection in this area was very difficult. To cop up with this challenge, the following techniques were implemented:

1) Data collection took place early in the morning before mothers left home.
2) The data collectors were selected from the local community members who were able to speak Amharic, well known and respected by the target communities. So that mothers could give the needed information to researcher. These helped us overcome the presumed challenges of data collection in the study area.

Data was analyzed using SPSS version 20 for windows. Logistic regression was fitted to assess possible association among variables, and strength of association was measured using odds ratio at 95% confidence interval.

Ethical Consideration: The study obtained Ethical clearance from GAMBY College of Medical Sciences. Written permission was also secured from the BGR Health Bureau. All the study participants were informed about the purpose of study, and their right to refuse. Privacy and confidentiality were maintained. Informed verbal consent was obtained from each study participant prior to the interview.

3. Results

A total of 530 women participated in the study. The response rate was 90%. About 60% of study participants were Muslim by religion, and nearly 90% were not able to read and write, and were farmer by occupation. The age of the study participants ranges from 15 to 49 with mean age of 29.4 ± 7.4 years (**Table 1**).

Table 1. Socio-demographic characteristics of study participants, Dangur Woreda, 2013.

Variable	Frequency N = 530	Percent (%)
Age		
15 - 19	38	7.2
20 - 24	105	19.8
25 - 29	140	26.4
30 - 34	105	19.8
35 - 40	88	16.6
40 - 44	34	6.4
45 - 49	20	3.8
Mean = 29.4 ± 7.4		
Educational status		
Not able to read and write	461	87.0
Able to read and write	41	7.7
Primary school	28	5.3
Religion		
Muslim	318	60.0
Orthodox	102	19.2
Protestant	27	5.1
Local religion	83	15.7
Occupation		
Housewife	49	9.2
Farmer	475	89.6
Government employ	6	1.2

More than 50% considered themselves as poor. Majority of study participants 420 (79.2%) did not have radio. About 366 (69.1%) of participants had average monthly income of less than 500 birr (**Table 2**).

Almost all study participants (99.6%) had history of pregnancy. Of them, nearly half (49.1%) had five or more pregnancies. Age at first marriage varies from 7 - 23 years. Mean age at first marriage was 14. Eighty four percent of respondents married before the age of 18 years and 48.6% became pregnant before the age of 18 years. Mean number of living children was 3.7 (**Table 3**).

Table 2. Socio-economic characteristics of respondents, Dangur District, 2013.

Variable	Frequency N = 530	Percent (%)
Possession of radio		
No	420	79.2
Yes	110	20.8
Monthly income (in Birr)		
≤500	366	69.1
501 - 2000	126	23.8
>2000	18	3.4
no answer	20	3.8
Perceived economy		
Very poor	45	8.5
Poor	283	53.4
Average	171	32.3
Well to do	31	5.9

Table 3. Reproductive characteristics of study participants, Dangur District, 2013.

Variable	Frequency N = 530	Percent (%)
No of pregnancies		
Never	2	0.4
1 - 2	125	23.6
3 - 4	143	27.0
≥5	260	49.1
Mean = 4.6 ± 2.36		
No of alive children		
≤2	151	28.7
3 - 5	251	47.6
≥6	125	23.7
Mean = 3.7 ± 1.94		
Age at first pregnancy		
≤15	61	11.5
16 - 26	466	88.2
>26 Mean = 18 ± 3.28	1	0.1
Age at first marriage		
<15	304	57.4
15 - 20	226	42.6
>20 Mean = 14 ± 2.5		

More than 80% of study participants had heard about modern family planning. Of these, nearly 80% of study participants knew injectables and 58.7 percent knew pills. The most frequently mentioned source of information for family planning were health professionals (79.7%), friends (39.8%), and radio (4.7%). The most commonly mentioned methods were injectables and pills (**Table 4**).

Table 5 shows common misconceptions about family planning. As displayed in the table, nearly 60% of them think that using contraceptives will cause a loss of confidence between couples, about 35% think that contraceptives cause infertility, and more than 80% of them think that many children means high income.

About 20% of study participants were current users of modern contraceptive, and most of them claimed to use contraceptives in injection form (83%). About 8% of study participants claimed to have experience of taking modern contraceptive methods, and discontinued because of several reasons (**Table 6**).

More than 80%, and nearly 75% of study participants attribute culture, and desire for having more children not to use modern family planning methods. Besides, more than 40% of them attribute fear of side effect as a reason not to use family planning methods (**Figure 2**).

Table 4. Knowledge of study participants about types of family planning methods, Dangur Ditrict, 2013.

Variable	Number	Percent %
Heard about MC		
Yes	435	82.1
No	95	17.9
Known contraceptive method		
Pills	311	58.7
Inject able	416	78.5
Norplant	225	42.5
Condom	74	14
IUCD	13	2.5

Table 5. Misconceptions about contraceptives among Gumuz married women, Dangur District, 2013.

Assessment items	Number	Percent
FP helps mother regain her strength		
Agree	118	22.3
disagree	412	77.7
Child spacing helps improve the health of mothers and children		
Agree	250	47.2
Disagree	280	52.8
FP practice will cause a loss of confidence between couples		
Disagree	221	41.7
Agree	309	57.6
Contraceptive use causes infertility in a women		
Disagree	345	65.1
Agree	185	34.9
Many children improve family income		
Disagree	103	19.4
Agree	427	80.6

Table 6. Utilization of modern contraceptive methods among Gumuz married women, Dangur District, 2013.

Variable	Number	Percent
Current use of contraceptive		
Yes	100	18.7
No	430	80.2
Contraceptive currently in use		
Pills	9	9
Injection	83	83
Norplant	8	8
Discontinued		
Yes	42	7.9
No	488	92.1
Ever used		
Yes	142	26.7
No	388	73.3
Source of contraceptive		
Health center	22	15.4
Private clinic	12	8.6
Health post	108	76

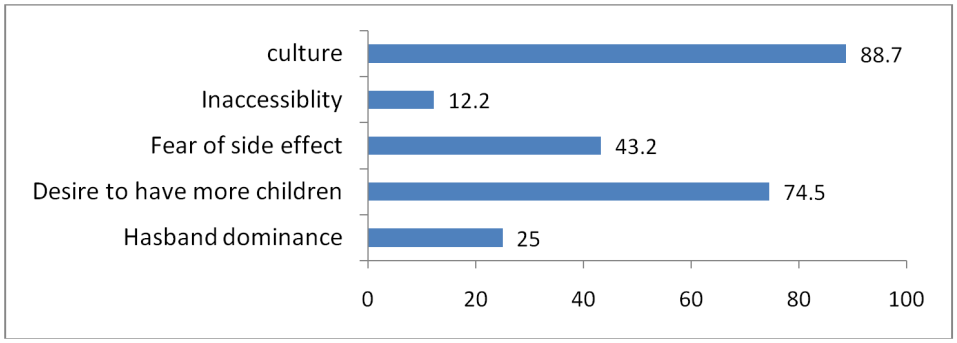

Figure 2. Reasons for not using modern family planning methods among married Gumuz women, Dangur District, 2013.

Educational status of women, number of children, knowledge about and attitude towards family planning were found to have statistically significant association with utilization of family planning methods. For instance, those women with primary level of education were 3 times more likely to use modern family planning method than those who were not able to read and write [AOR = 3.60; 95% CI = (1.49 - 8.70)] (**Table 7**).

4. Discussions

The major aim of this study was to assess level of modern family planning utilization and to identify factors associated to it. Being the second most populous nation of Africa, Ethiopia is a prototype example of nations which has been facing multitudes of challenges following rapid population growth including environmental degradation, chronic food insecurity, high maternal, and child mortality [5] [12] [13].

Cognizant of these multi-dimensional challenges of population growth, Ethiopia has developed several policies,

Table 7. Factors associated with utilization of Modern Family Planning Methods among Gumuz Married women, Dangur District, 2013.

Characteristics	Utilization of modern family planning		OR (95% CI)	
	yes	no	COR	AOR
Education of woman				
Not able to read and write	81	380	1.00	1.00
Able to read and write	9	32	1.32 (0.61 - 2.87)	1.08 (0.45 - 2.59)
Primary school	11	17	3.04 (1.37 - 6.73)*	3.60 (1.49 - 8.70)*
Religion				
Muslim	63	255	1.00	1.00
Orthodox	19	83	0.93 (0.52 - 1.64)	0.87 (0.47 - 1.60)
Catholic	8	19	1.70 (0.65 - 4.35)	1.81 (0.61 - 5.41)
Local religion	11	72	0.62 (0.31 - 1.24)	0.59 (0.28 - 1.22)
Alive children				
≤2	28	123	1.00	1.00
3 - 5	36	215	0.74 (0.43 - 1.26)	1.19 (0.55 - 2.58)
≥6	36	89	1.78 (1.01 - 3.12)*	3.31 (1.41 - 7.20)*
Attitude favorable	46	153	1.54 (1.02 - 2.39)*	1.58 (1.03 - 2.50)*
unfavorable	54	277	1.00	1.00
Knowledge				
knowledgeable	52	146	2.16 (1.39 - 3.36)*	2.18 (1.35 - 3.52)*
less knowledgeable	47	285	1.00	1.00

and strategies to culminate extreme poverty, to revive degraded environment, to reduce maternal and child mortality and finally to develop Ethiopia from the current lowest to middle income countries in the coming couples of decades [12].

In this regard, several achievements have been registered in the country in various sectors including the health sector. Making Family Planning accessible to all families across the nation has been one of the successful interventions in Ethiopia [5] [13].

The finding of the present study revealed that current use of modern family planning by married Gumuz women was 18.7%. It was much lower than 2013 annual report of Dangur woreda (60%) [20]. Possible explanation for this could be that the data from the district could have some intentional inflation. A research done by Tigist, 2012 in Afar Region cited by [21] indicated that communities in ethnic minorities such as Afar do not like to utilize modern family planning methods for they like to increase their population.

A study done in Southern Tigray (2011) revealed that contraceptive prevalence was (50.9%) [22]. This figure is nearly three times higher than the finding of the present study. Possible explanation for this discrepancy could be the following: difference in population characteristics, culture, and access to information to family planning. It is very likely that communities in Southern Tigray have been exposed for information to family planning and other health related issues than communities in Gummuz. Fortunately, the current government structure has addressed such discrepancies by establishing a Federal State based on ethnic distribution of populations in the country-ethnicity as pillar for geographic regionalization [9]-[11].

The result of the present study revealed that knowledge on family planning has statistically significant association with current contraception use. More than 80% of study participants in the present study claimed to have heard about modern family planning, and similar proportion of them knew injectables. This finding is consistent with research findings in Ethiopia [23] and abroad [24].

It is surprising to notice that how knowledge about modern family planning is successfully transferred to communities in Ethiopia even in hard to reach ones. This achievement can be considered as a real success for the Government of the Federal Democratic Republic of Ethiopia because this much has been achieved in hard to reach communities within less than two decades even before Information Education and Communication (IEEC) and Behavioural Change Communication Materials have been prepared using local languages.

This indicates how Federal and Regional Governments are committed to address the reproductive health needs of families in Ethiopia. The level of commitment of the Ethiopian Government in relation to success of family planning utilization has been recognized by USAID Africa Burea [13] recently. This paper indicated that Ethiopia is one of the three African nations with remarkable success in Family planning.

It is very likely that this good level of knowledge about family planning would decrease misconception surrounding modern family planning utilization. Studies indicate that knowledge about family planning is a prerequisite to obtaining access to and using a suitable contraceptive method in a timely and effective manner [5].

Study participants did mentioned several reasons for not using modern family planning methods. In the present study, more than 80% of study participants believed that many children mean high income, and hence the reason not to use modern family planning was desire to have more children for more than nearly 75% of the study participants. This result is supported by different findings from Sub-Saharan Africa and Asia [25].

In the present study about 25%, and 40% of study participants claimed that they did not use modern family planning because their husbands did not want, and because of fear of side effect, respectively. This finding is consistent with findings from Sub-Saharan Africa and Asia [25].

Moreover, the findings of this study showed that culture was found to be number one obstacle to the use of modern family planning methods. In this locality, marriage is by exchange. If a family has several daughters, the family has a chance to get several potential wives as an exchange [26]. In this locality women are the most important working force. Therefore, men would like to have several wives. The Gumuz communities are well known for polygamy [5] [26].

Cultural barrier of modern family planning utilization is different in different area. For instance, the research conducted in Ruanda revealed that family size is largely determined by the male partner. The preference for boys over girls was described as overruling concern for family size. According to Delphine (2007) [27], Rwandan women prefer to give birth to boys in order to please their husbands and in-laws.

In Muslim dominated countries such as Pakistan [28], Egypt [29] and Malaysia [30] the justification not to use family planning is religious. In the present study, region was not a statistically significant factor. This difference might be partly explained by the fact that in Gumuz communities culture rather than religion that determines whether people use family planning or not.

In the present study, those women who had at least primary education had good attitude to modern contraceptive use than those women who could not read and write. Studies elsewhere revealed a similar pattern of relationship between educational status and maternal health service including family planning utilization [30] [31].

The present study revealed that misconceptions related to modern family planning are rampant in this particular community. Culture associated desire for getting large number of children, and the perception that utilization of modern contraceptive reduces confidence or rather trust among partners are the two most important ones that require discussion at this point.

The reflected desire to have large number of children in Gummuz communities is in line with the theory of demographic transition. This theory states that first child mortality should drastically decrease before parents do agree to decrease the number of children they want to have [32]. Child mortality is Gumuz communities is one of the highest in Ethiopia [5].

One of the most important misconceptions is in this study was that utilization of family planning including condom decreases confidence or trust. This is in line with findings in Behavioural surveillance survey studies in Ethiopia [33]. However, the good thing about the aforementioned misconceptions is that they are change amenable if targeted health education is given.

The major limitation of this study is that study participants were only women while men decide on most of the family affaires in this communities. However, this study brought the current status of modern family planning utilization in hard to reach ethnic minorities about whom literature are scarce.

5. Conclusion

This study witnessed how successful Ethiopia is in addressing reproductive health service inequalities in hard to

reach communities. However, misconceptions surrounding family planning, and culture associated desire to have large family size should be addressed in a culture sensitive manner in Gummuz communities so that this success would further bear fruits. In this regard, Information Education Communication, and Behavioral Change Communication materials and messages should be prepared in local language to facilitate understanding to the wider community. Further research involving husbands is recommended.

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6

Maternal Mortality Risk Factors in Regional Hospital of Burkina Faso

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Abstract

Individual causes and community determinants are synergic in maternal death occurrence. This study aimed to identify maternal mortality risk factors in a regional hospital. Material and Methods: This was a retrospective cohort study from data of 1807 hospitalized women. To identify maternal mortality risks factors, mortality hazard ratio (HR CI95%) has been calculated in univariate analysis and Cox proportional hazard model. Results: During hospitalization, 30 maternal deaths occurred. From Cox regression, adjusted mortality HR confirmed that women age older than 35 (HR = 2.5, CI95%: [1.2 - 5.7] and younger than 19 (HR = 3.02, CI95%: [1.5 - 6.7]); distance to hospital ≥10 Km (HR = 4.1, CI95%: [1.8 - 9.4]; multiple deliveries (HR = 2.4, CI95%: [1.1 - 7.3]), less ante natal care (<3 visits) (HR = 3.03, CI95%: [0.97 - 9.48]); obstetrical maternal mortality directs causes (HR = 2.31, CI95%: [1.7 - 6.21]) and emergently reference (HR = 3.5, CI95%: [1.8 - 8.32]) were maternal mortality risk factors. Conclusion: In this regional hospital of low income country, identified maternal mortality factors are related to women socio-economic determinants and quality prenatal or obstetric care access. Interventions to reduce maternal mortality rate should be conducted within both household and women socio-economic status development and in maternal health and obstetric care strengthening.

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Keywords

Maternal Mortality, Risk Factors, Regional Hospital, Burkina Faso

1. Introduction

Goal five of the Millennium Development Goals (MDGs) aims to achieve three-quarter reduction of maternal mortality by 2015 from 1990 level. But despite efforts and global trends on maternal death, international health issue about maternal health in low-income countries continues to be focused on maternal deaths. Trends in maternal mortality rate showed a decline of 47% in 2010 from levels in 1990. Sub-Saharan Africa accounted for 56% of the total rate in 2010. Lack of skilled routine and emergency care is the underline linked cause of most of the maternal death [1]. Poor availability and quality of maternity services are determinant on maternal death occurrence [2].

Individual causes and community determinants are synergic in maternal death occurrence. Most of the time maternal death is associated with both poor socioeconomic situation (global poverty, women's economic situation, number of pregnancy, number of deliveries, women education) and serious lack of health resources (health care facilities, maternities, medicines, skilled health providers, prenatal preventive care). Large burden of pregnancy-related complications and associated disabilities and high maternal mortality rate are linked. For maternal death reduction, many key areas have to be combined: investment in maternal health promotion and primary care, in women education and global socioeconomic development (transport, nutrition and food security, women employment and social status etc…). When maternal death occurs in hospital, it can indicate a lack of timely improved health care. It is urgent to ensure that quality of care provided in hospital is optimal. The objective of this study was to identify maternal mortality risk factors in regional hospital of Burkina Faso few years from 2015 to purpose efficient actions.

2. Material and Methods

2.1. Study Design and Site

This was a retrospective cohort study. The study covered the period of one year, from January 1 to December 31, 2009. The study site was the maternity of Banfora regional hospital in Burkina Faso Cascades region area. At this maternity, skilled midwifes staff, leaded by a gynecologist and obstetrician medical doctor, was in charge of care providing.

2.2. Study Population

The study has been conducted from data of hospitalized women during pregnancy, delivery, or postpartum period. During the considered period, all hospitalized cases were considered.

2.3. Study Samples Size

Data of 1807 women have been considered for analysis.

2.4. Data Collection

Trained research midwife, not included in the maternity staff, collected data on women socio-demographic (age, education, marital status, occupation, distance to hospital, number of pregnancy, parity), antenatal visit, delivery mode, cause of death. Data have been recorded from patient's clinical document. The instrument for individual patient data collection was a pre-tested data case form.

2.5. Statistical Analyses

Usual statistics methods were applied. We used Pearson's Chi square test or Fisher's exact test to compare proportions. Mortality hazard ratio (HR) with confidence interval (CI95%) have been calculated in univariate analysis and Cox proportional hazard models has been used in multivariate analysis to identify maternal mortality risks factors. Statistical significance level was 0.05. The data were analyzed using SPSS software version 20.

3. Results

The women Socio-demographics characteristics at admission to the maternity are given in **Table 1**.

From the 1807 women, 30 maternal deaths occurred during hospitalization, in-hospital maternal mortality rate was 1.66%. From the 30 maternal deaths, 11 occurred at ante partum (pregnancy) period (37%), 4 deaths at per partum (13%), 11 deaths at post partum (37%) and 4 deaths at post-abortum period (13%). We observed that 90% of the 30 maternal deaths occurred within the first 24 hours of the hospitalization.

On the 30 maternal deaths, 16 deaths (53.33%) occurred due to obstetric directs causes: hemorrhage (3.33%), infection (13.33%), distocia (6.65%), eclampsia (16.67%), abortion (13.32%) and uterine rupture (1.04%); 14 maternal deaths (46.67%) occurred due to indirect causes: anemia (30%), HIV (3.33), malaria (3.33%), peritoneal sepsis (3.33), renal insufficiency (3.33%), post partum tetanus (3.33%).

Table 1. Women Socio-demographics characteristics at admission to the maternity.

	n	Percentage
Women age group (years)		
11 - 14	2	0.11
15 - 19	354	19.59
20 - 24	491	27.17
25 - 29	403	22.3
30 - 34	322	17.81
35 - 39	184	10.18
40 - 44	42	2.32
45 - 49	9	0.49
Marital status		
Married or in a relationship	1677	92.80
Single	130	7.20
Distance to hospital		
<10 km	1197	66.24
>10 km	610	33.76
Women main Occupation		
House mother	1607	88.93
Working with salary	66	3.65
Students	79	4.37
Informal sector	55	3.04
Gestity		
First	485	26.84
Multiple	1322	73.16
Parity		
None	535	29.61
One	387	21.42
2 - 3	552	30.55
>3	333	18.43

In univariate analysis, an increased maternal mortality risk have been founded for women: being older than 35 years (HR = 2.98, 95% CI:1.06 - 6.34); being younger than 19 years (HR = 2.53, 95%CI: 1.01 - 5.03); distance to hospital ≥10 km (HR = 6.45, 95%CI: (2.78 - 14.94); multiple deliveries (HR = 3.59, 95%CI: 1.38 - 9.36); less antenatal care (<3 visits) (HR = 3.03, 95%CI: 1.02 - 9.48); obstetrical mortality directs causes (HR = 4.51, 95%CI: 2.08 - 9.79); emergently referred patients (HR = 5.83, 95%CI: 2.52 - 13.52).

From Cox regression, adjusted mortality HR confirmed that, women age older than 35y (HR = 2.5, CI95%: (1.2 - 5.7)) and younger than 19y (HR = 3.02, CI95%: c1.5 - 6.7)); distance to hospital ≥10 Km.

(HR = 4.1, CI95%: (1.8 - 9.4)); multiple deliveries (HR = 2.4, CI95%: (1.1 - 7.3])), less ante natal care (<3 visits) (HR = 3.03, CI95%: (0.97 - 9.48)); obstetrical maternal mortality directs causes (HR = 2.31, CI95%: (1.7 - 6.21)) and emergently reference (HR = 3.5, CI95%: (1.8 - 8.32)) , were maternal mortality risk factors (**Table 2**).

Table 2. Univariate maternal mortality analysis and Cox proportional hazard ratio model for maternal mortality.

	Univariate analysis				Cox regression	
	n	**Maternal Mortality rate**	**HR (95%CI)**	**p**	**HR (95%CI)**	**p**
Women age group (y)						
11 - 19	356	2.53	2.2[1.06 - 5.03]		2.5[1.2 - 5.7]	
20 - 34	1216	1.15	1.00	0.04	1.00	0.02
>=35	235	2.98	2.64[1.06 - 6.34]		3.02[1.5 - 6.7]	
Delivery Mode						
Caesarean	173	1.16	1.23[0.27 - 5.49]	0.88		
Vaginal	1167	0.94	1.00			
Distance to hospital						
≥10 Km	610	3.77	6.45[2.78 - 14.94]	<0.001	4.1[1.8 - 9.4]	<0.001
<10 Km	1197	0.58	1.00		1.00	
Women occupation						
House mother	1575	1.84	4.27[0.58 - 31.21]	0.08		
Others*	232	0.43	1.00			
Gestity						
First	485	1.24	1.00	0.39		
Multiple	1322	1.82	1.47[0.60 - 3.57]			
Parity						
No parity	535	1.31	1.20[0.41 - 3.56]		1.1[0.2 - 3.7]	
Primiparity	387	1.03	0.95[0.27 - 3.35]		0.9[0.24 - 3.2]	0.001
Low parity	552	1.09	1.00	0.005	1.00	
Multiparity	333	3.90	3.59[1.38 - 9.36]		2.4[1.1 - 7.3]	
Antenatal consultation						
<3	697	1.58	3.03[0.97 - 9.48]	0.04	3.03[0.97 - 9.48]	0.02
≥3	769	0.52	1.00		1.00	
Diagnostic						
Obstetrical direct causes	616	3.41	4.51[2.08 - 9.79]	<0.001	2.31[1.7 - 6.21]	<0.001
Indirect causes	1191	0.76	1.00		1.00	
Women admission mode						
Referred (evacuated)	642	3.58	5.83[2.52 - 13.52]	<0.001	3.5[1.8 - 8.32]	<0.001
Not referred	1140	0.61	1.00		1.00	

*Others: women working with salary, women working in informal sector.

4. Discussion

This was a retrospective cohort study with related limitations. Data have been collected over one year and limited to in-hospital patients. In rural regions, all women during pregnancy, delivery or postpartum period who need to be hospitalized don't attend hospital for treatment.

Maternal mortality occurred between hospital attended patients is not acceptable. In this regional hospital of low income country, maternal mortality remains high (30 maternal deaths a year). It is important to provide quality care to women attending to that hospital. The analysis of the maternal mortality risk factors of hospitalized women showed that maternal mortality is directly related to poverty.

Number of authors, in low incomes countries, reported maternal individual factors (socioeconomic status, demographic, obstetric complications, infectious diseases prevalence) and village or community level factors (access to prenatal or obstetric cares, distance) as maternal mortality risk factors [3]-[8].

In our study, the identified risk factors were women's socioeconomics related factors: women age older than 35 and younger than 19, distance to hospital, multiple deliveries, less ante natal care.

Multiple deliveries affect maternal heath [9]-[12]. Women age (older than 35y or younger than 19y) added to women strong physical effort (overburden house work or labor), common in low income countries rural setting, can be synergetic in increasing maternal health risk [13] [14].

Lack of prenatal health care (prenatal visit) is a factor emphasizing maternal risk. Amy poverty related factors underling this lack of prenatal visit (low demand because of low education, women low power at home end in the community for decision, women lower economic status) [12] [15] [16]. Obstetrical maternal mortality directs causes (hemorrhage, infection, distocia, eclampsia, abortion and uterine rupture) and emergently references were maternal death risk factors. These maternal mortality causes can be prevented with quality maternal care adequate obstetrical care. But distance to hospital or to a skilled obstetric care provider can be a maternal mortality risk factor [17]. Low viability of transport is synergetic to distance to increase maternal mortality risk.

Observed indirect causes of maternal death in our study (anemia, HIV, malaria) are diseases closely associated with poverty [18]-[20].

5. Conclusion

In this regional hospital of low income country, identified maternal mortality factors are related to women socioeconomic determinants and quality prenatal or obstetric care access. These findings remind governments and international development agencies, that, if worldwide maternal mortality declines, its remains a big challenge in African low income countries. In these countries, interventions to reduce maternal mortality rate should be conducted within both household and women socio-economic status development and in maternal health and obstetric care strengthening in term of access and quality. In low income countries, building effective partnership between maternal health promoting programs and socioeconomic development programs for reducing maternal mortality can be an effective working area.

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7

Assessment of Maternal Near Miss at Debre Markos Referral Hospital, Northwest Ethiopia: Five Years Experience

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Abstract

Maternal mortality in Ethiopia is one of the highest in the world. Data on maternal near miss cases and events among mothers who received care at health institutions is lacking. The main aim of this study was, therefore, to assess trend and correlates of maternal near miss case at a referral hospital. Case notes of clients who received care in obstetric and gynecologic ward of Debre Markos Referral Hospital from 1st January 2008 to 30th December 2012 were reviewed. Case notes were selected using systematic random sampling technique. Tailored format was data collection tool. SPSS version 16 was used to analyze the data. Logistic regression was fitted to determine possible association, and strength of associations was measured using odds ratio at 95% confidence interval. A total of 1355 case notes were reviewed. Of them, 403 (29.7%) were near miss cases. The data showed that maternal near miss ratio over the study period was decreasing ($X^2 = 7.4$, $p = 0.007$). Distance from the hospital, history of difficult labor, and antenatal care (ANC) utilization were found to be major determinates of maternal near miss cases. The most common types of near miss events were obstructed labor and hemorrhage. Majority of maternal near miss cases brought referral letter to hospital. Although maternal near miss ratio is still high, it appears to decrease over the last five years period. This may reflect success of the government's Endeavour to decrease maternal mortality. However, this effort needs to continue in a sustainable manner to avoid preventable causes of maternal mortality in Ethiopia.

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Keywords

Maternal Near Miss, Maternal Near Miss Events, Maternal Death

1. Introduction

Maternal near miss is said to be occurred when women presented with life threatening complication during pregnancy, child birth and within 42 days after delivery, but survive by chance or good institutional care. Currently maternal near-miss ratio is increasingly used to evaluate the quality of obstetric care in low income countries [1].

Literatures indicate that maternal mortality has decreased worldwide. However, maternal mortality remains high in low income countries in which 99% of the deaths occur. Of this, Sub-Saharan Africa alone shoulders three fifth of maternal deaths [2].

Risk of maternal mortality is 1 in 30 in Sub-Saharan Africa. This figure is 1 in 5,600 in industrialized countries [3]. In order to device appropriate strategy to curb maternal mortality in these countries, knowing the statistics on levels of maternal mortality and morbidity is not enough. Reliable information on the underlying factors which lead to maternal complication and death is needed [4].

According to Ethiopian demographic and health survey 2011, the maternal mortality ratio was 676/100,000 live births. In Ethiopia 20,000 women die each year from pregnancy complications-during pregnancy, child birth and post partum period [5].

Well aware of these facts, the government of the federal democratic republic of Ethiopia attempts to reduce maternal mortality using different strategies [6]. Training human resource for health, construction health institutions, procuring vehicles for transporting mothers to health institutions, and making reproductive health services free or minimal charge are some of the interventions the government in collaboration with development partners is doing.

Currently, Amhara National Regional State alone constructs more than thirty hospitals. It had only twelve hospitals rendering health care for about 20 million people. However, data on trend of maternal near miss ratio, and maternal near miss events are lacking. The present study tried to fill the prevailing knowledge gap. The finding of the study could be used by different stakeholders including hospital management, regional health bureau, and development partners to further improve the care to women, and finally reduce maternal mortality.

2. Methods and Materials

Case notes of mothers who received care at department of gynecology and obstetrics of Debre Markos Referral Hospital over five years period was reviewed. Debre Markos is located 300 km far from the capital city of Ethiopia, Addis Ababa, and 256 km from Bahirdar a capital city of Amhara National Regional State. The Hospital provides health service to more than 3.5 million populations. Currently about 100 health centers and two district hospitals are available in the catchment area of the referral hospital.

Currently there are 109 Nurse, three health officer, 16 General practitioners, one emergency surgeon and five specialists. Gynecologic and obstetric ward has 19 midwifes, one gynecologist and one emergency surgeon. About 8136 patients are admitted per year, 34% of them in obstetric ward.

The study was conducted using available data form 1st January 2008 to 30th December 2012. Data was collected from July to August, 2013. The case notes were randomly selected from a list of all women who were admitted in obstetrics and Gynecology ward for any pregnancy related health service from 1st January 2008 to 30th December 2012. The cases notes were selected using systematic random sampling.

The sample size was determined by using single population proportion formula. Considering 95% confidence interval and 2% margin of error and proportion of critically ill obstetric patients among total delivery 17% [7], the total sample size was 1355. Patient's case note list was obtained from registered log book and then case notes were selected from each year proportionally. Incomplete notes in which important variables were not recorded were excluded. Data were collected from the selected case notes using tailored structured formats developed for the study.

WHO maternal near miss diseases specific criteria (obstructed labor, hemorrhage, pregnancy induced hyper-

tension, septic abortion and sepsis/infection) were used to identify maternal near miss cases from randomly selected case notes. Data were extracted from the case notes by trained midwife nurses. Questionable case notes were brought to the attention of the researchers for decision. Furthermore, each data collection format was reviewed daily by a supervisor or principal investigator to check for completeness and consistency of the collected data.

The collected data were entered in Epi-info version 3.4.3 and were cleaned and exported to SPSS version 16 for windows for analysis. Binary logistic regression model was fitted to assess possible association. Strength of associations, and statistical significance were measured using odds ratio at 95% confidence interval. The results were presented in the form of tables, and figures.

This study received Ethical clearance from Debre Markos University, post graduate research and institutional review board and permission was obtained Debre Markos Referral Hospital.

3. Result

A total of 1355 case notes were reviewed. Of these, 403 (29.7%) were near miss cases. A total of 409 near miss events were identified among near miss cases, indicating six women had more than one life threatening condition. There were 1,157 deliveries, 185 abortion and 11 ectopic pregnancies.

Of the deliveries, 1048 (90.6%) were live births and 109 (9.4%) were still births. Of the total deliveries, 709 (61%) had spontaneous vaginal delivery. Cesarean section was done for 177 (13%) cases. Of these, 152 (86%) were for near miss cases. Laparatomy was performed for ruptured uterus 28 (2%) (**Figure 1**).

About 80% of near miss cases brought referral paper from governmental and private health institutions. Of the total near miss cases, 362 (90%) were admitted with near miss events. Further 10% of near miss-cases develop near miss events after admission. Twenty five per cent of near miss cases were transfused with at least one unit of blood. Blood was transfused for women whose haematocrite was less than 21%. About 50% of near miss cases stayed in the hospital for more than six days (**Table 1**).

During the 5-years period, the trend of maternal near miss ratio has decreased almost from 50% to 34%.

The ratio of maternal near miss cases observed to this facility has decreased significantly ($X2 = 7.4$, $p = 0.007$) (**Figure 2**).

The most common types of near-miss events fall under the diagnostic categories of obstructed labor, hemorrhage and pregnancy induced hypertension. Obstructed labor and hemorrhage were responsible for 45% and 43% of near-miss cases, respectively. Hemorrhage at early pregnancy, late pregnancy and postpartum period were 17.11%, 9.05% and 16.63%, respectively. Least common cases of life threatening condition were septic abortion and infection, accounts 4% (**Figure 3**).

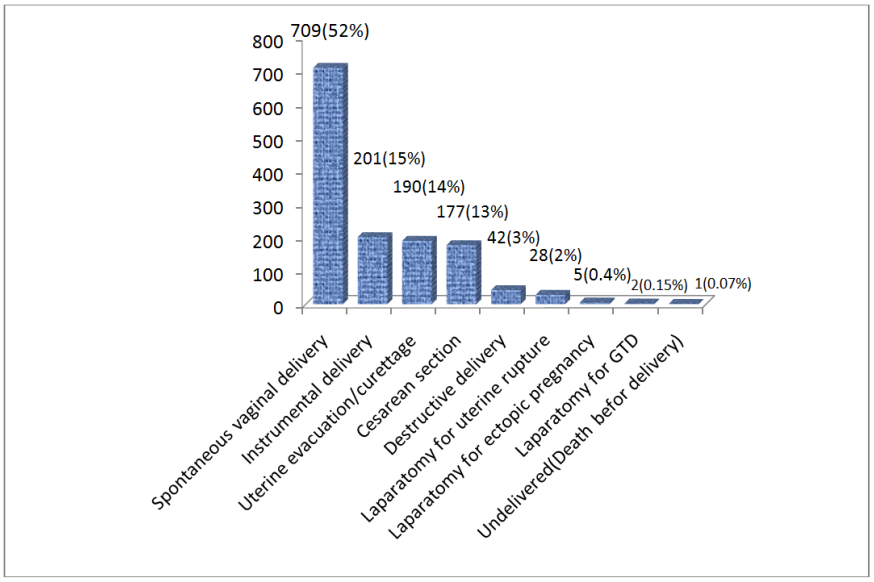

Figure 1. Modes of delivery in Debre Markos Referral Hospital (2008-2012).

Table 1. Characteristics of maternal near miss cases in Debre Markos Referral Hospital (2008-2012).

Near miss case characteristics (n = 403)		Frequency	Percentage
Referral linkage			
Self referral		71	18
Referred from health institution		332	82
Occurrence of near miss events			
Before admission		362	90
During Hospitalization		41	10
Status at admission			
Stable		208	52
Un stable		195	48
HCT Level			
>33%		238	59
21% - 33%		102	25
<21%		63	16
Transfused at least one unit of blood	YES	102	25
	NO	301	75%
Duration of Hospital stay in hours			
< =48		94	23.33
49 - 96		46	11.40
97 - 144		55	13.65
145 - 196		174	43.18
> =197		34	8.44

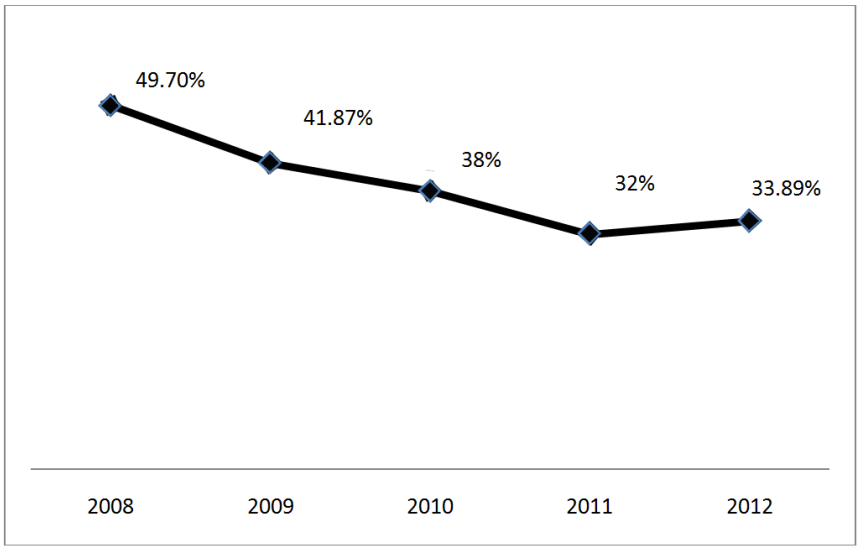

Figure 2. Trends of maternal near miss ratio over five years period, 2008-2012 in Debre Markos Referral Hospital.

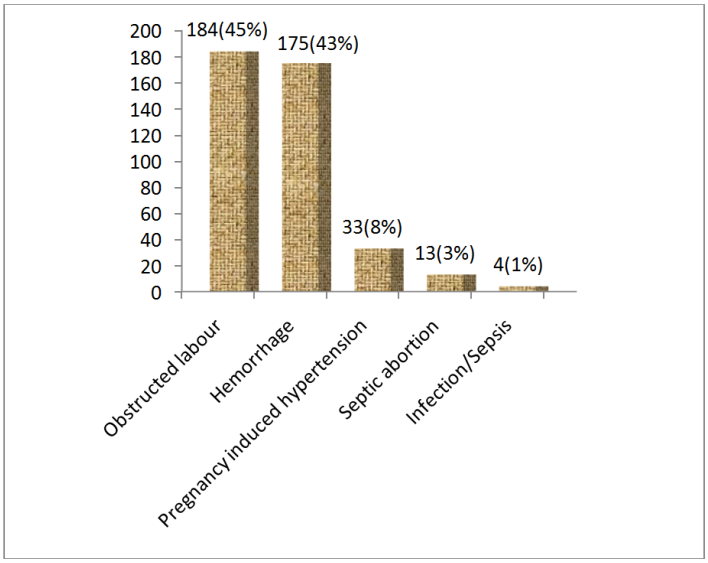

Figure 3. Most common cause of life threatening condition from 2008-2012 in Debre Markos Referral Hospital.

Multiple logistic regressions revealed that distance between residences of the clients and this referral hospital had significant association with maternal near miss case. For instance, those who resided 25 km and far from the hospital were two times more likely to suffer from near miss events than those who came from less than 25 km (OR = 1.9, 95% CI = 1.17 - 2.94).

Birth weights, bad obstetric history, parity, gravidity, ANC follow up were found to have statistically significant association with the occurrence of maternal near miss events. For instance, those mothers who gave birth to neonate with a birth weight of 4 kg and more were three times more likely to develope life threatening condition than their counter parts. (OR = 3.3, 95% CI = 1.9 - 5.7). Similarly, mothers who had at least one bad obstetric history were two times more likely to face near miss event(s) than their counter parts (OR = 1.99, 95% = 1.1 - 3.3) (**Table 2**).

4. Discussion

The study showed that total maternal near-miss ratio were 384.5/1000 live births. The ratio of maternal near miss was very high (38%) as compared to studies done in other African countries [8]-[10]. The difference could be explained by different health delivery strategies, differences in socio-demographic characteristics of the populations and differences in case definitions [11]-[14]. In the present study, maternal near miss was defined according to the WHO disease specific criteria.

The frequency of maternal near miss events showed a decreasing trend over the study period (2008-2012). This reduction is statistically significant ($X^2 = 7.4$, $p = 0.007$). This is in agreement with a study done in Nigeria from 2002-2004 [7]. However, the magnitude of maternal near miss ratio still remains high.

The most common near miss events in the present study were obstructed labor and hemorrhage, and the least cause of maternal near miss events were septic abortion and sepsis. This finding is in line with Ethiopian demographic health survey (EDHS) 2011. Studies in other African countries indicated that common cause of maternal near miss events were hemorrhage and infection (9), hemorrhage and hypertension [7] [12] [15]. This shows that hemorrhage is an important maternal near miss event across Africa.

In the present study, duration of hospital stay for near miss cases ranged from 1 - 18 days. This finding is comparable to the findings in Kassala Hospital (in Sudan). In Kassala it ranged 3 - 15 days [9]. The present study also revealed that more than half of near miss cases (52%) stayed for more than six days in the hospital.

Our hospital has no intensive care unit (ICU). All gynecology and obstetrics cases were treated in the same ward. Studies in Nigeria [7], Damascus [15] and Bangladesh [16] revealed that hospitals do have intensive care unit dedicated to mothers admitted to obstetric ward.

Table 2. Socio-demographic and obstetric determinants of near miss cases in Debre Markos Referral Hospital from 2008-2012.

Variables (n = 1351)	Near miss	Non near miss	Crude OR (95% CI)	Adjusted OR (95% CI)
Age				
<20	41	74	1.6 (1.1 - 2.4)	1.9 (0.95 - 3.9)
20 - 34	268	773	1.00	1.00
> =35	94	101	2.7 (1.96 - 3.67)	1.3 (0.7 - 2.6)
Resident				
urban	100	535	1.00	1.00
rural	303	413	3.9 (3.03 - 5.09)	2.1 (1.4 - 3.1)
Distance in Km				
< =24	84	420	1.00	1.00
25 - 74	218	389	2.8 (2.1 - 3.7)	1.9 (1.2-2.9)
75 - 99	67	98	3.42 (2.3 - 5.0)	2.7 (1.5-4.8)
> =100	34	41	4.2 (2.5 - 6.9)	2.5 (1.2 - 5.3)
ANC				
Yes	176	686	1.00	1.00
No	227	262	3.4 (2.65 - 4.31)	1.9 (1.3 - 2.8)
Parity (n =1351)				
0	171	384	1.6 (1.2 - 2.1)	2.9 (1.1 - 8.2)
1	73	220	1.1 (0.8 - 1.6)	2.3 (1.2 - 4.2)
2 - 4	82	306	1.00	1.00
> =5	77	38	6 (3.8 - 9.5)	2.6 (1.1 - 6.1)
Gravida (n =1351)				
1	172	377	1.8 (1.4 - 2.3)	1.2 (1.02 - 7.4)
2-4	127	488	1.00	1.00
> = 5	104	83	4.8 (3.4 - 6.8)	2.9 (1.3 - 6.3)
GA (n = 1074)				
< =28	79	116	2.0 (1.44 - 2.80)	2.1 (0.29 - 15.04)
28.14 - 36.86	28	110	0.75 (0.48 - 1.18)	0.7 (0.43 - 1.26)
37 - 42	177	522	1.00	1.00
>42	12	30	1.18 (0.59 - 2.35)	0.9 (0.45 - 2.12)
Birth weight (n = 1094)				
1 - 1.499	3	6	1.9 (0.46 - 7.45)	0.96 (0.1 - 6.5)
1.5 - 2.499	19	64	1.1 (0.64 - 1.87)	1.01 (0.5 - 2.01)
2.5 - 3.999	194	716	1.00	1.00
> =4	46	46	3.7 (2.38 - 5.72)	3.3 (1.9 - 5.7)
Bad obstetric history (n= 1351)				
YES	84	74	3.11 (2.22 - 4.36)	1.9 (1.1 - 3.3)
NO	319	874	1.00	1.00

COR = crude odds ration; AOR = adjusted odds ratio.

Of the total near miss cases, 82% were referred from governmental and private health institutions. This figure is comparable to figures in Syria and Bangladesh. Reports from these two countries indicated that about 93% of near miss cases were referred in critical condition from different health institutions [15] [16].

In the present study, majority of near miss cases (90%) were admitted with at least one near miss event while about 10% of cases became near miss after admission. This finding is in agreement with a study done in Sagamu, Nigeria [7].

In our set up, this situation could be interpreted as good because it shows a functional referral system from low level health care institution to a high level care.

The very existence of the referral system saves the lives of mothers as depicted in this study. However, the study revealed also that nearly 50% near miss cases were critical ill/unstable at admission, lost much of their blood. This could be partly explained by the fact that mothers reached to the near by health center late because institutional delivery in Ethiopia in general and in Amhara Regional State in particular is still less than 20%.

The finding of the present study also revealed that maternal near miss events occurred more than two times among rural women compared to their urban counterparts. This finding was in agreement with previous studies conducted in other areas of the country [17]. This might be due to the fact that urban women do have better access to information, and to delivery services. On the other hand, rural women are mostly influenced by traditional practices [5].

Distance between place of residence of clients and this referral hospital was found to be an important predictor for a mother became maternal near miss. This finding is in line with other studies [18] [19]. Correspondingly, the finding is supported by three delays of maternal death specifically delay in reaching health facility [10].

The study also revealed that there is a statistically significant association between ANC visit during last pregnancy and occurrence of maternal near miss events. Women who didn't have ANC visits were two times more likely to become maternal near miss case than mothers who had visit ANC. The result was in line with other studies done [6] [7] [13] [16]. This could be due to the fact that ANC provides mothers with opportunities to get health education and information regarding danger signs of pregnancy, labor and post partum period as well as the benefits of having a skilled birth attendant during childbirth.

Parity and gravidity were also other important predictors for the occurrence of maternal near miss events. Women with higher parity were more likely to develop near miss events than mothers who gave birth for the first time. This finding agrees with several other studies [8] [20]. This might be partly explained by the fact that women who experienced prior peaceful labor at home delivery might believe that things go similarly every time in pregnancy and might decide to give birth at home.

Likewise, the present study revealed that women with prior bad obstetric history were more likely to become maternal near miss case than their counter parts. This is in accordance with similar studies [21]. Though every pregnancy entails risk to mothers, those mothers with known risks could have higher risk than those with no known risk factors.

The major limitation of the present study is that because of lack of standard format about what variables should be documented in every maternal case note book, some relevant variables were not registered in the case note books. Moreover, the study has confined itself in only one referral hospital; hence it has limited scope for a region with about 20 million people.

However, the finding could be almost similar to situations in other referral hospitals in the region. Therefore, the finding of this study is informative about maternal near miss, maternal near miss events, and predictors of maternal near miss in the region, and other areas with similar contexts.

5. Conclusion

Although maternal near miss ratio is still high, it appears to decrease over the last five years period. This may reflect success of the government's Endeavour to decrease maternal mortality. However, this effort needs to continue in a sustainable manner to avoid preventable causes of maternal mortality in Ethiopia.

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Conflict of Interest

We declare that there is no conflict of interest in this research.

Contribution of Authors

H.G.: raised the research idea, wrote the first proposal, as well as manuscript drafts. M.G., and A.G. reviewed and finalized them. F.T. performed the statistical analysis.

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8

Breast Cancer in Inner Mongolia 2009-2011

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Abstract

The aim of this study was to determine the mortality rate and the burden of breast cancers among residents of Inner Mongolia. We analyzed mortality data reported by the Death Registry System from 2009 to 2011. The age-specific mortality of breast cancer was close to female cancer in 25 to 35 years group. Regional distribution of breast cancer was not significant difference (p = 0.36). The women who were employed, married and living in rural areas were more likely to die of breast cancer. Over the period 2009 through 2011, the elimination of deaths from breast cancer resulted in increased life expectancy of 0.15 years. Mortality due to breast cancers is substantially greater among the younger women. Further, the mortality rate associated with breast cancers is greater for employed and married women than those unemployed and single women. Therefore, in Inner Mongolia, breast cancers appear to pose a greater mortality risk for young, employed and married women.

Keywords

Breast Cancer, Mortality Rate, Life Expectancy

1. Introduction

"Breast cancer is the leading cause of cancer death in female worldwide, accounting for 14% (458,400) of the total cancer deaths in 2008 [1]." "Breast cancer is the most commonly diagnosed cancer and the second-leading cause of cancer related deaths among women in the US [2]." "It is also the most common tumor in European women and is the first cause of death by cancer in females [3]."

Cancer is a major public health problem in China. Based on reports from the Ministry of Health [4]; it is the second cause of death in China. "In China, breast cancer is the fifth most common cause of death for Chinese women and the mortality was 10.2 per 100,000 [4]." "Breast cancer mortality has been on the increase until re-

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cently in China [5].” “It was 9.14 per 100,000 and accounted for 6.86% of all cancer deaths in females in 2006 [6], however, it was 10.24 per 100,000 and accounted for 7.54% in 2009 [4].”

Hence, it is necessary and important to get accurate projections of breast cancer mortality. However, there were few studies for breast cancer mortality in Inner Mongolia. The aim of this study is to assess the breast cancer mortality and its burden in Inner Mongolia. The data covered a larger population and reflected the most recent and accurate estimate of cancer burden in Inner Mongolia.

2. Materials and Methods

Breast cancer and female cancer death data were obtained from the Death Registry System, maintained by the Inner Mongolia Centers for Disease Control and Prevention (CDC). The five monitoring points from the death registry system are Muslims District in Hohhot City, Linhe District in Bayannur City, Sonid Youqi in Xilingol League, Bairin Youqi in Chifeng City and Kailu County in Tongliao City, respectively. The five monitoring points are located in the eastern, middle and western regions in Inner Mongolia. Three regions are divided according to their geographical location, historical evolution，traditional lifestyle, as well as some provisions for policy laws.

The death database included information on primary cause of death, death date, sex, and age. The cause of death was coded according to the International Classification of Disease-10th Revision (ICD-10). The ICD-10 codes were grouped in this study into breast cancer (C50) and malignant neoplasms of female genital organs (C51-C57). Breast cancer and malignant neoplasms of female genital organs are called female cancer.

The annual midyear population figures in 2009-2011 were obtained from the CDC of Inner Mongolia to calculate age-specific mortality and annual mortality of each region per 100,000 women. Occupational status, marital status and urban/rural area were chosen as the indicators to assess the demographic characteristics of breast cancer and female cancer mortality. The death number and percentage of breast cancer and female cancer were calculated for five monitoring points.

Potential years of life lost (PYLL) are used to emphasize premature mortality by estimating the average time a person would have lived had he or she not died prematurely. We used PYLL to measure the contribution of changes in breast cancer and female cancer mortality on overall changes in life expectancy during the period 2009-2011.

Microsoft Excel software and SPSS 13.0 statistical software were used for data management and analysis. The χ^2 test was used to assess differences in rates, and a significance level of 0.05 was used.

3. Results

The age-specific mortality from 2009 to 2011 for breast cancer and female cancer are shown in **Figure 1**. The breast cancer accounted for three-fourths of the female cancer from 25 to 35 years. Breast cancer mortality was a half of the female cancer mortality, although the mortality of breast cancer decreased after 40. The age-specific mortality trends were similar between breast cancer and female cancer.

Figure 2 shows the region trend of mortality for breast cancer and female cancer. There were differences for breast cancer mortality between eastern region and Midwest regions, whereas less differences between middle region and western region [**Figure 2(a)**]. A gradual and steady increasing trend in female cancer mortality was observed in three regions from 2009 to 2010. This trend was not observed in 2011 [**Figure 2(b)**]. In three regions, the mortality trend for both breast cancer and female cancer was decreased from 2009 to 2011, except breast cancer in 2009. There was no significant difference in death distribution both breast cancer ($p = 0.36$) and female cancer ($p = 0.19$) in three regions.

Table 1 shows the percentage of female cancer and breast cancer deaths for occupational status, married status and resident areas. Most deaths were married. Employment women were 3 times more than unemployment women. Although rural areas were higher than urban areas, the difference was a little.

Figure 3 displays the PYLL associated with breast cancer and female cancer in Inner Mongolia from 2009 to 2011. The elimination of deaths from female cancer and breast cancer resulted in increased life expectancy of 0.31 and 0.15 years respectively. The impact of the elimination of breast cancer remained relatively stable under 30 in women and relative years of life lost associated with female cancer is much 2.1 times than breast cancer. After 35, relative years of life lost associated with female cancer and breast cancer decreased rapidly, but the speed was relatively faster in female cancer.

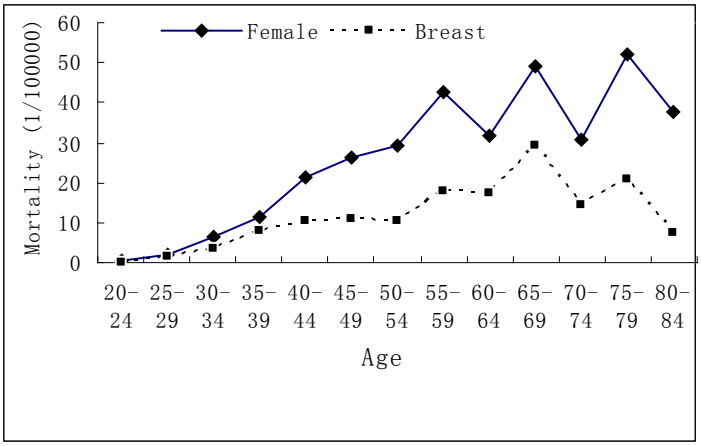
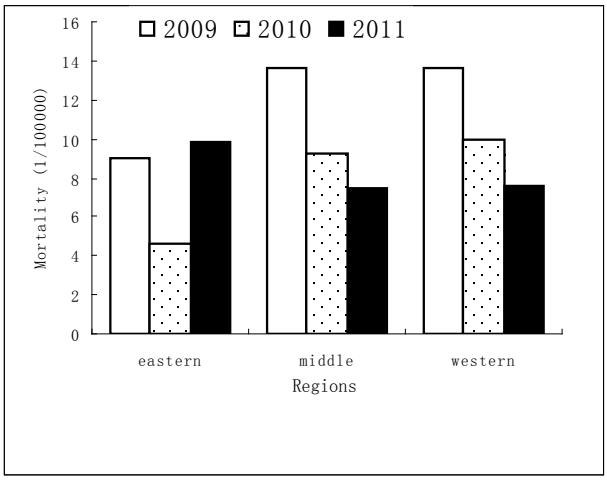
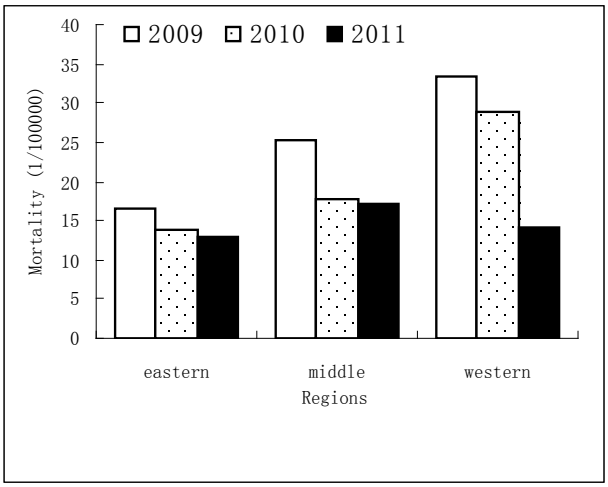


Figure 1. Age-specific mortality from female and breast cancer in five monitoring poins.



(a)



(b)

Figure 2. (a) The mortality of breast cancer in eastern, middle and western of Inner Mongolia. (b) The mortality of female cancer in eastern, middle and western of Inner Mongolia.

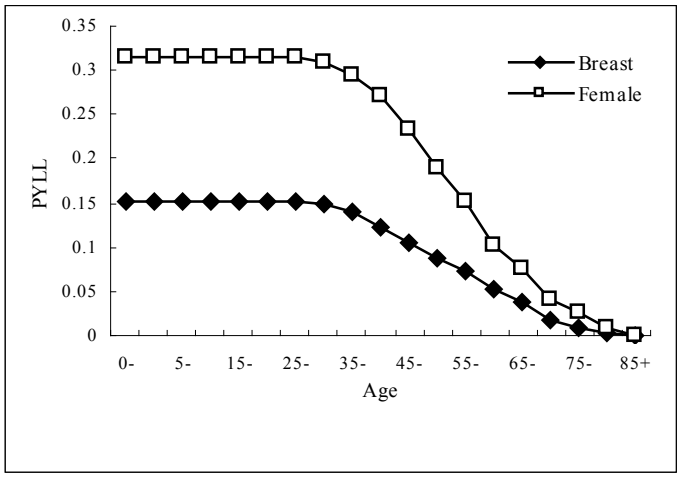


Figure 3. The PYLL of female cancer and breast cancer in Inner Mongolia, 2009-2011.

Table 1. Percentage of breast cancer and female cancer in monitoring points.

	Breast cancer		Female cancer	
	n = 158	%	n = 335	%
Occupational status				
Employed	119	75.3	254	75.8
Unemployed	39	24.7	81	24.2
Married status				
Unmarried	2	1.3	3	0.9
Divorce	0	0.0	1	0.3
Widowed	13	8.2	25	7.5
Married	143	90.5	303	90.4
Unknown	0	0.0	3	0.9
Area				
Urban	74	46.8	164	49
Rural	84	53.2	171	51

4. Discussion

In this study, we calculated breast cancer mortality in order to identify the magnitude of breast cancer in female cancer in Inner Mongolia. Breast cancer mortality ranked the first in female cancer mortality from 2009 to 2011. The result was consistent with the report from National Central Cancer Registry (NCCR) of China [4].

Age-specific mortality showed that breast cancer has a higher proportion of deaths before 35 years age group compared to female cancer. The breast cancer mortality increased with ages before 65 years age group. The mortality began decreasing in 70 years age group. Our results are different from other East Asian studies [7]. The mortality increased with ages in these regions. The increasing trend was rapid in young and steady in old people. The highest mortality was in the highest age groups. The discrepancies may reflect differences in the detection and management of breast cancer. Some studies showed breast cancer screening reduces breast cancer mortality [8]. In Inner Mongolia, lack of breast cancer screening programs may be one of reasons for young

people with higher mortality. In Japan, however, young people with lower breast cancer mortality are attributed to high rate of breast cancer screening.

The findings of our study suggest that breast cancer was decreasing over the time, except eastern region in 2011. One possible explanation for the role of region may be the effect of economic levels. Recently, there have been suggestions that female breast cancer mortality was higher in the high economic levels than in the low economic levels [9]. In Inner Mongolia, the western region has the highest economic levels, followed by the middle region, and eastern region is lower than these regions. Our data is in agreement with this trend. However, this trend requires further research.

The findings of our study show that women who were in employment were more likely to die of breast cancer than those unemployed women. The result is consistent with other studies. Employed women have high levels of strain for their job and family than the unemployed. Some studies showed that high levels of strain were as- sociated with a slight increase in the risk of breast cancer [10]. Many employed women tend to postpone the age of the first birth. Older age at first birth increases the risk for breast cancer [11].

The findings of our study show that the proportion of women with breast cancer deaths who were married was more than other women. Married may be one risk factor for breast cancer in Inner Mongolia. With regard to the findings from the present study, one may argue that the relatively high proportion of married breast cancer deaths is most likely due a to a married population structure. Evidence from the Norwegian women suggests that, breast cancer was found to be decreased among divorced women [12]. Similarly, divorced women had a de- creased risk of breast cancer in Swedish women [13].

The proportion of breast cancer mortality in rural areas was slightly higher than urban areas. In China, this proportion in rural areas (4.92%) was lower than that in urban areas (9.47%) in 2006 [6]. The results are oppo- site with our findings. The difference between rural areas and urban areas may due to the absence of breast can- cer screening programs and health education in rural areas, whereas such programs are fully or partly imple- mented in the majority of urban areas in Inner Mongolia.

The findings of our study show that PYLL of female cancer and breast cancer were high before 30. The result is different from our previous study for Japanese at the end of the last century [14]. Our previous study showed that PYLL of breast cancer were high before 40, and it decreased rapidly after 45. It is indicated that the death age of breast cancer was earlier than Japanese women. Some risk factors that associated with the developed countries such as higher economic income, higher education and screening programs, can explain the reason why the higher age of death in these countries.

In the present study, we report the characteristics of breast cancer between five monitoring points located in three different regions in Inner Mongolia. The mortality of breast cancer in the three regions increased with age. There is not a significant difference in death distribution in the three regions. The deaths of breast cancer and female cancer are more likely to be employed women and married women. The death of breast cancer for young women is more serious. Further studies are needed to assess more recent trends in the mortality of breast cancer as well as the respective roles of genetic and environmental factors of breast cancer in Inner Mongolia.

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9

Current Status of Antenatal Care Utilization in the Context of Data Conflict: The Case of Dembecha District, Northwest Ethiopia

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Abstract

Good antenatal care (ANC) is one of the most important health care aspects known to reduce maternal mortality. In Ethiopia, regional and national data at times do not concur thus data from district to district level decision making are needed. The aim of this study was, therefore, to assess the prevalence and correlates of ANC service utilization. A community based cross-sectional study was conducted among pregnant women. Multistage sampling was used. Pre-tested structured questionnaire was data collection tool. Data were analyzed using SPSS version 16.0 for windows. Logistic regression was used to assess possible association among variables. Odds ratio at 95% confidence interval was used to measure strength, and statistical significance of associations. Prevalence of ANC service utilization was 57%. Of these, more than 80% of them received ANC for ≥4 times. This finding is more similar to the regional report (68%) than that of EDHS (2011) for Amhara Region (34%). Marital status, educational status and income were important predictors for ANC service utilization. The most outstanding finding of this study was that more than 20% and 60% of mothers received antennal care, and information about antenatal care from health extension workers. Antenatal care utilization is still low. Single, divorced, or separated mothers were less likely to utilize ANC while economically better off, and literate mothers were more likely to use ANC services than their counterparts. The finding of this study is in line with the annual reports from the Regional health bureau and disagrees with Ethiopian demographic health survey—EDHS-(2011). Therefore, districts should be encouraged to make decisions based on their own locally generated data than based on EDHS data which could at times be discouraging for districts with better performance. Further strengthening of Health Extension Program is recommended.

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Keywords

Prevalence, Antenatal Care, Utilization, Associated Factors

1. Introduction

Antenatal care (ANC) is a care provided by skilled health personnel to a pregnant woman throughout her pregnancy [1]. Currently, it is regarded as a basic component of maternal health care on which the life of mothers and babies depend [2].

Women of reproductive age constitute more than one fifth of the world's population. They are repeatedly exposed to pregnancy related health risks. In spite of tangible national and global efforts to improve maternal health, more than half a million women die each year in middle and low income countries as a result of pregnancy and child birth related complications. The situation is even more serious for women in Sub-Saharan Africa where one in every 16 women dies because of pregnancy related causes [1] [3]. In fact, Sub Saharan Africa incurs 98% of maternal deaths [1].

In Ethiopia, an estimated 2.9 million women give birth every year. Of these, approximately 25000 women & girls die each year and more than 500,000 suffer from complications including obstetric fistula [1] [4]. As a result, Ethiopia has probably one of the highest and unacceptably high maternal mortality with 676 per 100,000 live births in the world [2].

The average fertility trend in recent years has shown significant decline from the 1990 level of 6.4 births per women to 5.4 births [5], an average of one birth drop per women in 15 years. The estimate also showed that there are marked variations in fertility trend among regions. Even though the overall population growth rate is 2.6%, this figure for Amhara National Regional State is 1.7% which is significantly lower than population replacement [5].

Evidences indicate also that utilization of services targeted to mothers is unbelievably low: Antenatal care coverage 68%, Clean and safe delivery 10.8%, Post natal care 34% [5]. According to EDHS (2011) [2], these figures were even lower than this: National ANC coverage 28% with (33.6% for Amhara, 50.1% for Tigray, 27.3% for Southern Nations and Nationalities peoples Region (SNNPR) and 31.3% for Oromia). These figures are very low even when compared to other countries in Sub Saharan Africa [6] [7].

Knowing this, the Government of the Federal Democratic Republic of Ethiopia considers maternal and neonatal mortality among the high ranking development, and health agendas of the nation. It strives to make maternal and neonatal care services such as ANC, Delivery, Postnatal and Abortion care services geographically and economically accessible to every pregnant woman throughout the nation. Unfortunately, however, the change in maternal mortality is disappointing. Therefore, it needs thorough investigation why women do not seize this golden opportunity.

In light of this keen interest of the government, generating evidences based on research is critical to help the government make informed decision. The major aim of this research was, therefore, to determine the prevalence and associated factors of antenatal care utilization among mothers in Denbecha District, Northwest Ethiopia in the context of conflicting reports-ANC coverage 68% [5] versus 33.6% [2]. The situation in this district is assumed to reflect the situation in major segment of Amhara National Regional State where more than 20 million people reside.

2. Methods and Materials

2.1. Design

A cross sectional community based study was conducted in Dembecha district in the Month of August, 2012. Dembecha District is one of the 167 districts of Amhara National Regional State, and located 350 kms Northwest of Addis Ababa, the capital city of Ethiopia (**Figure 1**).

According to bureau of finance and economic development (BOFED) (2011/12) population estimation, the district has a total population of 123,246. Of these 28,346 were women in reproductive age group (15 - 49 years).

Dembecha district has two urban and 25 rural *Kebeles*. There are five health centers and 25 heath posts rushing to satisfy the health care needs of people including antenatal care services. Target population of this study was women who were pregnant at the time of the survey.

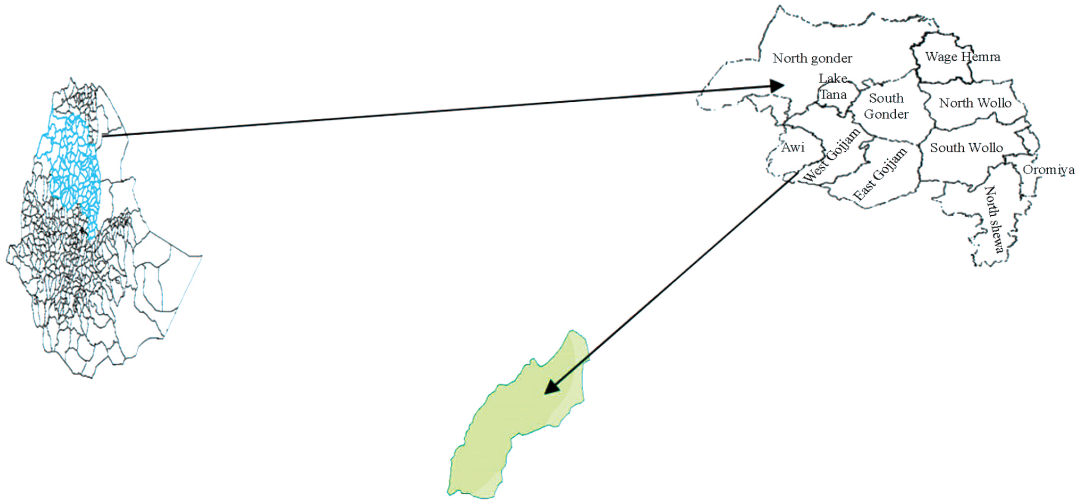

Figure 1. Location of Denbecha District, Northwest Ethiopia.

2.2. Sample Size Determination

The required sample size was determined using single population proportion formula with the following assumptions: n = the number of mothers to be interviewed; $(Z\ \alpha/2)^2$ = standardized normal distribution value for the 95% CI, which is P = Proportion of antenatal care service utilization in Ethiopia. P = 34% [2] d = margin of error taken as 5%, $n = (Z_{\alpha/2})^2 \times P(1-P)/d^2 = (1.96)^2 \times (0.34)(0.66)/(0.05)^2 = 345$.

Since multistage sampling technique was used, the sample size was multiplied by the design effect. By taking two as the design effect, the required sample size became 690. After 10% of non response was added, the final sample size was determined to be 759.

2.3. Sampling Procedure

One from urban and five from rural kebeles were selected by simple random sampling technique. Then households from selected kebeles were selected by systematic random sampling technique. In situations where more than one candidate was found in a household, one was selected by lottery method.

2.4. Data Collection Procedure

Sixteen data collectors with a minimum educational level of grade ten. Data collectors were non-health by profession in order to minimize the possible social desirability bias that women might introduce while interviewed by health workers who usually teach about the importance of ANC utilization. The supervisors were four and all were health workers with a minimum qualification of diploma and above.

To keep the quality of the data, a structured questionnaire was adopted from similar studies in English version and translated into Amharic and then back into English to maintain its consistency by independent language experts. Both the data collectors and supervisors were trained for one day on the study objective, data collection processes including questionnaires, interviewing techniques and importance of the confidentiality, privacy, obtaining informed consent and ethical consideration. Then pre-test was conducted in Jabi-Tahinan district and Finote Selam town to avoid contamination. Based on the pre-test, the questionnaires were revised and made ready for data collection. During data collection, questionnaires were checked for completeness and consistency on daily basis by supervisors.

The data were analyzed using SPSS version 16 for windows. Binary logistic regression model was fitted, and backward stepwise regression was run to determine possible association among variables. The strength of association and statistical significance was determined using odds ratio at 95% confidence interval.

2.5. Operational Definitions

Antenatal care utilization: If a woman received ANC at least once, antenatal care was said to be utilized.

Ethical Consideration: Was obtained from Ethical review board of Bahir Dar University.

3. Results

A total of 723 women were included in the study. The response rate was 95%. As shown in **Table 1**, majority (70%) of study participants were in the age group between 20 and 34 years, and lived in rural area (72%), married (80%), and could not read write (62%) (**Table 1**).

Table 2 displayed sources of information about antenatal care for mothers in Denbecha District. As shown in the table, of 723 study participants, 485/723 (67%) heard about antenatal care. The three most important sources of information were Health Extension Workers 62%, voluntary community health workers and Relatives (16%) (**Table 2**).

Table 3 shows antenatal care utilization. As shown in the table, about 60% pregnant women received at least one antenatal care by skilled health professionals. Of them more than 80% had four or more antenatal care visits. The major segment of mothers visited health facilities during the second trimester (**Table 3**).

Figure 2 displays reasons why mothers did not attend ANC in Dembecha district, Northwest Ethiopia, 2012. As shown in the figure, the three most important reasons why mothers did not attend antenatal care were the following: because they were apparently healthy, because they had low awareness or because they afraid of going o health institutions.

Table 4 displays factors associated with antenatal care utilization among mothers in Denbecha District. As shown in the table, mothers' age, mothers education, and income of the household were shown to have statistically significant association with antenatal care utilization. Those mothers aged less than 20 years, illiterate, and lived in a household whose annual income was less than 6000 Birr were less likely to utilize antenatal care. Those mothers aged between 20 to 40 years, with education attainment of primary and above, and lived in a house hold whose monthly income more than 6000 Birr per annum were 1.5 to 3 times more likely to utilize antenatal care than those who were younger than 20 years, illiterate and whose household earned less than 6000 Birr per annum. This study revealed also that single, divorced, widowed or separated women were less likely to utilize antenatal care than married ones (**Table 4**).

Table 1. Socio-demographic characteristic of study participants, Denbecha District.

Variable	Category	Frequency	Per cent
Age			
	15 - 19	26	3.6
	20 - 34	502	69.4
	35 - 49	195	27.0
Place of residence	Urban	204	28.2
	Rural	519	71.8
	Married	571	79.0
Marital status	Single	25	3.5
	Divorced	70	9.7
	Widowed	28	3.9
	separated	29	4.0
Education level	Cannot read and write	445	61.5
	Can Read and write	123	17.0
	Primary school	79	10.9
	Secondary and above	76	10.5
Family income	<6000 birr	242	33.5
	6000 - 12000	233	32.2
	12000+	248	34.3

Table 2. Sources of information for women about antenatal care services in Denbecha District, 2012.

Variable	Frequency	Per cent
Health extension workers	301	62.1
Voluntary community health workers	1102	21.1
Traditional birth attendants	10	2.1
Relatives	80	16.4
Health education through campaign	52	10.7
Radio/TV/News paper	20	4.1
Community conversation	34	6.5

Table 3. Antenatal care service utilization of Respondents at their Last pregnancy, Northwest Ethiopia, April 2012.

Variable	Frequency	Percent
Have you attended ANC for your last pregnancy?		
Yes	413	57.1
No	310	42.9
Total	723	100
For how many times did you attend ANC?		
1	32	7.7
2 - 3	44	10.7
≥4	337	81.6
total	413	100
Why did you attend ANC service?		
Health workers counseled/advised me	100	24.1
To take vaccination	177	42.8
To take iron	7	1.6
For check up	176	42.6
To have healthy child	304	73.6
To be counseled and tested for HIV/AIDS	53	12.8
Felt discomfort/illness	124	30.0
At what gestational age did you start attending ANC service?		
≤4	24	5.8
4 - 5	92	22.3
6 - 7	226	54.7
≥8	71	17.2
Total	413	100
Which sex do you prefer to give you ANC service?		
Male	180	43.6
Female	233	56.4
	413	100

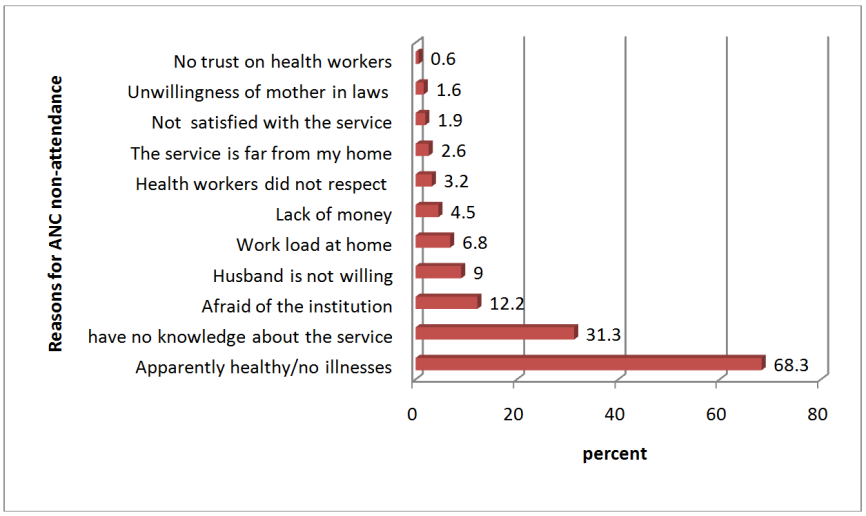

Figure 2. Reasons why mothers did not attend ANC services in Dembecha District, Northwest Ethiopia, 2012.

Table 4. Factors associated with antenatal care utilization among mothers in Denbecha District, Northwest Ethiopia, 2012.

Variable	Frequency		COR (95% CI)	AOR (95% CI)
	Yes	No		
Age				
15 - 19	10	16	1	1
20 - 34	305	197	2.477 (1.102 - 5.569)	2.544 (0.984 - 6.581)
35 - 49	98	97	1.616 (0.699 - 3.739)	1.856 (0.694 - 4.965)
Marital status				
Married	334	237	1	1
Single	8	17	0.334 (0.142 - 0768)	0.151 (0.29 - 0.794)*
Divorced	38	32	0.843 (0.512 - 1.388)	0.311 (0.065 - 1.486)
Widowed	15	13	0.819 (0.382 - 1.758)	0.336 (0.061 - 1.868)
Separated	18	11	1.161 (0.539 - 2.504)	0.546 (0.220 - 1.354)
Mothers level of education				
Illiterate	219	226	1	1
Read and write	77	46	1.727 (1.147 - 2.602)	1.585 (1.021 - 2.323)
Primary	62	17	3.764 (2.133 - 6.641)	2.968 (1.566 - 5.624)
Secondary and above	55	21	2.703 (1.581 - 4.620)	1.546 (0.724 - 3.300)
Family income				
<6000	199	123	1	1
6000 - 12000	135	98	1.424 (0.991 - 2.045)	1.569 (1.069 - 2.323)**
12000+	159	89	1.847 (1.286 - 2.651)	1.531 (1.022 - 2.294)**

COR: crude odds ratio; AOR: adjusted odds ratio; 95% CI: confidence interval.

4. Discussion

The main objective of this study was to investigate the prevalence and factors associated with ANC service utilization of mothers in Dembecha. The finding of this study showed that about 57% of women used at least one

ANC service by skilled providers for their last pregnancy. This finding is consistent with the survey report (54%) of John Snow Institute which runs a project known as Last 10 Kilometer in Amhara National Regional State [8]. This finding is also consistent with a study conducted in Metekel Zone (2009) where (49.8%) of the respondents had at least one antenatal care visit during their last pregnancy [9].

A study done in Yem especial Zone (2009) [10] and Jima town (2007) [11] of southwest Ethiopia revealed that antenatal care utilization rate was 28.5%, and 76.7%, respectively. These findings were not in agreement with ours. This might be partly explained by possible differences in sample size, socio-cultural differences, and time gap between study periods.

The finding of this study is also not consistent with the reports of EDHS 2011 [2]. The report of EDHS 11 [2] for Amhara National Regional State was 33.6%. This difference might be partly explained by the fact that EDHS covered remote areas in the region while the study area for this study is located not far away from the main street connecting central Ethiopia with Northwest parts of the country.

Though the first antenatal visit is recommended to occur within the first three months of pregnancy, only 5.8% of pregnant women had their first antenatal visits before the fourth month of their pregnancy. This is consistent with EDHS 2011 report. Optimal antenatal care should begin in the first three months of pregnancy and continues until delivery so as to contribute for safe maternal and child health [12].

Ethiopian antenatal care coverage figures remain low even among Sub Saharan African countries. Studies conducted in Gambia [13], and Kassala, Eastern Sudan [6] revealed that more than (90%) of mothers in these countries experienced at least one antenatal care visit.

Surprisingly, the finding of our study was consistent with findings from Nigeria where only 60% of mothers reported to attended at least one antenatal care visit during their last pregnancy [14]. This could be partly explained by the fact that these two nations are highly populated nations of Africa; therefore, it is likely that they faced similar challenges in providing health care to their people because of several factors.

Our study revealed that health extension workers provided antenatal care services for more than 20% of mothers. It showed that deploying health extension workers in almost each *kebele* the lowest administrative level with about 1000 households-made antenatal care service accessible to mothers. According to EDHS 2011 [2] nationally 9% of women receive antenatal care from health extension workers and 7% for Amhara National Regional State. This could be attributed to the fact that EDHS covers more remote areas where distance from health institution could be a major predictor of ANC service utilization. It is also important to note the difference in sampling techniques and sample size.

With regard to the determinants of ANC service utilization; our study revealed that ANC service utilization is significantly influenced by mother's education, and family income. Most of these findings were consistent with previous studies done in Ethiopia and elsewhere [15]-[19].

This study illustrated that there was a wide variation in ANC service utilization between educated and illiterate mothers. Mothers who attended primary levels of education were about 3 times more likely to use ANC service than those who were illiterate. These finding concur with report of EDHS 2011 [2]. It is also consistent with research reports from Ethiopia findings from Metekel (Ethiopia) [9], and other middle and low income countries such as Nigeria [18], Karachi (India) [15], Sindh (Pakistan) [19].

Marital status is another socio demographic variable found to be significantly affecting ANC service utilization. Mothers who were single were 6.6 times less likely to attend ANC service than mothers who were married. This finding is not consistent with study done in Hadya zone [20].

Mothers who lived in a household whose family yearly income was Birr 12,000 and above were 1.5 times more likely to utilize antenatal care service than those mothers whose family annual income was less than Birr 6,000). This is also consistent with findings from other studies done in Karachi (India) [15], and Ethiopia [20]. This could be because of the fact that better income increases the ability to pay for transportation and other costs.

This study revealed that more than 20% of antenatal care service was provided by health extension workers, and more than 60% of women claimed that they heard about the service by health extension workers. This is an important finding because it heralds that mothers have trust on health extension workers. This is very critical again for the success of health extension package program on which the health system of the nation depends on to make changes at the grass root level.

Impact and challenges of health extension program have been reported recently by Hailom Banteyerga, 2011 [21]. According his report, the program has had a tangible effect on the thinking and practices of rural people regarding disease prevention, family health, hygiene and environmental sanitation.

The major limitation of this study was that the findings of this study cannot be generalized to pregnant mothers residing in Amhara National Regional State as a whole because of its limited scope in geographical coverage as well as potential differences in socio-cultural aspects, and potential differences in access to antenatal care services. However, because of full implementation of health extension packages in almost all kebeles in the region, and specially because the antenatal care is provided in each kebele by young women born and grew up in the respective similar setups and culture, the difficulty of generalizing the data to most women in the region can hopefully be ameliorated so that the finding of this study might reflect the current antennal care utilization in the region for which data discrepancy had been observed.

5. Conclusion

Antenatal care service utilization is low even to the context of Sub Saharan Africa. Single, divorced, or separated mothers were less likely to utilize ANC while economically better off, and literate mothers were likely to use ANC services than their counterparts. The finding of this study is in line with the annual reports from the Regional health bureau, and disagrees with EDHS, 2011. Therefore, districts should be encouraged to make decisions based on their own locally generated data than based on EDHS data which could at times be discouraging especially for districts with high performance. Further strengthening of Health Extension Program is recommended. Besides, quality of ANC needs to be assessed.

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Utilization of Youth Reproductive Health Services and Associated Factors among High School Students in Bahir Dar, Amhara Regional State, Ethiopia

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Abstract

Introduction: Young people in Ethiopia face greater reproductive health risks than adults. Despite efforts that were made on youth to utilize reproductive health service, studies show that there is little information about the extent to which youth utilize available health services. For the proper planning of appropriate health services for youth, it is crucial to have knowledge on the pattern of their use and its associated factors. So this study was conducted from June to September 2013 to assess utilization of youth reproductive health and its associated factors among high school students in Bahir Dar town, Amhara region, Ethiopia, 2013. Methods: Institutional based cross-sectional study was conducted among High school student from June to September 2013. Multistage sampling technique was used to select the total of 818 study participants. Data were collected by means of a pretested standardized questionnaire; analysis was carried out using SPSS version 16. Crude and adjusted odds ratio with 95% confidence interval was calculated using binary logistic regression; p-value less than 0.05 was considered as statistically significant. Results: The study indicated that among 818 students, 480(58.7%) were females. The data indicates that, 32% of youth utilized youth reproductive health service. Barriers in utilizing reproductive health services, for 31% of the students were due to inconvenience hours and 28.5% were due to fear of being seen by parents or people whom they know. Among socio-demographic predictors, age and reproductive health problems showed a significant association with utilization of youth reproductive health services. Students with age 20 - 24 were 2.31 times more likely to utilize reproductive health ser-

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vice than age15 - 19 (AOR = 2.31, CI 95% (1.01, 5.28)). Similarly, students who had reproductive health problems were 1.54 times more likely to utilize reproductive health services than students who had no reproductive illness. Conclusions: The majority of youth were not utilizing reproductive health services. Age and reproductive health problems showed a significant association with utilization of youth reproductive health services.

Keywords

Youth Reproductive Health, Utilization, Ethiopia

1. Introduction

According to World Health Organization, youth are defined as persons between 15 and 24 years of age and are characterized by significant physiological, psychological and social changes that place their life at high risk and making up about 20% of the world's population, of whom 85% live in developing countries [1].

As reports show that sexual activity, early pregnancies and sexually transmitted infections (STIs) including human immune deficiency virus (HIV) infection rates are increasing at unprecedented rates among adolescents, adolescent and youth reproductive health becomes a concern [2] [3].

Considering these problems, many countries have started giving a due attention to the problems of youth and adolescents after the declaration of international year of youth by United Nation (UN) in 1985 and the Cairo 1994 International Conference for Population and Development (ICPD). Among the strategies being performed to solve the problems of youth, establishing youth friendly services is the major one in addressing the reproductive and sexual health need of youth [4].

Ethiopian government adopts youth friendly services and additionally, Health Extension Program (HEP) has institutionalized to strengthen the delivery of preventive, promotive and basic health care in the rural area to reach adolescents and youth at the community level [5]. Not only the government of Ethiopia but also other non-governmental organizations support this program.

Despite these efforts, there is little information about the extent to which youth utilize available health services in Ethiopia as most studies that examined the use of health services had primarily focused on adults [6].

A national study conducted by MOH on selected urban areas of Ethiopia (Oromia, Amahara, Southern people and Tigray) showed that youth couldn't properly utilize the available health service [7]. For the proper planning of appropriate health services for youth, it is crucial to have knowledge of the pattern of their use and its associated factors.

So, this study was conducted to assess utilization of youth reproductive health and its associated factors among high school students in Bahir Dar town Amhara region, Ethiopia, 2013.

2. Methods

2.1. Study Design

Institutional based Cross-sectional study design was carried out in Bahar Dar town, Amhara Regional State from June to September, 2013.

2.2. Study Area

Bahir Dar town administrative is located in the North Western part of Ethiopia. In the town, 15 - 24 age accounts 78,930. There are 2 general hospitals and 35 clinics which are private owned with different categories in the town. There are 8 high schools of theses 4 are governmental high schools and there are a total of 11,965 students in these schools [8].

2.3. Sampling Method and Sample Size Determination

The sample size was determined by using single population proportion formula by considering the following assumption: Prevalence of utilization of were 40% as a study done in Adiss Ababa among high school students

[9] (p = 40%), level of significance (α = 5%), 5% marginal error, designing effect of 2 and by adding 10% of non response rate which gave the final sample size to be 818. Then, Simple random sampling technique was used to select the study subjects.

2.4. Data Collection Instruments and Procedure

Data was collected using self administered pretested standardized questioners.

The data collectors and supervisors were trained for two days a day before the pretest and a day after the pretest. After pretest discussion was carried out with facilitators and some corrections and changes were made on the questionnaires by principal investigator .Multistage sampling technique was used in order to select a representative sample of students. Four out of 8 government and private schools were selected using simple random technique. The total sample was allocated to the selected schools proportionate to their student population size. Grade 9^{th} and 11^{th} students were selected from the school as others have finalized their national examination and were not available during data collection time. From each grade, sections were selected randomly and finally the study subjects were selected by using lottery method using their attendance lists.

On the day of data collection, randomly selected students were told to remain in their classes. All students gave their consent to participate. Remarks were given to study subjects to ask questions if any and not to jump any question unless they are not in need to respond the specific question.

2.5. Data Analysis

Analysis was done using SPSS version 16 soft ware. Univariate analyses were done using frequency, percentage, tables and charts. Associations between dependent and independent variables were assessed using logistic regression. Multivariate analysis was done using backward stepwise logistic regression to assess individual effect of variables on services utilizations. Crude and adjusted odds ratio with 95% confidence interval was calculated using binary logistic regression; p-value less than 0.05 was considered as statistically significant.

2.6. Ethical Considerations

Ethical clearance was sought from GAMBY College of Medical Sciences. Permission was obtained from Amhara Regional Health Bureau research and technology transfer core process Bahir Dar town Education office. Moreover; all selected participants were communicated about the objective of study. Participants were also informed their full right to withdraw or refuse to participate in the study. Data were collected after getting informed consent from the selected youth.

3. Results

3.1. Socio-Demographic Characteristics of the Respondents

A total of 818 students were participated in the study: Of these 480(58.7%) were females and 338 (41.3%) were males. The response rate was hundred percent. Among the respondents, 575(70.3%) and 242(29.7%) were attending grade 9 and 11 respectively. Seven hundred ninety seven (97.7%) were Amhara by ethnicity. The majority, 90.6%, were Orthodox Christian followers. From the total respondents, 571(71%) were living with their both parents, the rest were either with mother or father only, or with relatives and other (**Table 1**).

Two hundred sixty three (32.2%) of the respondents utilized reproductive health services. The major factors in utilizing reproductive health by youths were inconvenience service hour (31.8%), feel fear to be seen by parents or other adults (28.5%) and too long waiting hours (28.4%). Second category of barriers were consultation hour is too short (25.4%) providers are judgemental and unfriendly (23.6%) feel embracement at seeking or going to RH services (21.6%) (**Table 2**).

3.2. Accessibility and Affordability of Health Facility as Perceived by High School Students

Participant who had no access to health service in nearby were 13.6%. Similarly, 15.5% of the study participants couldn't afford the cost for payment of the health services (**Figure 1**).

Table 1. Socio-demographic characteristics of high school students, Bahir Dar town, North West Ethiopia, June 2013 (N = 818).

Socio demographic Variables	N (%)
Sex	
Female	480(58.7%)
Male	338(41.3%)
Age	
15 - 19	793(96.9%)
20 - 24	25(3.1%)
Grade	
9	575(70%)
11	243(29.7%)
Marital status	
Single	778(95.1%)
Married	32(3.9%)
Separated	7(0.9%)
Widowed	1(0.1%)
Religion	
Orthodox	741(90.6%)
Muslim	56(6.8%)
Protestant	17(2.1%)
Catholic	2(0.2%)
Others	2(0.2%)
Ethnicity	
Amahara	797(97.4%)
Tigre	10(1.2%)
Oromo	6(0.7%)
Agew	3(0.4%)
Others	2(0.2%)

Table 2. Health facility and provider factors on youth reproductive health service utilization among high school students, Bahir Dar town, June 2013.

Variables	(%)
Youth reproductive health services hours are inconvenience	31.8
Fear being seen by parents or others when you visiting RH services.	28.5
Reproductive health services waiting hours are too long.	28.4
Service providers are judgmental and unfriendly.	23.6
Feel embracement at seeking or going to RH services.	21.6

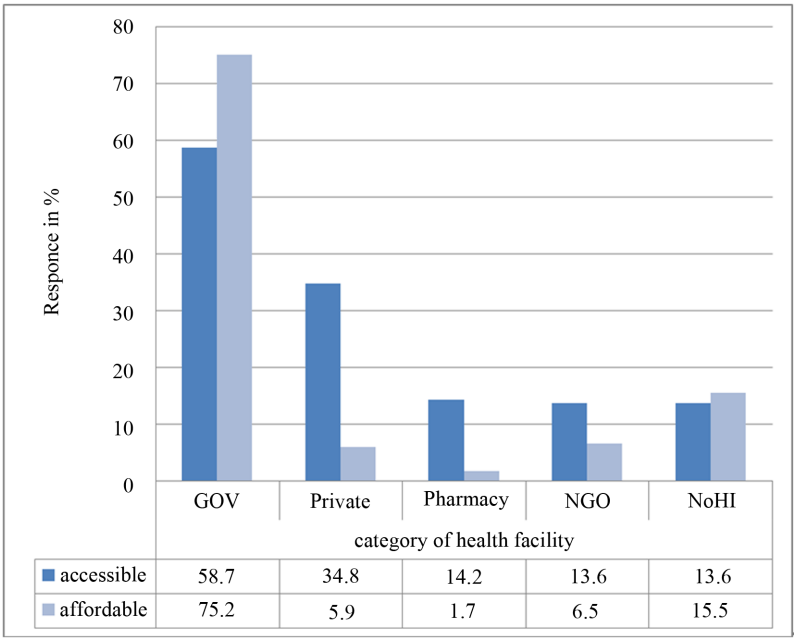

Figure 1. Accessibility and affordability of reproductive health services as perceived by high school students, Bahir Dar town, June 2013.

3.3. Factors Associated with Utilization of Youth Reproductive Health Service and Its Associated Factors among High School Students in Bahir Dar Town, 2013

The effects of different independent variables were tested for utilization of youth reproductive health using logistic regression analysis. Age of youth and exposing to RH problems were significantly associated with utilization youth reproductive health service. Youth who were in the age group of 20 - 24 years were about 2.34 times more likely to use RH services than whose age ranges from 15 - 19 years (AOR = 2.34, 95%CI (1.02, 5.38)). Youth with RH problems were 1.59 times more likely to use RH service than those with no RH problems (AOR = 1.53, 95%CI (1.10, 2.13)) (**Table 3**).

4. Discussion and Concussions

Utilization of youth reproductive health service among high school students in Bahir Dar town was found to be 32.2%, elicited by asking past one year use of RH services from the date of data collection and this was lower as compared to study conducted in Adiss Ababa 40% [9], and community study undertaken in Jimma 41% [10], Harar 36% [11] and greater than study conducted Machakal district 21.5%, Northwest Ethiopia [12]. The findings of this study also indicated that youth used various health facilities similar to those previous studies conducted in Jimma [10].

This study also showed that a small proportion (3%) of the participants used traditional health service and it was in line with Jimma [10] and Machakal study 3.14%, 3.1% respectively [12].

In this study, the presence of RH illnesses was associated with the utilization RH service. Participants who had RH problems were 1.54 times more likely to utilize RH services than those not ill (AOR = 1.54, 95%CI (1.11, 5.14)). The factors affecting utilization of health services are the health status of the individual [13] and the type of illness [6]. This might show health seeking behavior of the respondents.

Age of respondents is found to be associated with the utilization of youth reproductive health service. Youth within age groups of 20 to 24 years were 2.31 times more likely to use RH services than youth of age 15 to 19 years (AOR = 2.31, 95% CI (1.01, 5.28)). This finding is in agreement with the study conducted in Jimma [10].

In this study, 88.1% respondents were accessed at least for one health facility but the utilization was low. Despite better access, the utilization of health services was low. Study participants claimed that: reproductive health service working hours were inconvenient (31.8%); waiting hours were too long (28.4%); service providers were judgmental and unfriendly (23.6%) and on their attitude side fear of being seen by parents or people

Table 3. Factors associated with utilization of youth reproductive health services among high school students, Bahir Dar town, 2013.

Variables	Utilization of use reproductive health		COR 95%CI	AOR 95%CI
	Yes	No		
Age				
15 - 19	249	554	1	1
20 - 20	14	11	2.78(1.24,6.21)	2.31(1.01,5.28)
RH illness				
No	175	422	1	1
Yes	88	133	1.59(1.15,2.20)	1.54(1.11,2.14)
Affordability				
Can't afford	34	92	1	1
Can afford	229	463	1.33(0.87,2.04)	0.93(0.55,1.58)

who know them (28.5%), they deter to utilize reproductive health service. This indicates that geographic accessibility only does not imply the utilization of health services. This is also evidenced by other studies carried out in Harar [14].

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Satisfaction of Chronic Illness Patients at Felege Hiwot Referral Hospital, Bahir Dar City, Northwest Ethiopia

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Abstract

Introduction: Patient satisfaction is a popular way of evaluating quality of health care given in health facilities. This study was done to assess the level of chronic illness Patients' Satisfaction in Felege Hiwot Referral Hospital, Bahir Dar City, Ethiopia. Method: Cross-sectional study was conducted by involving 415 patients using systematic sampling method at Felege Hiwot referral hospital, Bahir Dar City, Ethiopia from 1st September, 2012 to 2nd November, 2012. Structured questionnaire was data collection tool. The questionnaire was prepared in English. It was translated to Amharic and back to English. Discrepancies in the translation were resolved by mutual agreement with the research team. Pre-testing was done prior to the actual data collection process on a sample of 20 respondents and modified accordingly. The study was approved by ethics review board of Bahir Dar University. The collected data were checked for completeness and consistency before being coded, entered and analyzed using SPSS version 19. Result: The overall level of satisfaction of chronic illness patients in this hospital was 242 (58.3%) which is lower as compared to other local studies in Ethiopia. More than 40% of the patients were not satisfied with the service. Conclusion and Recommendations: The current level of patients' satisfaction in the hospital is totally unacceptable care for a referral hospital situated in the capital city of a region in which more than 20 million people reside. Therefore, there is a need to revisit care given to chronic illness patients, and appropriate strategy should be designed to address the lifelong care needs of patients with chronic illness in our set up.

Keywords

Satisfaction, Chronic Illness, Ethiopia

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1. Introduction

Measuring and reporting on patient satisfaction with health care has become a major industry [1]. Patient satisfaction is one of the desired outcomes of health care and it is directly related with utilization of health services [2]. Satisfied patients are more likely to utilize health services, comply with medical treatment, and continue with the health care providers [3]. Studies showed that the overall level of patient satisfaction and associated factors were varied in different countries and settings, for example 75.08% in Tertiary Care Hospital in Nagpur [4], 66.8% in Southeastern Nigeria [5] and in South Africa 51.9% for midwifery service [6] were reported about overall patients' satisfaction.

Ethiopia previous studies showed that, there were differences in different localities with regard to the overall patients' satisfactions; 89.1% in Jimma [7], 80.1% in Hawassa [8], 54.1% in Harari region [9] and 18.0% of the patients at the public hospitals were very satisfied, 54.1% and 47.9% were just satisfied in Addis Ababa [10]. This study was done to assess the level Patients' Satisfaction in Felege Hiwot Referral Hospital, Bahir Dar City, Ethiopia.

2. Methods

2.1. Study Design

Cross-sectional study was conducted at Felege Hiwot referral hospital, Bahir Dar City, Ethiopia from 1st September 2012 to 2nd November 2012. Bahir Dar City is the capital city of the Amhara National Regional State located at about 565 km northwest of Addis Ababa (the capital city of Ethiopia).

2.2. Sample Size Determination and Sampling Procedure

Targeted groups of patients for this study were diabetes mellitus, hypertension, and asthmatic patients. The sample size was determined by using a single population proportion formula, which took the proportion of overall satisfaction as 43.6% [11], with a margin of error of 0.05 at the 95% confidence interval (CI). Adding 10% non-response rate, the final sample size was calculated to be 415 patients. From the hospital pervious report about patient flow, average number of adult patients with chronic illness who visited the hospital was 77 per day. Therefore the number of patients who visited the hospital was estimated for the study period; then sampling fraction for selecting the study participants was determined by dividing with total estimated number of patients during the data collection period to the total sample size which was calculated to be five. The first study participant was selected by lottery method among the list from one to five; the next study participant was identified systematically in every 5th intervals until the required sample size was achieved.

2.3. Data Collection Procedure and Quality Assurance

A structured questionnaire was prepared according to the objectives of the study and the local situation of the study area in English language. Then the questionnaire was translated to Amharic and back to English to assure consistency of the tool. Discrepancies in the translation were resolved by mutual agreement with the research team. Pre-testing was conducted on 20 respondents at a referral hospital with similar settings.

2.4. Data Management and Data Analysis

The collected data were checked for completeness and consistency before being coded, entered and analyzed using SPSS version 19. Descriptive analysis using frequency distribution and percentages were calculated.

2.5. Ethical Consideration

The research approved by Research Ethics Review Board of Bahir Dar University. Permission to conduct the study was also obtained from Health Bureau of Amhara National Regional State, and Felege Hiwote referral hospital. During data collection, the purpose of the study was clearly explained to the participants, and informed oral consent was obtained. Confidentiality and privacy was maintained.

3. Result

3.1. Socio Demographic Characteristics of the Respondents

A total of 415 adult patients having chronic illness were involved for this study. As shown in **Table 1**, 54.7% of

the respondents were male, 43.4% were above 44 years old, 44.3% were married, and 40% never attended formal education and 60.7% were urban dwellers (**Table 1**).

3.2. Patients' Experience

Patients' experience was assessed using 14 items. These items were about the quality of care, its convenience and the medical expense. Majority (74%) of the respondents had experienced long waiting time for physical examination. Moreover, about 44% of the respondents were having long waiting time to get prescribed medications in pharmacy. About 64.6% of the respondents complained of inconvenient location of the hospital pharmacy.

More than 70% of study participants claimed that the cost of lab tests-blood and urine-was affordable while 55.2% of the patients claimed that the cost for X-ray test was not affordable.

Nearly 90% of study participants rated treatment provided by medical doctor as good. Moreover, nearly 70% of study participants also claimed that medical doctors give chance to patients to ask questions. However, 56.1% of the respondents claimed that nurses were not skilled in using medical equipment. Besides, about 65% of study participants complained that hospital officers did not give due attention to concerns of patients (**Table 2**).

Table 1. Socio demographic characteristics of respondents at FHRH, Bahir Dar City, North Western Ethiopia, 2012.

Variables	Categories	N	%
Sex	Male	227	54.7
	Female	188	45.3
Age	15 - 24	72	17.3
	25 - 34	85	20.5
	35 - 44	78	18.8
	>44	180	43.4
Marital status	Single	93	22.4
	Married	184	44.3
	Widowed	92	22.2
	Divorced/Separated	46	11.1
Education	Never attended school	166	40
	Primary and junior education	64	15.4
	High school education	63	15.2
	Diploma and above	122	29.4
Occupation	Self dependent	90	21.7
	Government employed	103	24.8
	Non-government employed	22	5.3
	Merchant, farmers and others	200	48.2
Family income	<525 Eth Birr	135	32.6
	525 - 2500 Eth Birr	100	24.1
	2501 - 5500 Eth Birr	108	26
	>5501 Eth Birr	72	17.3
Address	Urban	252	60.7
	Rural	163	39.3

Table 2. Experience of patients concerning heath care services at the OPD of FHRH, Bahir Dar City, North West Ethiopia, 2012 (n = 415).

Experiences of Patients	Yes	No
	N (%)	N (%)
Experience to health care services		
Waiting time for physical examination was long	307 (74)	108 (26)
Waiting time at pharmacy was long	182 (43.9)	233 (56.1)
Place for receiving the medicine was in convenient	268 (64.6)	147 (35.4)
Place for receiving the treatment was in adequate	173 (41.7)	242 (58.3)
Schedule was appropriate	151 (36.4)	264 (63.6)
Receiving medical services from one department to another department in OPD was difficult	308 (74.2)	107 (25.8)
Medical expense		
The cost of urine was affordable	308 (74.2)	107 (25.8)
The cost of X-ray affordable	186 (44.8)	229 (55.2)
The cost of blood examination was affordable	281 (67.7)	134 (32.3)
Quality of care		
Services by doctor was good	369 (88.9)	46 (11.1)
Availability of Prescribed medicine in pharmacy	316 (76.1)	99 (23.9%)
Nurse was skilled in using medical equipments	182 (43.9)	233 (56.1)
Doctor gave you an opportunity to ask about your illness	290 (69.9)	125 (30.1)
Hospital officers listened to your problem attentively	147 (35.4)	268 (64.6)

3.3. Accessibility of Health Care Services at Outpatients Department

About 50% of the respondents claimed that they travel more than 10 kilometers to reach the hospital. For about 70% of the study participants accessing public transport was not a problem. About 55% of study participants claimed to spent 10 birr or more for public transport.

More than 55% of the study participants claimed that the information provided to patients was inadequate. (**Table 3**).

3.4. Attitude of Study Participants towards Structural and Process Indicators of Health Service Quality

The structural areas include physical facilities, and medical equipments. The process areas include: services provided by deferent categories (doctors, nurses, registration, and laboratory). The level of the patient satisfaction towards OPD services was measured using 19 items with five ikert's scale. The scale had five grades which include strongly agreed, agreed, not agreed, disagreed and strongly disagreed. As a result, the mean score of total satisfaction was 59.7%.

The finding of this assessment is displayed in **Table 4**. As shown in the table, major segment of study participants rated the structural aspect of the hospital (physical facilities, and medical equipments) negatively (not agreed, disagreed, or strongly disagreed). Except for laboratory cost, the process aspects which were related to services rendered by different categories of health professionals were rated positively (strongly agreed or agreed).

3.5. Overall Satisfaction

The overall level of patients' satisfaction was categorized into two categories: satisfied and unsatisfied. The

Table 3. Responses of study participants to accessibility assessment items, FRH, North West Ethiopia, 2012 (n = 415).

Accessibility to health care services	Number	Percent
Distance from hospital		
Less than or equal to 10 km	204	49.2%
Greater than 10 km	211	50.8%
Access to public transport to hospital		
Yes	295	71.1%
No	120	28.9%
Time taken to reach the OPD		
Less than or equal to 1 hour	256	61.7%
More than 1 hour	159	38.3%
Money spent to reach the OPD		
10 birr and less	187	45.1%
Greater than 10 birr	228	54.9%
Waiting time to see the doctor		
Less than or equal to 1 hour	232	55.9%
More than one hour	183	44.1%
The total time of spent to getting complete health services		
Less than or equal to 2 hour	48	11.6%
More than two hour	367	88.4%
Schedule of working hour of OPD is adequate		
Yes	185	44.6%
No	230	55.4%

highest overall score of satisfaction was registered for pharmacy services (86.15%) and the lowest score was attained by patient registration services (**Table 5**).

4. Discussion and Conclusion

The overall satisfaction level of outpatient service users in the study area was 58.3% (242). This finding was lower than research reports from Ethiopia (89.1%) in Jimma [7] and 80.1% in Hawassa [8], and abroad having overall patient satisfaction of 75.08% in Tertiary Care Hospital in Nagpur [4], 66.8% in Southeastern Nigeria [5].

These studies were about over all patient satisfaction, and our study was about satisfaction level of chronic illness patients. Therefore, the deference could be attributed to the fact that the health system in low income countries including Ethiopia is not prepared to provide care to chronic illness patients such as hypertension, diabetics etc. It is rather prepared for acute infectious and parasitic diseases. Therefore, patients with chronic illness do not get appropriate care.

For instance, recently we conducted clinical audit on care of diabetic patients in the same hospital. The most outstanding finding of the study was that in all 341 diabetic patient case notes reviewed we found even no single record about weight, height, and body mass index let alone, regular check up of eye, foot, lipid profile, glycated hemoglobin, and microalbuminamia (Gedefaw M. unpublished). Hence, they are very much dissatisfied than any other patient category receiving care in the hospital.

Table 4. Patient satisfaction towards OPD health care services at FHRH, Bahir Dar City, Northwestern Ethiopia, 2012.

No	Variables	Level of satisfaction (n = 415)				
		5 = SAG	4 = AG	3 = NAG	2 = DAG	1 = SDAG
	Physical facilities					
1	Building of this hospital is clean	50 (12.1%)	175 (42.2%)	62 (14.9%)	108 (26%)	20 (4.8%)
2	Ventilation inside the hospital is good	35 (8.4%)	144 (34.7%)	122 (29.4%)	88 (21.2%)	26 (6.3%)
3	Enough light inside the building of hospital	54 (13%)	174 (41.8%)	114 (27.5%)	60 (14.5%)	13 (3.2%)
4	Noise around the hospital	37 (8.9%)	162 (39%)	103 (24.8%)	85 (20.6%)	28 (6.7%)
5	Waiting room has enough sitting chairs	30 (7.2%)	60 (14.5%)	78 (18.8)	200 (48.2%)	47 (11.3%)
6	Enough clean toilets are available	6 (1.5%)	26 (6.3%)	52 (12.5%)	228 (54.9%)	103 (24.8%)
7	Enough examination rooms are available	17 (4.1%)	77 (18.6%)	100 (24.1%)	135 (32.5%)	86 (20.7%)
	Medical equipment					
8	Enough medical equipment for examination is available	14 (3.4%)	35 (8.4%)	84 (20.2%)	224 (54%)	58 (14%)
9	Supplies of medical equipment are always available	5 (1.2%)	30 (7.2%)	91 (21.9%)	197 (47.5%)	92 (22.2%)
	Doctor services					
10	Hospital doctors do physical examination with respect	88 (21.2%)	228 (54.9%)	51 (12.3%)	34 (8.2%)	14 (3.4%)
11	Doctors spend enough time to patient	55 (13.2%)	199 (48%)	87 (21%)	55 (13.2%)	19 (4.6%)
	Nurse services					
12	Hospital nurses treat the patient with respect	66 (15.9%)	180 (43.4%)	84 (20.2%)	59 (14.2%)	26 (6.3%)
13	Nurses explain the treatment clearly	44 (10.6%)	182 (43.9%)	82 (19.8%)	79 (19%)	28 (6.7%)
	Pharmacy services					
14	Hospital pharmacists treat the patient with respect.	138 (33.3%)	178 (42.9%)	45 (10.8%)	37 (8.9%)	17 (4.1%)
15	Pharmacists explain the use of medicine clearly	91 (21.9%)	196 (47.2%)	67 (16.2%)	46 (11.1%)	15 (3.6%)
	Registration services					
16	Registration staffs treat the patient with respect	26 (6.3%)	116 (28%)	54 (13%)	153 (36.8%)	66 (15.9%)
17	Registration staffs have good communication skill	19 (4.6%)	84 (20.2%)	91 (21.9%)	141 (34%)	80 (19.3%)
	Expense for laboratory tests					
18	Expenses for pathology laboratory tests are affordable	25 (6%)	83 (20%)	98 (23.6%)	168 (40.5%)	41 (9.9%)
19	Medical expenses for X-ray laboratory tests are affordable	17 (4.1%)	87 (21%)	101 (24.3%)	154 (37.1%)	56 (13.5%)

*SAG: strongly agree; AG: agree; NAG: not agree; DAG: disagree; SDAG: strongly disagree.

To put it in a nut shell, more than 40% of the patients were not satisfied with the service. This is totally unacceptable care for a regional referral hospital situated in the capital city of a region home for more than 20 million

Table 5. Number and percentage distribution overall satisfaction.

Variables	Level of satisfaction n = 415			
	Satisfied		Not satisfied	
	N	%	N	%
Physical facilities	257	62.05	158	37.95
Medical equipment	140	33.75	275	66.25
Doctor services	293	70.6	122	29.4
Nurse services	318	76.85	97	23.15
Pharmacy services	358	86.15	57	13.85
Registration services	195	46.95	220	53.05
Expense for laboratory tests	205	49.5	210	50.5

people. Therefore, there is a need to revisit care given to chronic illness patients, and appropriate strategy should be designed to address the lifelong care needs of patients with chronic illness in our set up.

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12

Structured Equation Model of Tuberculosis Incidence Based on Its Social Determinants and Risk Factors in Bandar Lampung, Indonesia

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Abstract

World Health Organization through tuberculosis (TB) control averted up to six million deaths and cured thirty-six million people in 1995-2008, but had less success in reducing TB incidence, especially in thirteen high burden countries, including Indonesia. Therefore, TB control will need to have more emphasis on the issues of social determinants, as social determinants affect TB's incidence directly and/-or through TB's risk factors. This study aimed to identify a significant effect of social determinants and the risk factors of TB incidence. The research setting was at twenty-seven primary health centers and one hospital that have implemented the Directly Observed Treatment Short Course (DOTS) strategy in Bandar Lampung municipality, Indonesia. Respondents of this research were 238 smear-positive TB patients as case group and 238 patients without TB as control group. Research variables consisted of "social determinants", "housing condition", "household food security" and "health access" which were set as latent variables and measured through their indicators. Data had been collected by using questionnaire and then was analyzed with Structural Equation Modeling using SmartPLS 2.0 software. The result showed that "social determinants" through "housing condition" and "household food security" affected "TB incidence". Moreover, "social determinants", "housing condition" and "household food security" can be used to explain 34.1% variation of "TB incidence". In conclusion, the knowledge can be used to support the TB control program, particularly to implement the DOTS strategy together with improving social determinants, housing condition and household food security.

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Keywords

Social Determinants, Housing Condition, Household Food Security, TB Incidence, Structural Equation Modeling

1. Introduction

Since 1947-now, World Health Organization (WHO) has been conducting tuberculosis (TB) control through various interventions, such as mass Bacillus Calmette-Guérin (BCG) vaccination, improved chemotherapy, management and service program as well as the implementation of the Directly Observed Treatment Short Course (DOTS) strategy. Moreover, since 2000, WHO has initiated the Stop-TB Partnership in order to improve the effectiveness of the TB control program globally. The Stop-TB Partnership targets, included in the Millennium Development Goals (MDGs), is to halve prevalence and mortality by 2015 compared with their levels in 1990 [1]-[4].

TB control averted up to six million deaths and cured thirty-six million people in 1995-2008. Unfortunately, the control had less success in reducing TB incidence. TB incidence only declined in 0.7% per year during 2004-2008. Moreover, the decline only occurred in some American and European countries. None of them are among the thirteen WHO high burden countries, which are mainly in Sub-Saharan and South East Asia [3] [5]-[7]. Globally, in 2010, there were estimated of 8.8 million TB incidences. The number was equivalent to 128 cases/100,000 populations. Most of cases occurred in Asia (59%) and Africa (26%), meanwhile smaller proportions of cases occurred in the Eastern Mediterranean region (7%), European (5%) and Americas (3%). Indonesia is one of the five countries with the highest number of TB incidence in 2010 (0.37 - 0.54 million incidences). In addition to that, the number increased compared to TB incidence during 2009 (0.35 - 0.52 million incidences) [3] [6].

Therefore, in order to reduce the incidence of TB further, TB control will need to "move out of the TB box" with more emphasis on the issues of social determinants [8] as, social determinants affect TB's incidence directly and/-or through TB's risk factors, those are household food security, housing condition and health access [5] [9]-[12]. In addition, it has been proven that social determinants and TB risk factors are latent variables that couldn't be measured directly but measured through their indicators (manifest variables). Previous studies have shown that TB incidence in some countries such as Philippines, Bangladesh, Vietnam, India, South Africa and Gambia is closely related to some indicators of social determinants as well as some indicators of TB risk factors [13]-[16]. In those studies, however, social determinants and TB risk factors have not been studied as latent variables.

Bandar Lampung is the capital city of Lampung Province in Indonesia. Based on Bandar Lampung Municipality Health Office TB report 2010-2011, although TB cure rate in 2009 and 2010 had reached 80% - 85%, TB incidence in the city during that period increased, from 112/100,000 population in 2009 to 114/100,000 population in 2010. Moreover, based on statistical data in the year of 2011, Lampung is one of the poorest provinces as well as the province with poorest housing condition in Indonesia. Those two factors, poverty and housing condition, are well known to directly correlate with social determinants and TB risk factors.

This study aimed to identify the significant effect of social determinants and TB risk factors again TB incidence. Since social determinants and TB risk factors were latent variables which couldn't be measured directly, Structural Equation Modeling (SEM) was then required to analyze the effect rather than the ordinary regression model. The knowledge of how social determinants and TB risk factors influence the TB incidence will then be useful to support a more effective TB control program.

2. Methods

2.1. Study Site and Sample

This study has been conducted in one hospital and twenty-seven Primary Health Centers (PHC) across the Bandar Lampung City that have been implementing the DOTS strategy. Population of this research consisted of case population and control population. Case population was consisted of 628 smear-positive TB patients recorded during January-July 2012 at the study site. Meanwhile, control population was TB suspects that were recorded

during period of January-July 2012 who did not suffer from TB. The control population, were confirmed by negative result of TB laboratory test or X-ray examination. The sample size of both the case group and control group was decided based on the sample size calculation method for case and control group [17]. In this study, a sample size of 238 were used for both case and control groups to clarify a statistically significance influence of research variables, with 80% power and 95% significance level.

2.2. Research Variables

Research variables in this study were latent variables, which cannot be measured directly and must be measured through their indicators. The dependent variable was TB, which was measured by one indicator namely suffering TB (yes and no). The independent variables consisted of "social determinants", "housing conditions", "household food security" and "health access". Latent variable of "social determinants" was measured by four indicators: education (length of education that has been received: less than nine years, nine years, more than nine years), occupation (unemployed, temporary employee, permanents employee), income (income per-capita: less than US$ 804; US$ 804 – 1639; more than US$ 1639) and social classes (having none productive asset, having one productive assets, having more than one productive assets) [11] [12] [18] [19]. "Housing conditions", as latent variable, was measured by three indicators: house density index (house area divided by number of person: less than 5.6 m^2, 5.6 - 8 m^2, more than 8 m^2), ventilation (percentage of ventilation area of house width: less than 13.75%, 13.75% - <20.00%, more than 20%) and indoor air pollution (number of indoor air pollution sources: 5, 4, 3, 2, 1,0) [14] [20]. "Household food security", as latent variables, was measured by three indicators: food budget (monthly food budget for each person: less than US$ 13, US$ 13 - 30, more than US$ 30), diet diversity (number of diet type of daily consumption: 1, 2, 3, 4) and food sufficiency (ever missed meal time and reduced meal portion for one—four weeks, ever missed meal time less than one week and ever reduce meal portion for one—four weeks; ever reduced meal portion for one—four weeks; ever reduced meal portion for less than one week) [21] [22]. Meanwhile, "health access" was measured by two indicators: distance to health facility (more than five kilometer, one—five kilometer, less than one kilometer) and transportation needs (availability of transportation: public transportation, private transportation, no transportation needed) [23].

2.3. Data Collection and Analysis

In-depth interview using questionnaire was performed in order to collect data in this research. The data collected were then analyzed using SEM. It has been known that SEM is a statistical method which can be used to measure not only relationship among all latent variables involved but also measure relationship between latent variables and their indicators. This method provides relationship significance among latent variables simultaneously. In the other hand, both using ordinary regression and only using indicators without latent variables to analyze latent variables will be able to cause a parametric measurement false [24].

Partial Least Square (PLS) algorithm was chosen to set up SEM since the data was considered as non-normal distribution and due to its multi-co-linearity. SmartPLS version 2.0M3 was chosen as software to conduct the SEM analysis. The SmartPLS supports graphical modeling and carries out the bootstrapping procedure to generate significance measurements. Evaluation within the PLS algorithm consists of measurement-model evaluation (outer model) and structural-model evaluation (inner model). Measurement-model evaluation was performed to evaluate goodness of concerned indicators to represent their latent variable signified by loading indicator values. Meanwhile structural-model evaluation was done to evaluate goodness of relationship between independent-latent variable and dependent-latent variable signified by value of both the path-model coefficient and R^2. In this research, the PLS analysis was performed by specifying the sampling number of 1000 for bootstrapping. Furthermore, the latent variables namely TB, social determinants and risk factors scores were estimated for further analysis.

2.4. Ethical Clearance

We obtained ethical clearance for the study from the Medical and Health Research Ethics Committee, Faculty of Medicine, Gadjah Mada University. In addition to that, all of respondents involved in this research were asked to participate on voluntary basis and received sufficient information to consider consent prior to the interview.

3. Result

PLS path model of TB incidence has been developed, to identify relationship between latent variable and its indicators as well as correlation among the concerned latent variables namely TB risk factors, "social determinants" and "TB incidence" (**Figure 1**). In this path model, "social determinants" is predicted to affect "TB incidence" directly and/or- through other latent variable namely "housing condition", "food security" and "health access" of concerned household [9]. The significances of predicted each and or simultaneous paths were then analyzed during the model running (measurement-model and structural-model evaluation). The path coefficient of the structure model and bootstrapping test results for outer loading of the measurement model are presented at **Table 1** and **Table 2** respectively.

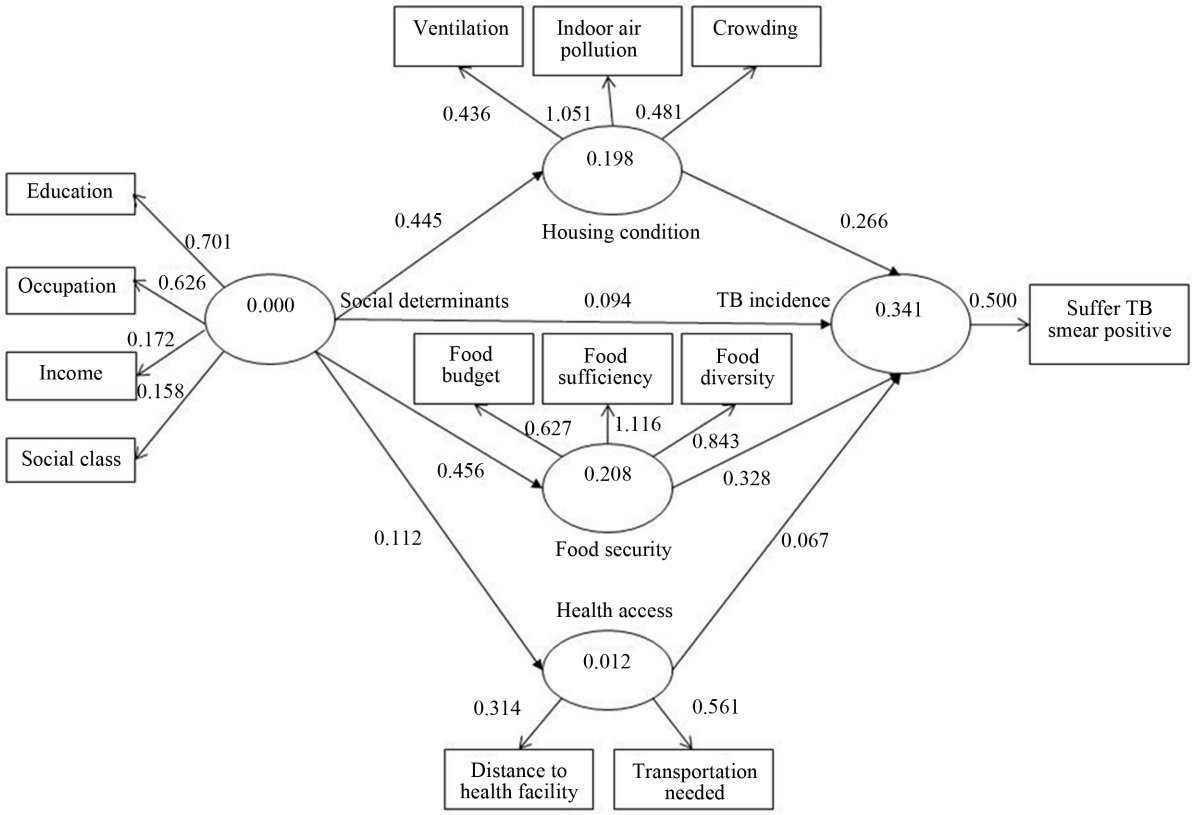

Figure 1. PLS path model of TB incidence, social determinants and risk factors.

Table 1. Bootstrapping test for path coefficients.

Indicators	Original Sample	Mean	Standard Deviation	Standard Error	T statistics
Social determinants → Household food security	0.456	0.463	0.075	0.075	6.088*
Social determinants → Housing condition	0.445	0.450	0.076	0.076	5.821*
Social determinants → Health access	0.112	0.156	0.086	0.086	1.299
Social determinants → TB incidence	0.094	0.112	0.103	0.103	1.233
Housing condition → TB incidence	0.266	0.272	0.108	0.108	2.467*
Household food security → TB incidence	0.328	0.328	0.096	0.096	3.427*
Health access → TB incidence	0.067	0.095	0.066	0.066	1.008

*p value < 0.05.

Table 2. Bootstrapping test for outer loadings.

Indicators	Original Sample	Mean	Standard Deviation	Standard Error	T statistics
Education ← Social determinants	0.701	0.684	0.077	0.077	9.094*
Occupation ←Social determinants	0.626	0.494	0.149	0.149	3.622*
Income ← Social determinants	0.172	0.174	0.064	0.064	2.696*
Social class ← Social determinants	0.158	0.165	0.103	0.103	1.636
Crowding ← Housing condition	0.481	0.480	0.060	0.060	8.057*
Indoor air pollution ← Housing condition	1.051	1.345	0.082	0.082	16.478*
Ventilation ← Housing condition	0.436	0.436	0.049	0.049	8.920*
Food budget ← Household food security	0.627	0.620	0.042	0.042	15.109*
Food sufficiency ← Household food security	1.116	1.106	0.057	0.057	19,623*
Food diversity ← Household food security	0.843	0.836	0.058	0.058	14.629*
Distance to health facility ← Health access	0.314	0.349	0.182	0.182	1.780
Transportation needed ← Health access	0.561	0.472	0.139	0.139	4.039*
Suffering TB smear-positive← TB incidence	0.500	0.497	0.004	0.004	133.679*

*p value < 0.05.

Table 1 shows that four out of seven paths in the model are considered significant indicated by their t value which higher than 1.96 (at 0.05 of significant level) and the remaining three path lines within the model are considered as insignificant. Those three path lines have origin and destination respectively as the following: "social determinants"—"TB incidence", "social determinants"—"health access" and path from "health access" to "TB incidence". The four significant paths consist of: "social determinants"—"food security", "social determinants"—"housing conditions", "food security"—"TB incidence" and "housing conditions"—"TB incidence". Two paths that originated from "social determinants" which are connecting to both "food security" and "housing condition" of concerned household have t value of 6.088 and 5.821 respectively. Meanwhile, paths from both food security and housing condition of concerned household which are connecting to "TB incidence" as their destinations have t value of 2.467 and 3.427 respectively.

Refer to the results above which are schematized in **Figure 1**, it can be learned that "social determinants" has no direct effects to "TB incidence". Paths of "social determinants" through "health access" also found insignificant influence to the "TB incidence". Meanwhile, path of "social determinants" through other two latent variables, "food security" and "housing condition" of the concerned household, present strong effects to "TB incidence".

Figure 1 and **Table 1** also show that standardized path coefficients of "social determinants", "household food security" and "housing condition" are positive, which mean that effect of social determinants to "TB incidence" through "household food security" and "housing condition" are also associated as positive. The path coefficient of connecting paths originated from "social determinants" to "TB incidence" through "household food security" is 0.149 which was provided by multiplication among all paths coefficient involved, in this case 0.456 multiplied by 0.328. Meanwhile, with the same method, the path coefficient of "social determinants" to "TB incidence" through "housing condition" was calculated as 0.456 multiplied by 0.266 which is 0.118.

The resultant effect of "social determinants", "household food security" and "housing condition" can explain 34.1% variation of TB incidence, as showed in **Figure 1**. Meanwhile, the remaining variation can be explained by other variables which are not studied in this research.

Both **Figure 1** and **Table 2** show that most of loading factors, except social class and distance to health facility, are considered prominent to explain their latent variable at 0.05 significant level (t value is more than 1.96). It means that most of the indicators, ten out of twelve, represent or can be used to explain their latent variable. **Figure 1** and **Table 2** also show that education is indicator with the highest loading factor value (λ = 0.702), compared to other indicators in "social determinants" latent variable. Indicator with the highest loading

factor value indicates that the indicator also has the strongest correlation to its latent variable. Meanwhile, indoor air pollution (λ = 1.051) and food sufficiency (λ = 1.116) are indicators which have strongest correlation to their latent variables, those are "housing condition" and "household food security" respectively.

4. Discussion

Our findings suggest that "social determinants" through "household food security" and "housing condition" affect "TB incidence" significantly. The result indicates that people with lower education, occupation, income and social class, tend to have house with an overcrowded, inadequately ventilation, and indoor air pollutions. The people also tend to have lack of food budget, food diversity and food sufficiency. Those factors will increase risk of TB. The result concur with some reviews which stated that social determinants through TB risk factors ("housing condition" and "household food security") affect TB incidence [5] [9] [25]. Since found no particular published studies about "social determinants", "housing condition", "household food security" and "TB incidence" as latent variables, it was difficult to have a significant comparison that can be performed. In the other hand, there were some researches which studied relationship between indicators of the three concerned latent variables ("social determinants" and "housing condition" or "household food security") and they provided similar results. Similar result also presented on number of works studied about interaction between "housing condition" and "TB incidence" as well as "household food security" and "TB incidence" [14]-[16].

Our findings suggest that latent variable of "social determinants" have no direct effect to "TB incidence" or indirect effect through "health access". The result, however, is not in line with some reviews which stated that social determinants have direct effect to TB incidence, as well as indirect effect through "health access" [5] [9] [25]. The insignificant could be caused by the fact that there is no difference of social class between control group and case group, which can be resulted from the same sources of control and case group [16]. It also could be caused by fact that basically distance from their address to health service both for control group and case group are relatively the same. The fact was mainly due to regional conditions of the Bandar Lampung. Distance from one health-service unit to the other health-service unit in the Bandar Lampung, as a research location, is only about two kilometers, in perpendicular line, and the farthest respondent from health service is only 6 kilometers. Moreover, the non-concurrence of the findings is also caused by other independent latent variables which have stronger relationships to TB. On the path model, it can be seen that all indicators of both "housing conditions" and "household food security" are significant at 0.05 level and have high loading factor (λ) values, which means that those variables represent their latent variables and have a stronger relationship to "TB incidence" compared to "social determinants" and "health access" [26].

Our findings show that education, indoor air pollution and food sufficiency are indicators which have the strongest correlation to social determinants, housing condition and household food security respectively. The knowledge suggests that improvement in education would have the strongest effect in social determinants improvement. The result in line with "*fighting Poverty to Control TB Project*" in Lima, Peru, which demonstrated that improving access to the work education has a significant effect in improving social determinants as well as the tuberculosis control [27]. In spite of improvement in education, our findings also suggest that improvement in indoor air pollution and food sufficiency would have the strongest effect in housing condition and food security, respectively.

Our finding also shows that "social determinants" through "housing condition" and "household food security" all together represent 34.15% of "TB incidence". Meanwhile, the remaining 65.85% should be explained by other variables which are not studied in this research. The remaining variables are strong related to human behavior that could be measured by its indicators namely: HIV, diabetes mellitus, smoking and malnutrition [10].

5. Conclusion

We have demonstrated that TB incidence is closely related to the insufficiency of social determinants (education, occupation, income and social status) which then also affect TB risk factors namely inadequate of housing condition and food security of the concerned household. The findings of social determinants and risk-factors significance can be used to support TB control program in low and middle countries that have social determinants as main issue causing TB incidences, including Indonesia. The knowledge also implies that the implementation of the DOTS-strategy should be combined with promotion and improvement effort upon all aspects regarding "social determinants", "housing condition" as well as "household food security". Indicators suggested in the im-

provement are education, indoor air pollution and food sufficiency. To be more effective, the effort must be supported by other health sectors and other institutions [25] [28]. Therefore, social determinants, housing condition as well as household food security improvement should be elaborated into the implementation of the DOTS strategy as an integrated TB control program.

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Epidemiology of Tumors of the Brain and Central Nervous System: Review of Incidence and Patterns among Histological Subtypes

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Abstract

Most epidemiology reports indicate that brain tumor rates in whites are higher than other populations and that they are more common in males than females. In this report, we analyze incidence patterns in registry data from the Surveillance, Epidemiology, and End Results program in different histological groups, racial/gender combinations and compare the overall and age-specific incidence rates. Our analysis shows statistically significant racial differences in rates for astrocytomas non-otherwise specified in both sexes, and unspecified malignant intracranial intraspinal neoplasms for females. Those of other specified intracranial and intraspinal neoplasms in females are higher than males, indicating the importance of biological differences. Other glioma young age rates peak after the age of five, the peak is higher for the black race. The study demonstrated several distinctive patterns in the rates by histological subtypes and showed differentiation in the age at diagnosis, giving insight on potential true changes in different subpopulations.

Keywords

Incidence, SEER, Brain and CNS Tumors, Demographic

1. Introduction

Epidemiological data on the full scale of primary brain and central nervous system in the USA can be found from Surveillance Epidemiology and End Results (SEER), North American Association of Central Cancer Regi-

stries and the Central Brain Tumor Registry of the United States (CBTRUS), their latest reviews are reported in [1], [2]. Characteristics of the three databases are reviewed and relevant information on brain tumors is discussed in [3]. Variation in adult brain cancer incidence for grouped populations in an international level has been studied in [4]. Incidence rates from regional population based registries in Japan are evaluated in [5] and Northern Europe in [6].

Epidemiologic studies of brain and Central Nervous System (CNS) tumors have examined survival and incidence rates over the past decades presenting the most recent data on rates and trends of brain tumor histological diversity. Concerns with regard to brain tumor risk are increasing and epidemiologic studies have examined available evidence over the past decades. A major priority has been to find differences between incidence and survival experienced by the subjects based on their biological diversity. Since any new treatments have limited ability to improve prognosis for all brain tumors histology type, grade, age, tumor location are mostly linked to survival times.

While progress in diagnostic technologies may have contributed to an increase in incidence for several histologies, changes in brain tumor classifications are also likely to be responsible for shifting towards certain brain tumor histologies. Studies intending to update information and provide detailed perspectives on the epidemiology of primary brain tumors in the USA are increasingly prompting debates on weather changes in the trends reflect changes in etiology or cases ascertainment.

In the following we include an overview of the literature on incidence rates, not intended as an exhaustive coverage of the relevant studies, but as a presentation of studies with various priorities and evidence.

A brief description of the literature since 2001 for major molecular, genetics findings is discussed in [7]-[13]. Already established and new emerging risk factors are discussed in [14]-[18]. For developments in pediatric tumors research we refer to [19]-[26]. Brain tumors incidence trends and new diagnostic tools are discussed in [27]-[32]. For discussions about prioritized areas for further research, and consensus on available evidence, see [33]-[36]. Epidemiologic findings for brain tumors and methods of classification are reported in [37]-[47].

In this study we employ descriptive and statistical methods to update the incidence of brain tumors and provide information on occurrence by sex, age and race. If the variation in incidence rates among the registries represents differences in incidence experienced by the population then the registered brain tumors represent the variation of brain cancer incidences in USA. Our estimates showed i) sex differences with demonstrated distinctive patterns on the incidence rates depending on histologies; ii) racial differences in specific rates in several histologies giving insight into possible etiologies of brain tumors. An effort is undertaken to better characterize pediatric brain tumor incidence, with an emphasis on improving our understanding on racial and gender differences. Analysis of malignant tumors is based on data between 1973 and 2010 for a broad spectrum of histologies.

2. Methods

The National Cancer Institute's SEER program provides information and other comprehensive resources with regard to incidence on tumors from various US metropolitan areas.

In summary, the program collects information on incidence from specific geographic areas representing 28 percent of the US population and compile reports for the entire country through the SEER program. Conventionally, the risk is evaluated by incidence rates; in some instances these statistics are reported by histology classifications, race, sex, tumor location and grade. The following nine registries provided data on the incidences of brain tumors diagnosed between 1973 and 2010: San Francisco-Oakland SMSA-1973+, Connecticut-1973+, Detroit (Metropolitan)-1973+, Hawaii-1973+, Iowa-1973+, New Mexico-1973+, Seattle (Puget Sound)-1974+, Utah-1973+, Atlanta (Metropolitan)-1975+. All the tumors included in the study were malignant, primary tumors of the brain and the central nervous system, site codes are C000-C809 and ICD-O-3 histology codes are 9161 - 9571 as well as 8000 - 8005, finally, 0, 1 and 3 are the ICD-O-3 behavior recodes [48]. For definitions of the primary sites, ICD-O-3 behavior recodes and histology, see [49]. Available information included gender, race, age at diagnosis and type of histology; for more details see [50].

Age-adjusted incidence rates per 100,000 persons based on the 2000 standard US population were extracted using the SEER*Stat 8.0.4 software of the Surveillance Epidemiology and End Results program, National Cancer Institute. Between 1973 and 2010, 57,343 cases of malignant brain tumors were diagnosed in the nine SEER registries and recorded in the data released in April 2013 with complete data on sex, race, and birth date, year and age at diagnosis, histological diagnosis. Rate calculations include crude rates for white, black, and American In-

dian/Alaska native, Asian/Pacific islander populations; consequently the detail statistics of incidence rates may not be available in some cases. Included in the SEER datasets is the "other unspecified" race. Since the information for this group is very sparse, we decided not to include this racial group in the analysis.

Brain and CNS tumors are classified according to the adolescents and young adults (AYA) site recode variable based on the classification scheme in [50]. Incidence rates are reported for ten histologies: specified low grade astrocytic tumor, glioblastoma and anaplastic astrocytoma, astrocytoma NOS are the astrocytic histologies, other glioma, ependynoma, medulloblastoma, supratentorial PNET, other specified intracranial and intraspinal neoplasms, unspecified malignant intracranial intraspinal neoplasm, unspecified benign/boarder intracranial intraspinal neoplasm. In this study we will attempt to compare rates for those histologies that allowed for comparisons between all sex, race and age groups, the last histology was excluded because of the insufficient number of records. A risk-adjusted method proposed for estimating cancer incidence rates from data collected by the SEER program of the US National Cancer Institute is used when comparing rates in different races.

Characteristics of the available primary brain and other CNS tumors patients during the study period are shown in **Table 1**. Relative frequencies by histology subtypes in all male and female racial groups are presented for the 1973-2010 period. The frequencies for three age groups and histological subtypes are reported for the same period. The majority (53.2%) of the tumors are in the 20 - 64 year age group, while 33.8% of the tumors occurred in the elderly and the remaining 13% of the tumors occurred in children. The percentage of brain tumors in the data by gender is 55.6% for males and 45.4% for female; the number of incidence cases is dramatically higher in whites 89.5% of the recorded tumors.

3. Results

Annual incidence rates and corresponding confidence intervals (CI) for all brain tumors ranged from 6.87 (95% CI 6.79 - 6.93) to 3.29 (95% CI 3.16 - 3.41), and 2.95 (95% CI 2.82 - 3.08) cases per 100,000 for the white, black and other race, respectively. The increased incidence rates for whites compared with other races is statistically significant ($p < 0.05$) is apparent by the non-overlapping CI's. The distribution of races was shown in **Table 1**, corresponding relative risks were 2.09 for whites versus blacks and 2.33 when whites are compared with the other group. Exact rate ratio tests assuming Poisson count, see [51], for the populations gave 95% confidence intervals for the whites over blacks, whites over other, and blacks over other incidence rates (2.01, 2.17), (2.23, 2.43), (1.05, 1.18). The corresponding one-sided hypotheses resulted in every case in $p < 0.0001$ as evidenced by the not containing CI's.

For the 1973-2010 period a total of 49,531 brain and CNS tumors were reported by the SEER registries with the resulting incidence rate of 6.14 (95% CI 6.08 - 6.19) cases per 100,000 person-years. The detailed distribution of tumors by histology, race, sex, age group is presented in **Table 1**. The most common histology has been

Table 1. Characteristics of the study population by histology, race, gender and age at diagnosis, SEER 1973-2010.

Site Group	Age at Diagnosis			Gender	Race		
	0 - 19	20 - 64	>65	Males	White	Black	Total
Specified low grade astrocytic tumor	1820	1743	347	56.31	86.67	6.98	3910
Glioblastoma and anaplastic astrocytoma	605	14,858	12,496	57.11	91.41	4.67	27,959
Astrocytoma NOS	1315	5165	2385	55.13	89.29	6.62	8865
Other Glioma	1399	5544	1971	54.68	87.18	6.44	8914
Ependynoma	588	1204	184	55.06	84.36	8.55	1976
Medulloblastoma	999	398	6	62.29	82.89	8.62	1403
Supratentorial PNET	434	221	25	57.94	79.85	10.15	680
Other specified intracranial and intraspinal neoplasms	145	726	578	44.24	77.92	13.87	1449
Unspecified malignant intracranial intraspinal neoplasm	122	618	1447	45.68	87.42	7.82	2187
Total	7427	30,477	19,439	55.47	89.02	6.05	57,343

Brain and CNS primary brain tumors were according to adolescents and young adults (AYA) site recode. The sum of the subgroups does not equal the total since certain tumor types are not represented on the table.

glioblastoma and anaplastic astrocytoma with 23,656 cases diagnosed resulting in 2.93 (95% CI 2.89 - 2.96) cases per 100,000 person-years, followed by astrocytoma NOS with 8,430 cases resulting in 1.04 cases (95% CI 1.02 - 1.07) per 100,000 person-years. Less common histology types have been supratentorial PNET with 0.07 cases (95% CI 0.06 - 0.07), medulloblastoma 0.16 (95% CI 0.15 - 0.17), and other specified intracranial and intraspinal neoplasms 0.16 (95% CI 0.15 - 0.17), with 574, 1267, 1274 cases, respectively. Glioblastoma showed similar variation (rates between 2.5 and 3.6) in data from six cancer registries for the years 1985-1999 of the central brain tumor registries of the United States (CBTRUS), while in the same dataset the rate of astrocytoma NOS was reported between 0.4 and 1.7 [52] [53].

3.1. Incidence Rates by Race and Gender

In **Table 2** we compare rates in different races and display relative risks by sex for nine histological types of brain tumors. The most common histologically confirmed tumor types, glioblastoma and anaplastic astrocytoma, have been much more frequent in white populations than any other tumor type, while this relationship is roughly inverted for supratentorial PNET, finally for other specified intracranial and intraspinal neoplasms, medulloblastoma and unspecified malignant intracranial and intraspinal neoplasms the incidence rate appeared to be equal. Most of the histology types are more frequent in males as the rates ratios clearly show; however, for other specified intracranial and intraspinal neoplasms and unspecified malignant intracranial and intraspinal neoplasms incidence rates for females are higher, see [54] for similar results from the central brain tumor registry of the USA. In **Table 3** we summarize comparisons of rates by race and sex for all the histology types.

Table 2. Relative risk of brain and CNS tumors in relation to gender and race.

Site Group	Gender			Race		
	Male	Female	Ratio	White	Black	Other
Specified low grade astrocytic tumor	0.45	0.39	1.22	0.47	0.24	0.22
Glioblastoma and anaplastic astrocytoma	4.07	2.55	1.38	3.56	1.72	1.43
Astrocytoma NOS	1.15	0.85	1.28	1.09	0.65	0.41
Other Glioma	1.15	0.87	1.26	1.08	0.61	0.64
Ependynoma	0.24	0.19	1.35	0.23	0.16	0.14
Medulloblastoma	0.18	0.11	1.67	0.16	0.10	0.12
Supratentorial PNET	0.08	0.06	1.50	0.07	0.06	0.07
Other specified intracranial and intraspinal neoplasms	0.16	0.17	0.82	0.16	0.26	0.15
Unspecified malignant intracranial intraspinal neoplasm	0.29	0.25	0.88	0.27	0.26	0.16

Incidence rates and relative risk by gender, and incidence rates depicted by race for nine histologies.

Table 3. Comparisons of primary brain and CNS tumors incidence rates by race and sex, SEER data.

Site Group	Male			Female			
	White	Black	Other	White	Black	Other	Total
Specified low grade astrocytic tumor	**0.50***	0.28	0.22	**0.44***†	0.21	0.22	0.42
Glioblastoma and anaplastic astrocytoma	**4.47***†	**2.15**	**1.77**	**2.81***†	**1.39**	**1.15**	3.23
Astrocytoma NOS	**1.27***†	0.74$^{\times}$	0.46	**0.93***†	0.57$^{\times}$	0.37	0.99
Other Glioma	**1.24***†	**0.73**	**0.75**	**0.95***†	**0.52**	**0.55**	1.00
Ependynoma	**0.26***†	0.16	0.15	**0.20**†	0.16	0.13	0.22
Medulloblastoma	**0.20***	0.11	**0.15**	**0.12**	0.9	**0.08**	0.15
Supratentorial PNET	**0.09**	0.06	0.08	**0.06**	0.06	0.06	0.07
Other specified intracranial and intraspinal neoplasms	0.15	0.25$^{\times}$	0.12	0.16	0.26	0.18	0.17
Unspecified malignant intracranial intraspinal neoplasm	**0.28***†	0.25	0.18	**0.24***†	0.25	0.14	0.26

Reported crude rates are per 100,000 person year. $p < 0.05$ for statistically significant difference between sexes and races. The table is structured with the following interpretation for its contents. Incidence rates in bold indicate significantly different rates between male and female of the same race for the type of brain tumor. Rates are noted with * and † in whites for differences with blacks and others, while $^{\times}$ in blacks notes differences with others.

The reported differences in incidence rates between races and sexes especially for some histological types illustrate significant variation across the contributing registries. For all the reported histologies the incidence rate for white males are significantly higher than the rates for white females. For the following histologies: glioblastomas and anaplastic astrocytomas, specified low grade astrocytic tumors, astrocytomas NOS and other gliomas, the significantly different incidence rate pairs among the three races are the same in both male and female populations. The ratios of the rates were tested assuming Poisson counts for the two populations at risk. The alternative hypothesis is the true ratio is not equal to one, which we accepted when the p-value is smaller than 0.05 [51]. A uniformly most powerful unbiased (UMPU) test for equality of two Poisson rates derived in [55], [56] are recent developments of the test for unequal sampling frames.

Higher incidence rates in males compared with females in the white race are statistically significant for all types of tumors ($p < 0.05$). In contrast, gender specific rates for the black race do not significantly differ for specified low grade astrocytic tumor, ependynoma, supratentorial PNET, other specified and unspecified intracranial and intraspinal neoplasms. Gender differences were only apparent for the most common histologies, glioblastoma and other glioma, for the other race. Male predominance in glioblastoma and anaplastic astrocytoma, with a male to female ratio between 1.5 and 2.0 has been reported in [9] [13].

Incidence rates that differ ($p < 0.05$) by race for the same sex are also presented in **Table 3**. For the three most frequently reported histologies: glioblastoma and anaplastic astrocytoma, astrocytoma NOS and other glioma there are commonalities in the pairwise racial differences between males and females. Specifically, rates for both sexes in whites are higher than those of the remaining two races, whereas rates for the black race are different than that for other race only for astrocytoma NOS. Racial difference between blacks and others were not identified in any other case most likely because of the small number of cases that were diagnostically confirmed. Incidence of glioblastoma or anaplastic astrocytoma among Caucasians has been previously reported twice than that among African Americans [57] [58].

The white predominance in incidence rates is confirmed with significantly higher rates for unspecified malignant intracranial intraspinal neoplasms (rates for the black race are also significantly higher than rates for the other race), and specified low grade astrocytic tumors. For medulloblastoma, the most common pediatric tumor, significantly different racial pairs are between white and black males. With regard to observed patterns in racial differences of ependymomas, rates are higher among whites in both sexes than the other race. In the current study, the remaining racial differences are not common in both sexes.

Unspecified malignant intracranial and intraspinal neoplasms presented different rates for every racial pair we compared, white-black, white-other, black-other in both sexes. Other specified intracranial and intraspinal neoplasms while accounting only for 2.6% of the cases have observed rates different compared with other reported histologies. These differences may be due to variation in reporting, or even, frequently underreported tumors in patients. Race specific rates are significantly higher for black than white females. In addition, rates for black males are higher too, however the difference is not significant.

Although variation in the diagnoses may have larger influence than in clinical or institutional settings, the accurate identification of differing patterns in the rates may have implications about the disease in the general population. The large number of cases which are reported as astrocytoma NOS (17%) or unspecified (3.7%) in these data suggest that certain histologies are underreported. On the other hand, there are histologies like supratentorial PNET (1.1%) for which an obstacle to overcome is obtaining a sufficient number of cases (the data set included 574 cases for the 34 years) to perform an analysis with adequate power.

3.2. Variations of Incidence by Age at Diagnosis

In the following paragraphs we will compare incidence rates between three age groups and examine the resulting rates for both sexes and races for the histologies of interest. The age-group specific incidence rates are in most cases similar to the overall rates, but in a few cases we identified sharp changes in incidence. In [59] a review of glioma, ependymoma, and medulloblastoma, highlights the differences between adults and children, including the higher incidence of spinal cord ependymoma and supratentorial high-grade glioma in the adults and a higher incidence of medulloblastoma in the children.

Regardless of sex or race the incidence rates for young patients diagnosed with specified low grade astrocytic tumors peak around the age of five. Nevertheless, the rate at this age is higher in females than males for the three

races we have considered. Age-specific weighted average rates for both sexes were higher in six out of twenty one instances for the young age group for females than males, in contrast with the incidence rates relation reported in **Table 3**. For the two remaining age groups the incidence rate is fairly constant at about 0.3 per 100,000 person years with no significant differentiation in gender and race.

Glioblastomas and anaplastic astrocytomas are the most common types of brain tumors diagnosed in the USA. While the incidence rates for the young age group do not differ by sex or race, there is an impressive increase of the rates for the adult age group especially for white males (the incidence rate increases more than four times between the ages of 45 and 65, while the increase is two-fold for black males). For the elderly, the incidence continues to rise for both sexes until the age of 75 with a ratio of 2:1 for males over females, also for white over black and other race. Tumors of this type are frequently occurring in the other two racial groups for young ages, especially between the ages of five and ten.

Regardless of the gender of the patient, the next most common tumor type is astrocytoma NOS with median age at diagnosis 9.5, 42 and 75 for the three age groups. The comparison of incidence rates for different age groups remains as reported in **Table 3**. The incidence increases sharply with age and peaks at the age of 65 with an incidence ratio five times that of the age of 20, this effect is pronounced in all the races. Incidence rate for other glioma young patients is higher between the ages of 5 to 10. Interestingly enough the rate for this age is higher in blacks than any other race in contrast to the analysis presented in **Table 3**. The average age-specific incidence rates for males and females for the three races depicted those differences; the average rate for blacks is the highest in about half of the 21 computed rates. For the ages between 20 and 65 there is an increase of the incidence rate with a magnitude of 4 and 2 for males and females respectively.

Ependymomas are most common before the age of 5 during the lifetime, even though there seems to be a secondary peak for the incidence rate between the ages of 50 and 55, regardless of the sex and the race of the individual. When plotting incidence rates for white and black females, see **Figure 1**, we observed higher rates for black than white females of younger age where most of the tumors actually occur, this behavior was not observed in the male population. Medulloblastomas are diagnosed mainly in young patients, especially males around the age of 5, are less common in adults, becoming exceptionally rare for the elderly. The average age at diagnosis with medulloblastoma is higher for young males than young females ($p < 0.05$). We also noticed that ependymomas in males are likely to occur earlier than in females, while the converse is true for medulloblastoma. See [19] for a detailed analysis of pediatric brain tumors.

Young patients are the majority diagnosed with supratentorial PNET, though there is an insufficient number

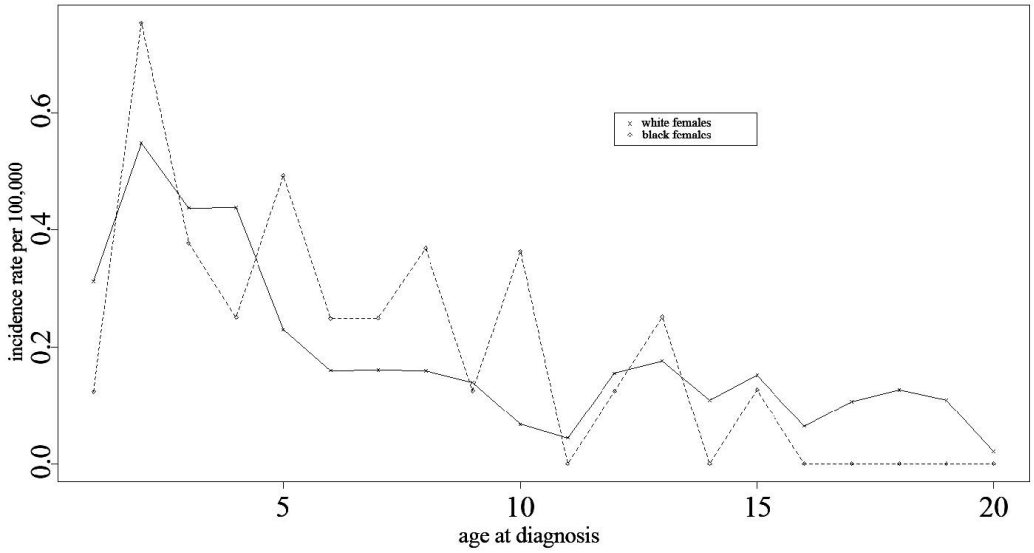

Figure 1. Incidence rates of primary ependymomas for the 0 - 19 age group. While estimated incidence rates are higher for white than black females, the converse is true for the young ages. The peak before the age of five is prominent for all the races and sexes. Rates are per 100,000 person years using the 2000 US standard population on single years of age, SEER data.

of cases to identify significant differences between racial and gender subgroups for this histology. Other specified intracranial and intraspinal neoplasms most commonly occur before the age of 5 in females especially, with a secondary peak at the age of 65. Black patients were more often diagnosed with other specified intracranial and intraspinal neoplasms. In **Figure 2** we plot averaged rates of two sexes for the three races. In more detail, incidence rates for young white females are higher than white males of the same age, while rates for middle aged male whites are higher than middle aged white females. In the case of black middle-aged population the female rate is higher than the rate for males.

Incidence of unspecified malignant intracranial intraspinal neoplasms increases with age especially for black patients, rates rise abruptly after the age of 65. For both the malignant intracranial and intraspinal neoplasms and the benign/border intracranial and intraspinal neoplasms we noticed a divergence between the rates for males and females in the young age groups; specifically, there is a higher number of young males than young females diagnosed with the aforementioned histologies.

4. Discussion

The study demonstrated an approach to understanding the patterns apparent in centralized data collections for statistical compilation on incidence of tumors. This report documented incidence of primary brain and CNS tumors, confirmed analyses in different subpopulations, even further noted separated trends in incidence for histology groups and age at diagnosis. The interpretation of incidence patterns is dependent on technological improvements, which alter the accuracy of the information over time, and the artificial spread of the tumor in the population because of changes in the classifications and coding. We have based our search on overall and histology specific incidence rates of primary brain tumors from the SEER data for the USA.

For the study period, overall incidence rates were higher for males than females, the observed histology-specific incidence rates are generally reported higher for whites than the other races. The observed patterns in the overall race and gender specific incidence were not always consistent with our analysis of incidence rates by age. Notably, we found that black females were predominant in other specified intracranial and intraspinal neoplasms, this change in the pattern of incidence is mostly evident after the age of forty-five. Overall, racial and gender

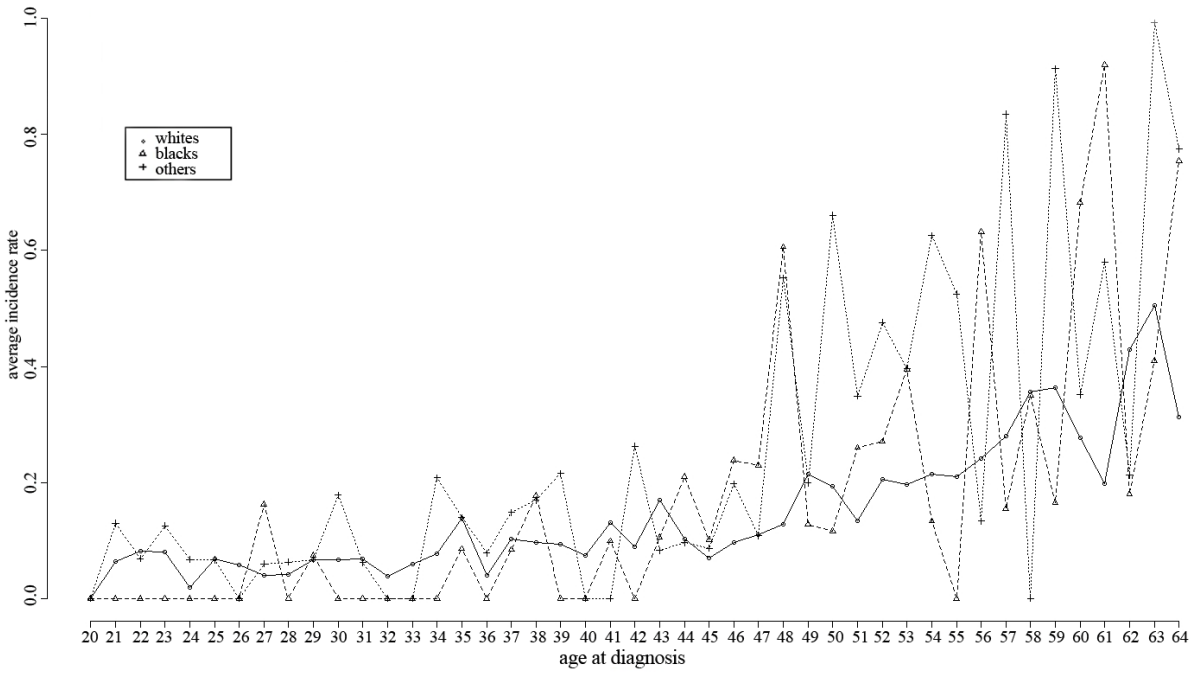

Figure 2. Averaged incidence rates of primary other specified intracranial/intraspinal neoplasms for the 20 - 64 age group. Estimated average rates for three races depict rates for young white females higher than white males of the same age, while rates for middle-aged male whites are higher than middle aged white females. In the case of black middle-aged population rate for females is higher than the rate for males.

factors, play a major role but do not appear to be consistently linked with observed differences in brain cancer incidence. Statistically significant difference in rates for all races and sexes were identified in astrocytomas NOS and for unspecified malignant intracranial intraspinal neoplasms in females.

Estimated age specific rates of primary specified low grade astrocytic tumors peaked at the age of five, especially prominent for the white and other races, on the other hand, the incidence picture that emerged by gender was one of female predominance at that age. We documented age specific rates of primary other gliomas where the peak at the age of five is especially prominent for the black race, in contrast to overall incidence rates. Age specific rates of primary ependymomas raise some concerns; incidence rates are significantly higher for white females than black females, the converse is true for the young ages. Analyses of age specific incidence rates by histology confirmed that the timing and impact of factors influencing incidence rates differ significantly among races and sexes. Differing patterns in statistically significant histology specific incidence rates were identified, although rates for whites compared to other races were higher for several histologies, the current report demonstrated at least one change where the proportion for blacks was bigger.

We observed a substantial amount of deviation in the incidence rates of brain tumors for young patients in contrast to the consistently observed sex and racial differences indicated by the overall rates. However, a major obstacle for formulating and evaluating explanations is the rarity of those tumors diagnosed in young patients. Further examination of the racial and gender differences for incidence in this age group using the broadest data available would enhance our understanding of the established demographic variables.

We explored in detail histology-specific incidence patterns for various subgroups of the population. To assess data on incidence that are currently available in the United States, compare the number of cases by tumor subtype and analyze such patterns in similar patient populations it is necessary to further separate artificial changes from true ones. Comprehensive comparisons of the information from different resources are of great importance for research associated with brain and CNS tumors to identify risk factors and their continuing influence.

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14

Evaluation of Tobacco Use and Her-2 Receptor Expression in Breast Cancer in an Ethnically Diverse Inner-City Population

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Abstract

Background: Tobacco is linked to most cancers however despite overwhelming biological plausibility and decades of epidemiological studies, no association has been established between tobacco and breast cancer. Although estrogen receptor status has been looked at as a variable there has been no evaluation of the role of Her-2 and smoking in breast cancer. Methods: Review of records from patients treated at the University of Miami/Jackson Memorial Hospital from 1998-2012. The incidence of smoking and Her-2 expression in1255 women was evaluated. Data was analyzed by age, race, ethnic group, menopausal status, tumor stage, and ER/PR/Her-2 receptor status. Results: 1255 charts were analyzed with 1094 having full information. Overall rate of Her-2 expression 18.1%. The rate of Her-2 expression was 21.4% in smokers and 17.0% in non-smokers (p = 0.10). The rate of Her-2 expression was 10.8% in Caucasian smokers and 9.8% in Caucasian non-smokers (p = 0.88); 24.5% in smokers of African descent and 17.3% in non-smokers of African descent (p = 0.24); 22.9% in Latino smokers and 17.4% in Latino non-smokers (p = 0.10). The rate of Her-2/ER expression was 9.4% in smokers and 7.9% in non-smokers (p = 0.42); 5.4% in Caucasian smokers and 4.9% in Caucasian non-smokers (p = 0.916); 12.2% in smokers of African descent and 5.9% in non-smokers of African descent (p = 0.11); 9.5% in Latin smokers and 8.8% in Latin non-smokers (p = 0.77). Conclusions: We found non-statistically significant positive associations in all analyses between Her-2 expression with or without ER expression and tobacco exposure when analyzed by ethnicity.

Keywords

HER-2, Breast Cancer, Tobacco

1. Introduction

Tobacco still remains the leading cause of preventable death in the US [1] and causes many illnesses, most notably, cancer. Tobacco has been linked to many cancer types and a causative relationship has been established for some malignancies, such as lung cancer [1]. Epidemiological studies are mixed results regarding the effect of tobacco in breast cancer risk [2] [3]. These studies included only estrogen (ER) and progesterone (PR) receptor analysis and the effect of Human Epidermal growth factor Receptor 2 (HER-2) may have a significant association with tobacco and breast cancer risk. We are the first study to examine HER2, ER, PR, tobacco use and breast cancer risk.

2. Methods

After Institutional review board approval granted, a retrospective chart analysis was performed involving 1255 patients**.** Medical records were combined electronic and paper charts from patients treated at the University of Miami Breast Clinic/Jackson Memorial Hospital, Miami, Florida. Two primary investigators performed chart review and data collection. Variables collected included age at diagnosis, stage at diagnosis, race, receptor status, smoking status and number of tobacco pack years. All patients enrolled in study had both paper and electronic charts and both were scanned in entirety for information from original date of consultation for breast cancer to most recent medical records in order to ensure highest accuracy of information extracted.

Inclusion criteria were adult female with breast cancer diagnosed from 1998-2009 who had available documented HER2 expression status, ER positivity and detailed smoking exposure history. To be considered a smoker, the patients had to be current or former cigarette smokers with exposure duration of one year or more. Patients with incomplete, inadequate or ambiguous smoking exposure were excluded, such as social history documented as "negative times 3". Likewise patients who did not have documented HER2 status or who had BRCA mutation were excluded from final analysis. Male patients with breast cancer were excluded as well.

Primary outcome was association between HER2 overexpression and tobacco exposure. Secondary outcome was the association of ER/PR positivity and breast cancer stage with tobacco exposure. Furthermore, primary and secondary outcomes were stratified by race and menopausal status given potential biological differences in these groups. Age 51 was chosen based on United States national average of menopause and not by chart documentation of menopausal status.

Statistical analysis was performed using SPSS version 13.0. Association between HER2 overexpression, ER and PR with tobacco exposure was evaluated by chi-square using a dichotomized approach to these variables which was then expressed as odd-ratios with 95% confidence intervals. When patients did have tobacco exposure, the intensity of exposure measured by the pack-years mean between dichotomized outcomes was evaluated by t-test. Subgroup analysis was performed by race, ethnicity and menopausal status. We also analyzed tobacco exposure by race and ethnicity.

3. Results

A total of 1255 patient's medical records were reviewed. Lack of records completeness resulted in exclusion of 161 patients. Final analysis was performed in a cohort of 1094 (**Table 1**). Mean age was 56 with range of 22 to 94 years old. Of the 1094 patients 725 (66.3%) where Latin, 78 (7.1%) where Caucasian, 286 (26.1%) were African American, and 5 (0.5%) were Asian. Of the 1095 patients 198 (18.1%) overexpressed HER2, 790 (72.2%) expressed ER, 90 (8.2%) expressed both ER and HER2, 498 (45.5%) expressed PR, and 171 (15.6%) were triple negative. Of the 1094 patients 828 (75.7%) were never exposed to tobacco and 266 (24.3%) patients were exposed to tobacco. Of the 266 exposed patients 105 (9.6%) were actively smoking at time of diagnosis and the remaining 161 (14.7%) of patients had reportedly quit at time of diagnosis. Duration of quit status was not documented. Smoking rates were significantly higher in Caucasian versus African American women (47.4% vs. 17.1%, $P < 0.01$) and in Latin versus African American women (24.7% vs. 17.1%, $P < 0.01$). Staging demographics of patients upon diagnosis were as follows: stage 1; 257 (23.5%), stage 2; 372 (34%), stage 3; 355 (32.4%), stage 4; 110 (10.1%).

HER2 receptor analysis: Odds Ratio of having HER2 over expression in patients who smoke vs. non-smokers is 1.33 ($p = 0.105$; 95% CI 0.94 - 1.87). Odds ratio of having HER2 over expression in Latin patient who smoke vs. non-smokers is 1.40 ($p = 0.102$; 95% CI 0.93 - 2.13). Odds Ratio of having HER2 over expres-

Table 1. Patient characteristics.

Characteristic	n	%
Mean age, years	56 (range 22 - 94)	
Race		
Latin	725	66.3
Caucasian	78	7.1
African America	286	26.1
Asian	5	0.5
Receptor status		
ER Positive	790	72.2
PR Positive (missing)	498(199)	45.5(18.2)
HER2 Over-expression	198	18.1
ER/HER2 Over-expression	90	8.2
Triple negative	171	15.6
Tobacco Exposure		
Exposed	266	24.3
Active	105	9.6
Quit	161	14.7
Stage		
Stage I	257	23.5
Stage II	372	34.0
Stage III	355	32.4
Stage IV	110	10.1

sion in Caucasian patients who smoke vs. non smoker is 1.12 (p = 0.878; 95% CI 0.26 - 4.84). Odds Ratio of having HER2 over expression in African American patients who smoke vs. non- smokers is 1.55 (p = 0.238; 95% CI 0.74 - 3.23). Odds ratio of having HER2 over expression in premenopausal women who smoke vs. non-smokers is 1.71 (p = 0.096; 95% CI 0.91 - 3.22); and 1.20 (p = 0.379 95% CI 0.80 - 1.82) in post menopausal women

Estrogen receptor analysis: Odds Ratio of having ER over expression in all patients who smoke vs. non-smokers is 0.95 (p = 0.74; 95% CI 0.70 - 1.29). Odds Ratio of having ER over expression in all Latin patients who smoke vs. non-smokers is 0.83 (p = 0.366; 95% CI 0.57 - 1.23). Odds Ratio of having ER over expression in all Caucasian patients who smoke vs. non- smokers is 0.74 (p = 0.611; 95% CI 0.24 - 2.3). Odds Ratio of having ER over expression in African American patients who smoke vs. non- smokers is 0.99 (p = 0.997; 95% CI 0.53 - 1.89). Odds Ratio of having ER over expression in premenopausal women who smoke vs. non-smokers is 1.12 (p = 0.700; 95% CI 0.62 - 2.00). Odds Ratio of having ER over expression in postmenopausal women who smoke vs. non- smokers is 0.89 (p = 0.519; 95% CI 0.62 - 1.28).

Estrogen and HER2 receptor analysis: Odds Ratio of having ER/HER2 over expression in all patients who smoke vs. non- smokers is 1.22 (p = 0.424; 95% CI 0.75 - 1.97). Odds Ratio of having ER/HER2 over expression in all Latin patients who smoke vs. non-smokers is 1.09 (p = 0.774; 95% CI 0.61 - 1.94). Odds Ratio of having ER/HER2 over expression in all Caucasian patients who smoke vs. non- smokers is 1.12 (p = 0.916; 95% CI 0.15 - 8.34). Odds Ratio of having ER/HER2 over expression in African American patients who smoke vs. non- smokers is 2.22 (p = 0.113; 95% CI 0.81 - 6.10). Odds Ratio of having ER/HER2 over expression in pre-

menopausal women who smoke vs. non- smokers is 1.56 (p = 0.329; 95% CI 0.64 - 3.79). Odds Ratio of having ER/HER2 over expression in postmenopausal women who smoke vs. non- smokers is 1.11 (p = 0.735; 95% CI 0.62 - 1.97).

Triple negative and progesterone receptor analysis: Analysis of associations between tobacco exposure and triple negative presentation and progesterone expression did not yield any trends or statistically significant correlations (data not shown)

Staging Analysis: A analysis of the association between tobacco exposure and stage 1 - 4 did not show any statistical significant correlations (**Table 2**).

4. Discussion

Tobacco still remains the leading cause of preventable death in the US [1] and causes many illnesses, most notably, cancer. Tobacco has been linked to many cancer types and a causative relationship has been established for some malignancies, such as lung cancer [1]. Carcinogens found in tobacco smoke pass through the alveolar membrane [4] and into the blood stream where they are transported to the breast via plasma lipoproteins [5] [6]. Due to the fact that these carcinogens are lipophilic they can be stored in breast adipose tissue and then metabolized and activated by human mammary epithelial cells [7] [8]. Animal experiments and in vitro studies have shown that compounds found in tobacco smoke, such as polycyclic hydrocarbons, aromatic amines, and N-nitrosamines, may induce mammary tumors [9]. The findings of smoking specific DNA adducts and p53 gene mutations in the breast tissue of smokers [2] further support the biological plausibility of a positive association between cigarette smoking and breast cancer, as does the detection of carcinogenic activity in breast fluid [2].

However epidemiological studies are present mixed results regarding the effect of tobacco in breast cancer risk. Most studies point towards slightly increased risk, but others null or even inverse association [2] [3]. The heterogeneous results may be in part due to the fact that breast cancer is a diverse group of diseases that are caused by different pathological mechanisms [2]. Two thirds of breast cancers are ER and or PR positive tumors which are caused by hormones [3]. Estrogen is a well known risk for breast cancer and this has lead researchers to study ER and PR status in tobacco users yielding mixed results [2] [3]. Furthermore, recent reviews suggest that breast cancer risk differs in pre menopausal vs. post menopausal women [3].

Roughly two thirds to three quarters of breast cancers are ER/PR dependent while the other third to one fifth of breast cancers are associated with over-expression of Human Epidermal growth factor Receptor 2 (HER-2). His receptor is notable for its role in the pathogenesis of breast cancer and as a target for treatment. It is a cell membrane surface-bound receptor tyrosine kinase and is normally involved in the signal transduction pathways leading to cell growth and differentiation.

Table 2. Staging and Tobacco exposure.

			Smoke Exposure		Total
			No	Yes	
Stage	I	Count	194	63	257
		% within Smoke Exposure	23.4%	23.7%	23.5%
	II	Count	285	87	372
		% within Smoke Exposure	34.4%	32.7%	34.0%
	III	Count	269	86	355
		% within Smoke Exposure	32.5%	32.3%	32.4%
	IV	Count	80	30	110
		% within Smoke Exposure	9.7%	11.3%	10.1%
Total		Count	828	266	1094
		% within Smoke Exposure	100.0%	100.0%	100.0%

Approximately 15% - 20% percent of breast cancers have an amplification of the HER2 gene or overexpression of its protein product. Overexpression of this receptor in breast cancer is associated with increased disease recurrence and worse prognosis. Because of its prognostic role as well as its ability to predict response to trastuzumab, breast tumors are routinely checked for overexpression of HER2. Overexpression also occurs in other cancer such as ovarian cancer, stomach cancer, and biologically aggressive forms of uterine cancer, such as uterine serous endometrial carcinoma. These cancers have a proven association with tobacco consumption. HER2 breast cancer has some estrogen dependent pathways, but not as much as HER2 negative breast cancers with ER and PR positive markers. Therefore it can be postulated that tobacco consumption may lead to HER2 overexpressing breast cancer more so than HER2 negative breast cancers. Currently there is no evidence on the relationship between risk of HER2 breast cancer and tobacco use. We found non-statistically significant positive associations in all analyses between Her-2 expression with or without ER expression and tobacco exposure when analyzed by ethnicity. This is suggestive that there is a potential positive association between tobacco use and HER2 positive breast cancer. A larger number of patients should be investigated in order to clarify this relationship.

Conflict of Interest Statement

All authors have nothing to disclose.

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15

Modern Contraceptive Use among Orthodox Christian and Muslim Women of Reproductive Age Group in Bahir Dar City, North West Ethiopia: Comparative Cross Sectional Study

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Abstract

Background: Mothers are dying as a result of abortion associated with preventable unintended pregnancy. The objective of this study was to compare the prevalence of Modern contraceptive use and associated factors among Muslim and orthodox Christian women of reproductive age group in Bahir Dar city. Methods: Comparative Cross-sectional study was carried out on 504 participants selected through Simple random sampling technique from the list of households. Data were collected through a pretested interviewer administered questionnaire. The data were analyzed using logistic regression model to determine odds ratio as a measure of strength off association. Result: The prevalence of modern contraceptive use was higher among Orthodox Christian women by 0.28: 95% for the difference (0.19, 0.36). While 63.9% orthodox Christian women were using modern contraceptives only 36.1% of Muslim women were using Modern contraceptive. Age, Religiosity and education level were found to have a statistical association for modern contraceptive use in Both Orthodox Christian and Muslim women (p value < 0.05). Conclusion: The prevalence of modern contraceptive use among Muslim women was found to significantly lower than that in Orthodox Christian. Recommendation: More efforts should be done to increase the number of Modern Contraceptive users, by focusing on awareness creation on Modern contraceptives with special emphasis on Muslims.

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Keywords

Modern Contraceptive Use, Christian, Muslim, North West Ethiopia

1. Introduction

Reducing the death of mothers in the process of giving birth by 2/3 was a global target for all nations worldwide [1]. However, the decline has been slow, stagnating or even reversing in many countries. Globally it is estimated that about 293,000 women died in 2013 as a result of pregnancy-related conditions [2]. Almost all maternal deaths (99%) occur in developing countries, more than half of which occur in sub-Saharan Africa [3].

Unsafe abortion as a result of unintended pregnancy is the third major direct cause of maternal death next to severe bleeding/hemorrhage and infections responsible for 8% of maternal deaths worldwide [3] [4].

It is a major public health problem particularly in developing countries. Of 182 million pregnancies occurring every year, an estimated 36% are unplanned, and 20% end in abortion [5].

The highest rate occurs in Sub-Saharan Africa, where about 86 unintended pregnancies occur for every 1000 women of reproductive age [6]. In Ethiopia, according to the 2011 EDHS, 25% of women with births in the five years before the survey and 32% of current pregnancies were reported as unintended [7].

Unintended pregnancy mainly results from the lack of, inconsistent, or incorrect use of effective contraceptive methods [8].

In Ethiopia even though an increase in the trend was observed for the past 10 years, the current contraceptive prevalence rate was very low (29%) as compared to the target set by 2015. This would have its own share for the death of 676 mothers (per 100,000 live births) and 88 children per 1000 live births [7].

2. Methods

2.1. Study Design

A Community based comparative cross sectional study was conducted among Orthodox Christian and Muslim women of reproductive age.

2.2. Study Area

This study was conducted in Bahir Dar City, 565 km northwest of Addis Ababa, the capital of Ethiopia. The city has nine urban kebele administrations with a total population of 277,566 (135,441 are male and 142,125 Female) [9].

2.3. Sample Size Determination and Sampling Method

The sample size of the study was determined using Epi Info software based on Kelsey formula. The two sided-significance level (90%), power (90%), Sample size ratio (1), (35%) outcome in Muslim (non exposure), (50%) outcome in Christian and non response rate (10%) was considered to come up with sample size of 252 for each group.

Proportional households were selected by Simple random sampling technique from the list in two randomly selected. From each sample household, a woman with in the reproductive age group was selected through lottery method. All Women in reproductive age group residing in Bahirdar town at least for the last six month were included in the study. However those who were critically sick, Pregnant and in postnatal period were excluded.

2.4. Data Collection

Instrument and Procedure

Current use of modern contraceptives was the dependent variable. It was measured interms of the use of one of the modern contraceptive methods during the data collection time.

A pretested interviewer administered questionnaire was employed to collect data. Four health extension workers were involved in data collection and one health professional was also recruited to closely supervise

them. To assure its quality, the questionnaire was first prepared in English and then translated in to Amharic, training was given for data collectors and Supervisor, Supervision was carried out on daily bases and every day at the end of data collection questionnaires were reviewed and checked for completeness.

2.5. Data Analysis

At the end of data collection; it was cleaned, coded and entered in to SPSS version 16 statistical programs for analysis. Frequency and Percentages were calculated and used to describe the finding. To assess whether there is a significant difference in modern contraceptive use, difference between two population proportions with 95% CI were done. In order to assess the importance of each independent variable, multiple logistic regression analysis models were employed. P-value of 0.05 was used as a cut of point for the level of significance and Odds ratio with 95% CI was used to measure the strength of the association.

2.6. Ethical Considerations

Ethical clearance was obtained from the Ethical Clearance Committee of GAMBY College of Medical Sciences and a letter of support was also obtained from the Regional Health Bureau to precede the study. Informed consent was obtained from participants before collecting the data to confirm their willingness to participate. Privacy and confidentiality was assured throughout the study.

3. Result

3.1. Socio-Demographic Characteristics of Participants

A total of 504 women of reproductive age group were interviewed giving a response rate of 100%. Regarding the age, 122 (48.4%) of orthodox Christian and 92 (36.5%) of Muslim women were between the age group of 25 to 34. Majority of the respondents 198 (78.6%) of orthodox Christian and 193 (76.6%) of Muslim women were married. With regard to the educational status of the respondents, 35 (13.8%) of orthodox Christian and 63 (25%) of Muslim women were not attended any formal education. The assessment of occupational status showed that 94 (37.3%) orthodox and 136 (54%) Muslim women were housewives (**Table 1**).

3.2. Reproductive and Other Characteristics of Participants

As portrayed in **Table 2**, 49.6% of orthodox and 39% of Muslim respondents have 1 - 2 children. When their intension for the need to have additional children were assessed majority (54%) Orthodox women need 3 - 4 children whereas majority of Muslims (50.4%) wants to have 5 and above children. Regarding their sex preference, more than half of the study participants, 235 (93.3%) orthodox Christian and 192 (76.2%) Muslim women responded that sex of children is not their big problem. The decision for the number of children in majority of the orthodox Christian (91.4%) and Muslim women (87.3%) were decided by discussion with their partner. Almost all of the participants in both groups knew at least one modern contraceptive method. A decision regarding contraceptive use in both orthodox Christian and Muslim women reported as it was determined by discussion with their husband. With respect to religious service attendance, 72.2% orthodox Christian and 75.4% Muslim women were religious. Moreover in the impact of religious philosophy of women on contraceptive 58.3% of orthodox Christian and 75.8% of Muslim women describe that their religion does not allow contraceptive.

3.3. Prevalence of Modern Contraceptive Use among Orthodox Christian and Muslim Women

In this study 232 (91.7%) orthodox Christian and 144 (57.1%) Muslim women have ever used one form of modern contraceptive methods in their life. The current modern contraceptive use was 63.9% in orthodox Christian women and 36.1% in Muslim women. The difference for modern contraceptive use in Orthodox Christian women with 95% CI was 0.28 (0.19, 0.36). Majority of Modern contraceptive users, 62.9% orthodox Christian and 65% of Muslim women were using injectables. Regarding their intention about 84.5% of orthodox Christian and 57.1% of Muslim respondents reported as they have the intention to use modern contraceptives. The need to have more children was the most frequently mentioned reason for 31.2% orthodox women and 36.6% Muslim women (**Table 3**).

Table 1. Socio-Demographic and Economic Characteristics of the respondents by religious Category, Bahir Dar, June, 2013.

Variables	Orthodox Christian		Muslim	
	Number	Percent	Number	Percent
Age				
15 - 24	83	32.9	87	34.5
25 - 34	122	48.4	92	36.5
35 - 49	47	18.7	73	29.0
Marital Status				
Single	54	24.4	59	23.4
Married	198	78.6	193	76.6
Educational Status				
Illiterate	35	13.9	63	25.0
Primary (grade1 - 8)	81	32.1	79	31.3
Secondary(>=grade 9)	136	54.0	110	43.7
Occupation				
Student	17	6.7	26	10.3
GO/NGO Employed	41	16.3	24	9.5
Merchant	48	19.0	43	17.1
Daily laborer	44	17.5	18	7.1
Unemployed	102	40.2	141	56.0
Income				
<500	27	10.7	33	13.1
501 - 1000	92	36.5	108	42.9
1001 - 1500	60	23.8	58	23.0
1501 - 2000	21	8.3	25	9.9
2001 - 2500	26	10.3	16	6.3
>=2501	26	10.3	12	4.8
Source of Family Income				
Husband	83	32.9	99	39.3
Wife	22	8.7	14	5.6
Both	126	50.0	107	42.5
Father and/mother	21	8.3	32	12.7

3.4. Factors Associated with Modern Contraceptive Use among Orthodox Christian and Muslim Women

Analysis of the independent variables in relation to the current use of contraceptive methods showed that religiosity, age and education were found to have significant association on contraceptive use (p value < 0.05). On the contrary, the multiple logistic regression result did not show significant relationship between the dependent variable and some independent variables such as occupation, marital status, income, sex preference of children, desire more children, discussion with husband on contraceptive and decision on contraceptive use.

There was decreasing trend for using contraceptives as age increases. Those orthodox Christian women whose age was found between15 - 24 found to have statistically significant difference towards the use of modern contraceptives as compared to those in the age group of 35 - 49 AOR: 11.39, 95% CI (3.03, 42.7) Similarly those Muslim women whose age was found between 15 - 24 found to have statistically significant difference towards

Table 2. Reproductive Characteristics of the respondents by religious category, Bahir Dar, North West Ethiopia, June 2013.

Variables	Orthodox Christian		Muslim	
	Number	Percent	Number	Percent
Total Living Children				
0	54	21.4	48	19.0
1 - 2	125	49.6	99	39.3
3 - 4	58	23.0	70	27.8
>=5	15	6.0	35	13.9
Number of Desired Children				
1 - 2	54	21.4	24	9.5
3 - 4	136	54.0	101	40.1
>=5	62	24.6	127	50.4
Sex Preference				
Have sex preference	15	6.0	43	17.1
Sex Does not matter	235	93.3	192	76.2
GOD/ALLAH knows	2	0.8	17	6.7
Family Size Decision				
Husband	8	3.6	16	7.5
Wife	11	5.0	10	4.7
Both	203	91.4	187	87.8
Decision to Use Contraceptive				
Husband	11	5.0	10	4.7
Wife	41	18.6	31	14.6
Both	169	76.5	172	80.8
Religiousity				
Religious	182	72.2	190	75.4
Less religious	70	27.8	62	24.6
Religious Permission				
Yes	2	0.8	2	0.8
No	147	58.3	191	75.8
Don't know	103	40.8	57	23.4

the use of modern contraceptives as compared to those in the age group of 35 - 49 AOR: 5.30, 95% CI (1.46, 19.19).

The finding has also shown that there is significant difference between religious and less religious women with regard to modern contraceptive use. Compared with religious women, less religious women were about 5.56 times more likely to use modern contraceptive (AOR: 5.56, 95% CI (1.4, 21.3)) in Orthodox Christian women and 5 times more likely to use modern contraceptives in Muslim women (AOR: 5, 95% (1.9, 14.8)).

The results of the study also showed that women's literacy status significantly associated with contraceptive use: women who have attended secondary education and above were illiterate women were 6.25 (AOR: 6.25, 95% CI (1.2, 33.3)) and 16.7 (AOR: 16.7, 95% CI (4.5, 50)) more likely to use modern contraceptives as compared to those who are illiterate in Orthodox Christian and Muslim women respectively (**Table 4**).

4. Discussion

Of 504 participants participated in the current study, majority 237 (47%) had a desire for having three to four children. This was similar with the report of EDHS 2011 [7]. However difference was observed in the proportion of women who wants to have three to four children. While, 136 (54.0%) Orthodox Christian women has the

Table 3. Respondents knowledge and practices of contraceptive Method by religious category, Bahir Dar City, North West Ethiopia, June, 2013.

Variables	Orthodox Christian		Muslim	
	Number	Percent	Number	Percent
Ever use FP methods				
Yes	232	91.7	144	57.1
No	20	8.3	108	42.9
Current use of Modern Contraceptives				
Yes	175	69.4	99	39.3
No	77	30.6	153	60.7
Type of Modern Contraceptive				
Inject able	110	62.9	65	65.7
Implants	29	16.6	8	8.1
IUD	7	4.0	2	2.0
Pills	21	12.0	24	24.2
Condom	8	4.6	0	0
Future Intention				
Intend to use	213	84.5	144	57.1
Not intend to use	39	15.5	108	42.9
Reason for Non Use				
Use of natural Method	7	9.1	35	22.9
Desire to have more children	29	37.7	62	40.5
Being single	16	20.8	2	1.3
Religious prohibition	12	15.6	43	28.1
Husband disapproval	1	1.3	8	5.2
Drug effect	12	15.6	3	2.0

Table 4. Factors affecting contraceptive use of women's by study category, North West Ethiopia, Bahir Dar City, June 2013.

Variables	Current Contraceptive Use					
	Orthodox Christian			Muslim Women		
	Yes	No	AOR (95% CI)	Yes	No	AOR (95% CI)
Age						
15 - 24	66	17	11.39 (3.03, 42.7)	44	43	5.30 (1.46, 19.19)
25 - 34	86	36	1.91 (0.73, 4.98)	41	51	3.24 (1.05, 10.00)
35 - 49	23	24	1**	14	59	1**
Religiousity						
Religious	111	71	1**	58	13	1**
Less religious	64	6	5.56 (1.4, 21.3)	41	2	5 (1.9, 14.8)
Educational Status						
Illiterate	17	18	1**	6	57	1**
Primary (Grade 1 - 8)	53	28	2.12 (3.7, 32.0)	34	45	12.2 (8.1, 14.5)
Secondary (grade 9)	105	31	6.25 (1.2, 33.3)	59	51	16.7 (4.5, 50)

desire to have a family size of 3 - 4 children, only 101 (40.1%) Muslims have the desire for having three to four children.

In the current study, 100% of orthodox Christian and 99.6% of Muslim women's knew at least one contraceptive method and its importance, which showed that Knowledge of respondents were nearly universal. The findings of 2011 DHS report also showed that Knowledge of at least one method of contraception were nearly universal among women in Ethiopia [7].

The overall prevalence of modern contraceptive use in current finding (54.3%) was in line with the finding in Arba Minch (51.1%) [10]. However it was higher than the finding in Hossana (47.6) [11]. This might be associated with educational status of participants. Participants in the current study and those in Arba Minch might be better educated than those in Hossana.

The prevalence of modern contraceptive use among Orthodox Christian (63.9%) and Muslim women (36.1%) had shown major variation. The prevalence in Orthodox Christian women was higher by 0.28, 95% CI: (0.19, 0.36). A significance difference was also observed towards their future intension on the use of modern contraceptives (Orthodox Christian (84%) and Muslim women (57%)). The possible reason might be difference in educational status of orthodox Christian and Muslim Women. As mentioned in **Table 1**, highest number orthodox Christian (54.0%) were completed secondary education compared with Muslim women (43.7%).

Though Modern contraceptives are effective compared with natural methods, significant proportion of Orthodox Christian (9.1%) and Muslim women (22.9%) were using Natural methods [12]. This might be associated with the educational status. Those women who were using Natural methods might be the less educated ones. Fear of side effect of modern contraceptives was also another reason mentioned for the non use of modern contraceptives. Twelve (15.6%) Orthodox Christian and Three (2%) Muslim women had mentioned drug side effect as a reason for nonuse.

Though long acting modern contraceptives are effective and have less side effects than short acting contraceptives, the proportion of women who were using IUCD and implants were very low [12]. Majority, 110 (62.9%) Orthodox Christian and 65 (65.7%) Muslim women were using injectables.

This was in line with EDHS 2011 report [7]. The low use of long acting contraceptives observed in this study was in contradiction with participant's future intension. The highest proportion of orthodox Christian (84.5%) and Muslim women 957.1%) had intension for future use of modern contraceptives. The reason might be the knowledge of participants on long acting modern contraceptives. Women of the study area might have limited knowledge on the advantage of long acting modern contraceptives.

One of the factors which was found to have associated with Modern contraceptive use was age of participants. Participants of both groups who were in the age group between 15 - 24 and 25 - 34 were using Modern contraceptives compared with those in the age group between 35 - 49. The possible reason might be difference in the desire for having child. Women in the age group between 15 - 49 and 25 - 34 might not have the desire to have children as compared with women in the age group between 35 - 49. The probability that women get answer for their economical constraints to carry a child increases as their age increases. Women in the age group between 35 - 49 might lead stable life compared with those in other groups.

Religiousity was also identified as one of the factors which determine Modern contraceptive use. Compared with religious women , less religious women were about 5.56 times more likely to use modern contraceptive (95% CI: 1.4, 21.3) in Orthodox Christian women and 5 times more likely to use modern contraceptives (95% CI: 1.9, 14.8) in Muslim women. On this regard, a study conducted on the influence of religiosity on contraceptive use among Roman Catholic Women in the United States in 2007, showed that, Low Church attending women were 38% more likely to use contraceptive than high church attendants [13].

The educational status of women has appeared to be significant predictors of contraceptive use. Compared to women with no education, women who attend secondary education had greater odds of utilizing family planning service in orthodox Christian (AOR = 6.25) and Muslim women (AOR = 16). This is true that as the level of education of women increases their level of understanding towards the complications of unintended pregnancy also increases.

5. Conclusions

The result of this study showed that Modern contraceptive prevalence rate among Muslim women was significantly lower than that in Orthodox Christian women. Modern Contraceptive use in both groups has shown significant association with age, education and religiosity of women.

To reduce the problem governmental and nongovernmental organizations who are working in the area of family planning need to focus on awareness creation on modern contraceptive use with special emphasis for Muslim Women.

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Conflict of Interests

Authors declared that they have no conflict of interests.

Author's Contribution

D. Walelign conceptualized the research problem, designed the study, conducted field work, collected and analyzed data. A. Mekonen was involved in supervision of the field work, revision of the research design, data analysis. M. Netsere contributed in the supervision of the research, revision of the research design and data analysis, and M. Tarekegn Contributed in revision of the the document and preparation of manuscript. All authors of the manuscript have read and agreed to its content.

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Injury-Related Profiles among School-Aged Children in Cameroon: Analysis Based on the "First Survey—Health Young People"

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Abstract

Aims: Establish profiles of young "at risk" of injuries, first, on an overall point of view and, secondly, for some types of injuries (sport, home, road traffic, school and work injuries). Methods: We have taken nearly 50 variables into consideration: 17 variables for construction of the socioeconomic status, 9 variables for the investigation of symptoms, 11 concerning drugs, 5 for healthy habits, 3 for investigating the violence behavior, 4 concerning the school, 3 for subjective health and finally 3 for social network. We have used the principal component analysis, the multiple correspondence analysis and the weighted-frequency score for reducing the number of them. After these reductions, 15 variables were available for analyses. The relationship between injuries and investigated factors was assessed using the Pearson's chi-square test. We also calculated odds ratio (OR) with their 95% confidence intervals (95%CI) to estimate the strengths of the associations. To further assess these relationships but also for taking into account the potentials confounding effects of some variables, logistic regression model and multinomial logistic regression model were applied. Results: The whole injury prevalence was equal to 45.6% and among the injured, the proportion of the several types was equal to 33.8% for sport injuries, 32.2% for home injuries, 16.6% for traffic injuries, 11.6% for school injuries and 5.7% for work injuries. We can say that, in light of the variables studied, the "at risk" profile for having reported an injury is being a boy, being younger, having drug experiences, with the violent profile, and declaring several symptoms. There are no consistent and marked deviations in this study from the findings obtained in previous studies. Conclusion: Analyzing injuries in general is interesting but for preventing them it is important to know in which activities children and students are engaged when they are injured.

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Keywords

Injuries, Health Behavior, Youth, Epidemiology, Cameroon

1. Introduction

If in industrial countries, death from all form of unintentional injury has decreased significantly. In Africa, there is a dramatic increase [1]. Injury-related mortality rates in sub-Saharan Africa are among the highest in the world and according to the WHO, Cameroon has an estimated annual mortality rate due to the injury of nearly 102 per 100,000 individuals [2]. Moreover, mortality is sometimes described—as Howe, Huttly and Abramsky [3] said, as "the "tip of the iceberg", because for every child who dies many more will suffer non-fatal injuries" and "a proportion of these will be left with varying degrees of disability". So, next to this high mortality fairly well documented, there is also a significant morbidity for which there is a lack of information [1] [3]-[6]. Furthermore, information regarding the epidemiology of injury in Africa is sparse and availability of data on children and young people are extremely limited [2] [3] [6] [7]. Moreover, the majority of these studies were usually based on hospital data; such data may provide information on the type and severity of injuries, but they contain little information on associated factors [1] [2] [4] [6] [8]-[11]. As said by Williams [12], medical records are designed for recording the type and severity of injuries and generally not to give detailed descriptions about the circumstances or other relevant information about the child. Data based on population surveys, which can provide more information on associated factors, are rare—especially for young people—but are very important because they can provide patterns of injury and demonstrate the existence of variations in health profiles from childhood, through early adolescence, to young adulthood. At the best of our knowledge, a small number of studies have investigated the problem based on population data. Peltzer [13] and colleagues have studied injury and social determinants among in-school adolescents in six African countries (Kenya, Namibia, Swaziland, Uganda, Zambia and Zimbabwe); Muula [7] and colleagues have studied socio-demographic correlates for serious injury among adolescents participating in the Djibouti Global School-based Health Survey; whereas Flisher [14] and colleagues have investigated injury-related behavior among South African high-school students. Finally, these data can help to identify the injuries that were not medically treated because it is known that even "small accidents" carry information towards a better prevention [15]-[17]. Based on the fact that Peltzer [13] and colleagues have found a large range in terms of variations of the injury's prevalence (from 38.6% in Swaziland to 71.5% in Zambia), we are in accordance with Muula [7] and colleagues which reported that each country needs to document the epidemiology of its injuries. Next to this, Pickett [18] and colleagues have shown, based on the analyses of the data from some countries participating to the Health Behavior in School-aged Children Study, that there was a link between injuries and (multiple) risk behavior.

In order to contribute to the literature on children and adolescents health behaviors, we carry out this study using existing data from the "First Survey—Health Young People" which was performed at the end of 2008 in Cameroon. Our aims were to establish profiles of young "at risk" of injuries, first, on an overall point of view and, secondly, for some types of injuries (e.g. sport injuries, home injuries, traffic injuries, school injuries and work injuries).

2. Methodology

This article is based on a secondary analysis of the cross-sectional study "First Survey—Health of Young People".

2.1. Study Design

The "First Survey Health of Young People" study was conducted within the framework of the "Implementation of a School Health Policy" at the request of the Ministry of Education in Cameroon, to collect health information in a representative sample of schoolchildren [19]. All young people included in this study were between 10 and 25 years old and attended primary or secondary education. Younger children were not included because experience has shown that it is hard for them to complete a questionnaire; accordingly, most international stu-

dies—like the "Health behavior in School-aged Children" study (HBSC) generally do not consider children less than 10 years in their protocols [20]. Primary school is compulsory in Cameroon. In 2004, school attendance was just below 90% for boys between 8 and 14 years old and around 80% in girls. At 18 years, it was 60% and 38%, respectively [21].

The sample size was based on a precision of 3% around a proportion of 50%, a confidence interval of 95% and a design effect equal to 1.2 (based on the 1994/1995 and 1997/1998 HBSC Studies). A large sample of 62,000 young people was expected taking also account of the 4 socio-climate zones, the 10 regions and the 2 cities of Yaoundé and Douala. The sample was expected to be representative for the country's regions, provinces, educational networks, types of education, French or English languages, levels of education and gender.

A self-administered questionnaire was used. It was largely inspired from the 2006 HBSC survey and was adapted to the Cameroonian context (with the help and the agreement of school doctors and experts from the Ministries of Health and Education). It was principally composed by closed and semi opened questions related to demographic characteristic, selected behaviors and other social and psychosocial variables. The filling of the questionnaire was done between October and November 2008, and data were encoded between December 2008 and February 2009. The final dataset received for the present analyses contained questionnaires from 47330 students, corresponding to a response rate equal to 76%.

2.2. Main Outcomes

Approach of the injury question was made by taking into consideration two main outcomes.

Firstly, for having an idea of the problem as a whole, we have considered the question "During the past 12 months, have you been injured (e.g. an open wound, a large bruise)?". From the four initial levels ("I was not injured", "1 time", "2 times", "3 times or more"), we have made a dichotomous answer (0) Not injured vs. (1) Injured at least one time. We have an answer to this question for 44,754 students on the 47,330 records in the dataset (94.6%).

Secondly, for having an idea of the problem by types of injury, we have considered two questions related to the place and the activity during the most serious injury. The question for the place was "think only about the most serious injury or accident that you had within the past 12 months. Where were you when this most serious injury happened? (Carefully tick the best answer to describe your most serious injury)" with the modalities of answers: 1/at home, in the courtyard; 2/in the garden, in the fields; 3/at school, including school ground and workshop, during school hours; 4/at school, including school ground, outside school hours; 5/at a sport field (not at school); 6/in street, in a parking lot; 7/in the countryside; 8/on the way to or from school; 9/elsewhere. The question investigating the activity was "What were you doing when this most serious injury or accident happened? (Carefully tick the best answer to describe your most serious injury)" with the modalities of answers: 1/riding a bicycle; 2/playing or training for sport, recreational activities; 3/school work (manual work); 4/was working, paid or unpaid work; 5/walking, running (not for sport team or exercises); 6/riding, driving or was a passenger on a scooter, a moped, a motor bike; 7/riding, driving or was a passenger on a car or other motor vehicle; 8/ other activity.

We have observed 20967 answers for the injury place and 19964 answers for the activity; with 19694 cases with both place and activity, 1273 with only the place (but not activity) and 270 with only the activity (and not the place). Based on these information, we have created a decision algorithm for compute five categories of types of injury. We have excluded 794 cases for lack of information (451 "elsewhere" and "other activity", 178 "elsewhere" and missing value for the activity; 113 "elsewhere" and "walking, running not for a sport team or exercises", 32 "walking, running not for a sport team or exercises" with missing value for the place, and 20 "other activity" with missing values for the place). The five types were, based on their occurrences: Sport injuries (33.8%), Home injuries (32.2%), Traffic injuries (16.6%), School injuries (11.6%) and Work injuries (5.7%).

2.3. Associated Factors

We have taken under consideration nearly 50 variables: 17 variables for construction of the socioeconomic status, 9 variables for the investigation of symptoms, 11 concerning drugs, 5 for healthy habits, 3 for investigate the violence behavior, 4 concerning the school, 3 for subjective health and finally 3 for social network. Even if, the sample size was very large, we have used principal component analysis, multiple correspondence analysis and

weighted-frequency score for reduce the number of them. After these reductions, 15 variables were available for analyses.

2.3.1. Age and Gender

The age of the children/adolescent has been estimated by the subtraction of the birth year from the survey year. The minimum and maximum observed were 10 years and 25 years old. The proportions of each age groups were: 32.8% under or equal to 13 years, 23.4% of 14 - 15 years, 19.4% of 16 - 17 years and 24.4% of 18 Years or more. The sex ratio was nearly equal to one, with 51.8% of boys and 48.2% of girls.

2.3.2. Family Structure and Siblings

The family structure was approached by a constructed variable in four levels: "Only with his/her mother and father" (27.2%), "With his/her two parents and at least someone else" (19.9%), "With one of his/her two parents with or without someone else" (32.3%) and "Without parents but with at least someone else" (20.6%). This was based on the reporting to the question "Please answer for the home where you spend most of the time. Who are the adults living there with you?"; with answer consisted of the ticked adults in a list. The list was mother/fostering mother/father/tutor/aunt/uncle/grand-mother, female cousin/grand-father, male cousin. For the construction of the sibling variable, we have added up the number of brothers and sisters reported by the respondents based on the question: "How many children live with you in your home. Count also your half-brothers and half-sisters, your cousins or the children of your father in-law or mother in-law". Median (P25-P75) of this distribution was equal to 5 (3 - 7) brothers and/or sisters. We have categorized this variable in three levels with the absence of sibling grouped with the lower number of brothers and/or sisters because of its weak occurrence (5.1%). So, the three levels were: "From zero to three sisters and/or brothers" (33.0%), "Between four and 6 brothers and/or sisters" (36.6%) and "Seven or more brothers and/or sisters" (30.4%).

2.3.3. Socioeconomic Status

The socioeconomic status was approximated by an index using the information collected on assets owned by the young's family. The assets investigated were (through the dichotomous answer having or not): Tap water in the house/Tap water in the courtyard/Toilet with flushing water in running condition/Latrines/Elevated or hard ground in the house, dry when it rains/A shower or a bath with a tap/A fridge/A television/A radio/A computer /A car/A bicycle/A motor bike/One or more cows/One or more chicken/one or more goats/A garden with growing vegetables.

We have used a principal component analysis (PCA) for extracting from these set of variables the main uncorrelated components that captures the largest amount of information that is common to all of the variables [22] [23]. In our case, we have retained the first four components, according to the Kaiser's criteria (eigenvalues > 1) and according to the examination of the scree plot [24] [25] (**Figure 1**). These four components explained nearly half of the total variance (49.1%) with 22.1% and 12.5% respectively for the two first components and only 7.7% and 6.8% for the last two components.

The first component seems to correspond to an "occidental urban" asset index characterized by tap water in the house (0.318), toilet with flushing water in running condition (0.291), shower or a bath with a tap (0.329), fridge (0.331), computer (0.329) and car (0.350). The second component seems to correspond to "rural livestock farmer" asset index characterized by bicycle (0.273), motor bike (r0.321), one or more cows (0.377), one or more chicken (0.434) and one or more goats (0.490). Third component seems correspond to "basic" asset index with latrines (0.426), elevated or hard ground in the house, dry when it rains (0.234) television (0.396) and radio (0.520). Finally, the fourth component is the most difficult to interpret, characterized only with tap water in the courtyard (0.381) and garden with growing vegetables (0.298). We have decided to call this component, the "grower/farmer" asset index.

Afterwards, we have categorized these components in four level for facilitate the analyses.; the first level corresponding to the lowest values of the specific asset index and the last level corresponding to the highest values (**Figure 2**).

2.3.4. Healthy Habits

A first step was to generate three variables (smoking, alcohol consumption and physical activity) derived from five questions. For the investigation of the smoking status we have compute a new variable from two questions

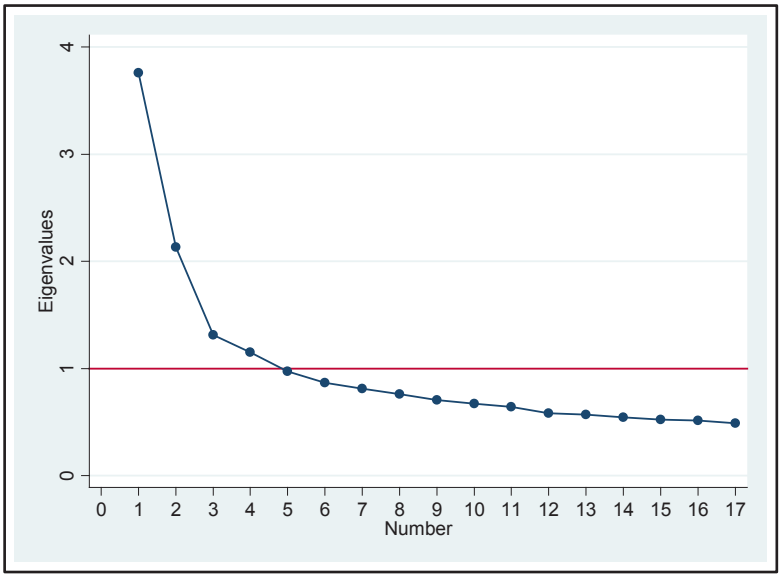

Figure 1. Scree plot of eignevalues after PCA for the construction of the socieconomic status.

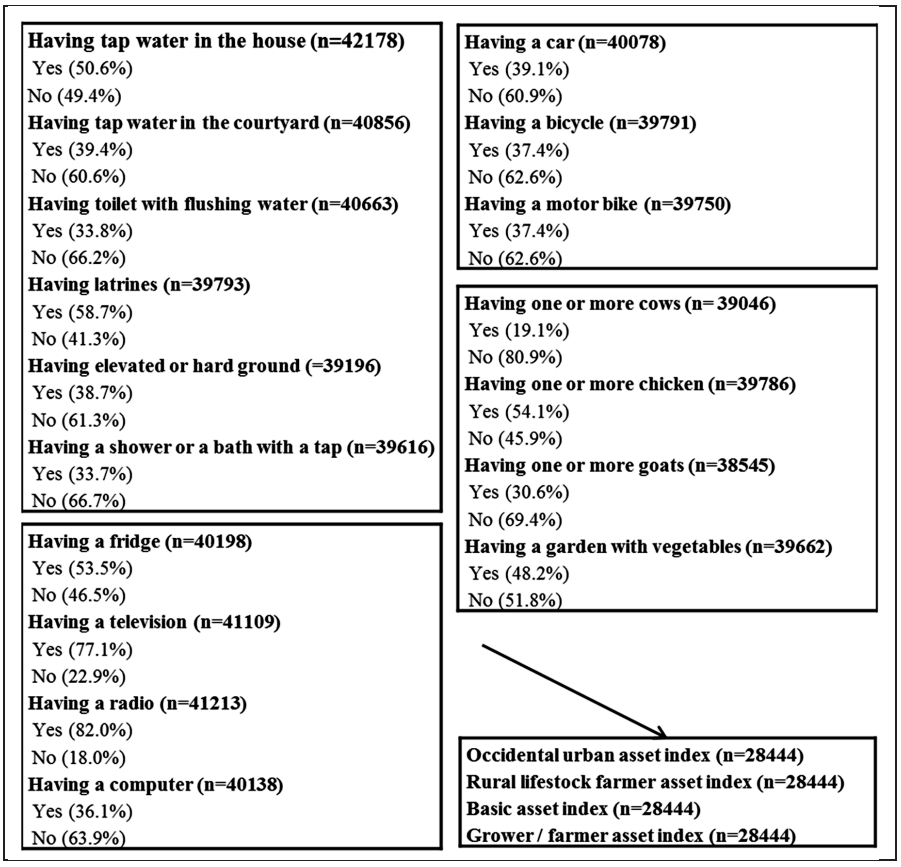

Figure 2. From the original variables used for the construction of the socioeconomic status to the final variable used.

"Have you ever smoke tobacco?" (Yes /No) and "How often do you smoke tobacco at present?" (I don't smoke/ I smoke every days/at least once a week, but not every day/Less than once a week). Due to weak occurrence of

active smoking, our variable had only two levels: (0) Never smoke and (1) Have tried or current smoker. For the alcohol consumption, we also used two questions to make one variable: "Have you ever drank alcoholic drinks (at least one glass of beer, of palm wine whisky, etc.)?" (Yes/No) and "Have you already had so much alcohol that you were really drunk?" (No, never/yes, once/yes, 2 or 3 times/yes, 4 to 10 times/yes, more than 10 times). Our variable was in three levels with (0) Never drink, (1) Drink but never being drunk and (2) Having been drunk at least one time. To objectivize the physical activity behavior we have used the question "Outside school hours, how often do you usually exercise in your free time so much that you get out of breath or sweat?" re-categorized in four levels (1) Never or less than once a month, (2) Between once a month and two times a week, (3) Between three and six times a week, (4) Every day.

A second step has consisted of a multiple correspondence analysis (MCA). It has identified two dimensions which explained 77.7% (75.3% for dimension 1 and 2.4% for the dimension 2) of the inertia among the three variables (**Figure 3**). Based on the patterns observed on the coordinate plot, we have computed the three levels of the indicator. These three levels, which present a gradient, were arbitrarily named: "Healthy habits", "Intermediate healthy habits" and "Unhealthy habits" (**Figure 4**).

2.3.5. Drugs Consumption

The drugs consumption was constructed according to the question "During the past month, did you take any of

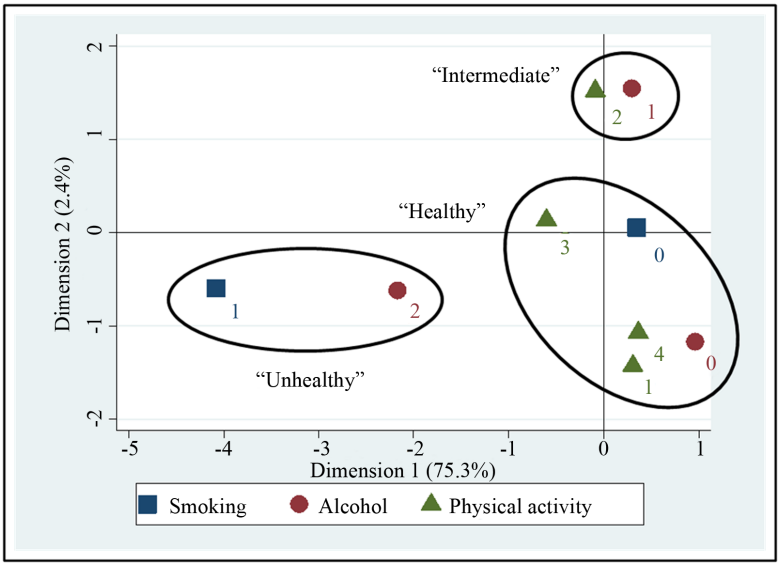

Figure 3. MCA coordinate plot for the creation of the "healthy habits" indicator.

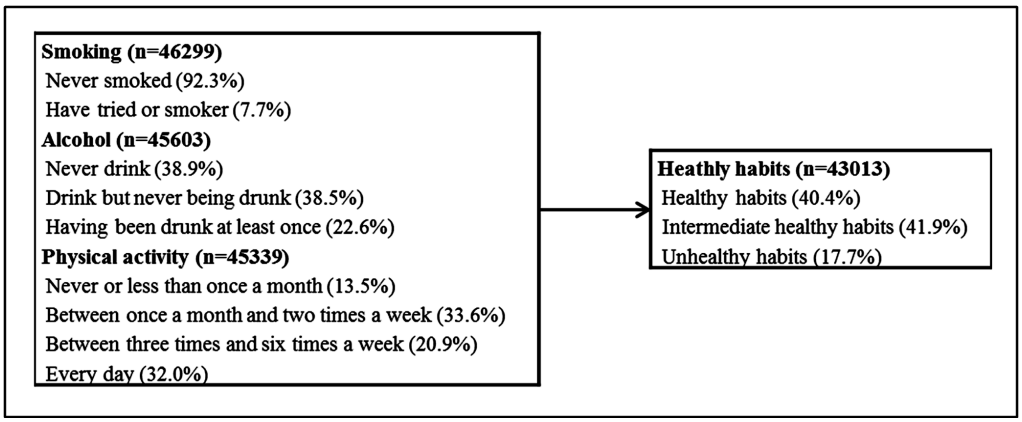

Figure 4. From the original variables used for the construction of the "healthy habits" indicator to the indicator used.

the following?". We have taken into account eleven substances or groups of substances: cannabis/amphetamine, speed/heroin, illegal methadone/medicines to be hallucinated/cocaine/LSD, acid/Glue, solvent, gasoline, fuel/ hallucinogenic mushrooms/hallucinogenic plants/tranquilizers, barbiturates/ecstasy, "oui-oui" pills. In the survey there were six levels for each variable (from "No" to "Yes, every day") but due to the weakness of some frequencies we have made dichotomous variables corresponding in one hand to (0) "No, don't take" vs. (1) "Yes, at least one time". Based on these dichotomous items we have made a score based on the simple addition of each item without weighting by the relative frequency because of the roughly equal low frequencies for each substance uses. So we have obtained a score range from zero to eleven. But due to low occurrences of the numbers of taken (only 8.5% have declared having taken two or more substances at least one time during the past month); we have re-categorized this score in three levels: "No drug taken", "One drug taken" and "Two or more drugs taken" (**Figure 5**).

2.3.6. School Perception

The "School perception" indicator was constructed, with the help of a MCA, by putting together the four variables from the questions: 1/"How do you feel about school at present?" with the two levels (1) Like it a lot, (2) Like it a bit or don't like it very much or at all. 2/"Since the beginning of the school year, do you usually absent school or school lessons not because you are ill but because you want to do something else like working or playing?" with the two levels (1) Never (2) Yes, at least from time to times. 3/"During the last 30 days, were the pupils in your class kind and helpful to you?" with the three levels (1) Never or rarely, (2) Sometimes, (3) Often or always. 4/"During the last 30 days, did your parents or tutors talked with you about homework and school?" with the three levels (1) Never, (2) Rarely or sometimes, (3) Often or always.

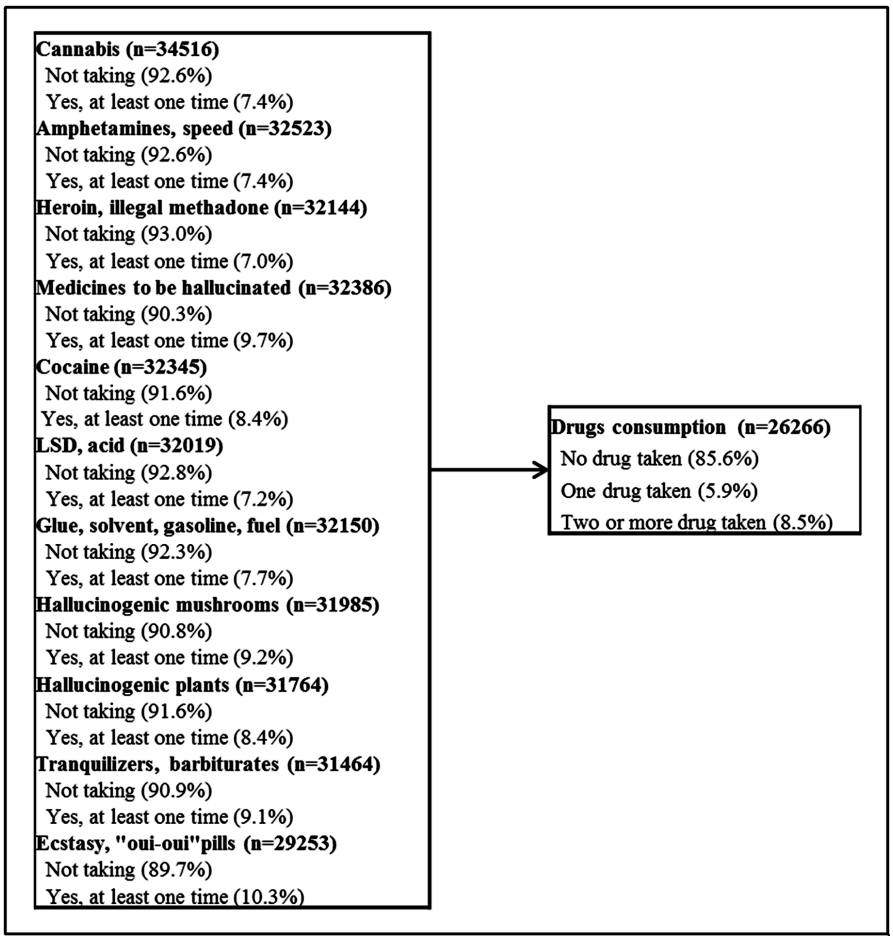

Figure 5. From the original variables used for the construction of the drug consumption score to the score used.

The MCA has identified two dimensions which explained 77.6% (64.7% for dimension 1 and 12.9% for the dimension 2) of the inertia among the four variables (**Figure 6**). Based on the patterns observed on the coordinate plot, we have computed the three levels of the indicator. These three levels, which present a gradient, were arbitrarily named: "Comfortable feeling with school", "Intermediate feeling", "Uncomfortable feeling with school" (**Figure 7**).

2.3.7. Social Network

The "Social network" indicator was constructed by putting together the three variables from the questions: 1/ "Last month do you feel alone in your head, did you feel abandoned, sad, without help?" with the three levels (1) Very often or quite often, (2) Sometimes, (3) Never. 2/"At present, how many close friends do you have?" with an answer in three levels (1) None, (2) One or two, (3) Three or more. 3/"During the last 30 days, did your parents or tutors talked with you about your leisure time and your activities outside school, about your problems, what you like or about what boring you?" with three levels (1) Never, (2) Rarely or sometimes, (3) Often or always.

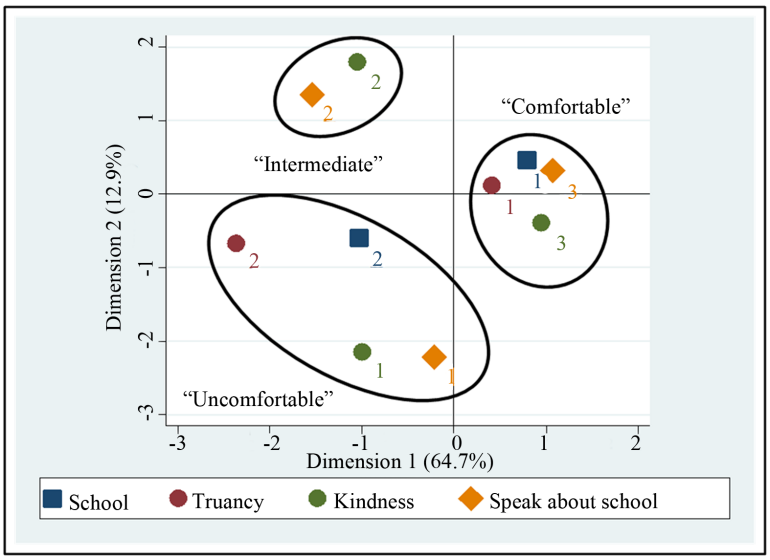

Figure 6. MCA coordinate plot for the creation of the "school perception" indicator.

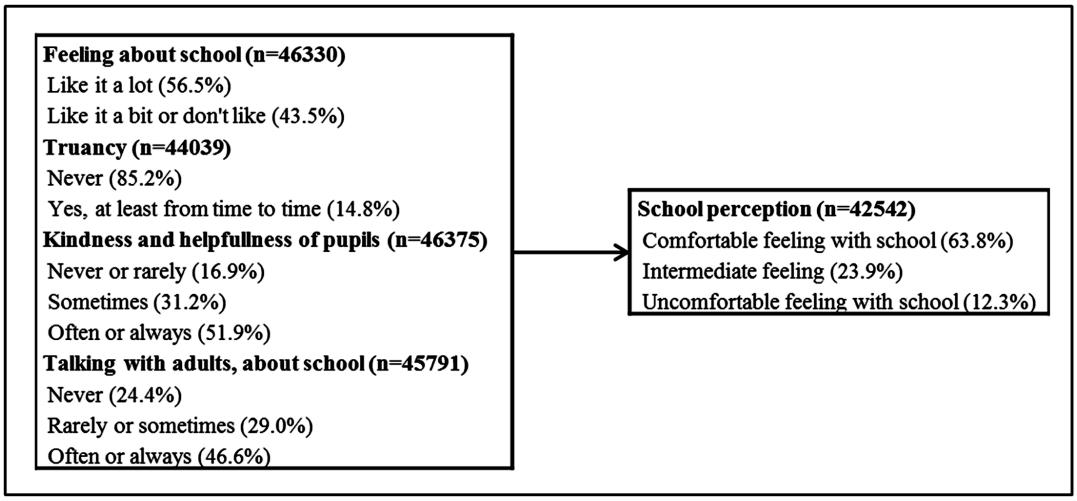

Figure 7. From the original variables used for the construction of the "school perception" indicator to the indicator used.

The MCA has identified two dimensions which explained 89.7% (63.9% for dimension 1 and 25.8% for the dimension 2) of the inertia among the three variables (**Figure 8**). Based on the patterns observed on the coordinate plot, we have computed the three levels of the indicator. These three levels, which present a gradient, were arbitrarily named: "Excellent network", "Intermediate network", "Poor network" (**Figure 9**).

2.3.8. Violence

The "Violence" indicator was constructed by putting together the three variables from the questions: 1/"Within the last 12 months, how many times did you fight?" with the 3 levels (1) Never, (2) One time and (3) Two times or more; 2/"During the last 30 days, how many times have you taken a weapon at school (like a knife, a pistol)?" with the three levels (1) Don't have, (2) Don't bring, (3) Bring at least one time and more; and finally 3/"Since the beginning of school year, have you been bullied, swindled, racketed (someone has forced you to give him/her something, some money, some clothes, while you did not want it)?" also with three levels (1) No, (2) Yes—once, (3) Yes—sometimes or more.

The MCA has identified two dimensions which explained 97.7% (96.6% for dimension 1 and 1.0% for the dimension 2) of the inertia among the three variables (**Figure 10**). Based on the patterns observed on the coor-

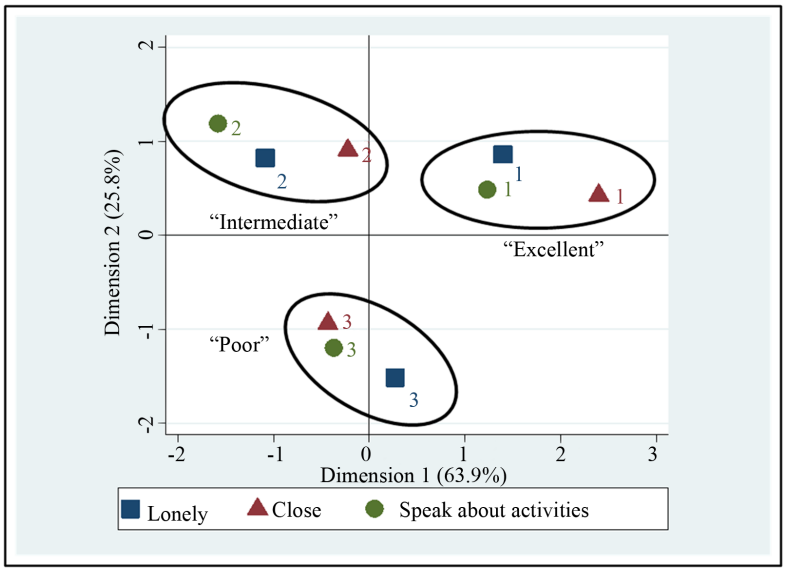

Figure 8. MCA coordinate plot for the creation of the "social network" indicator.

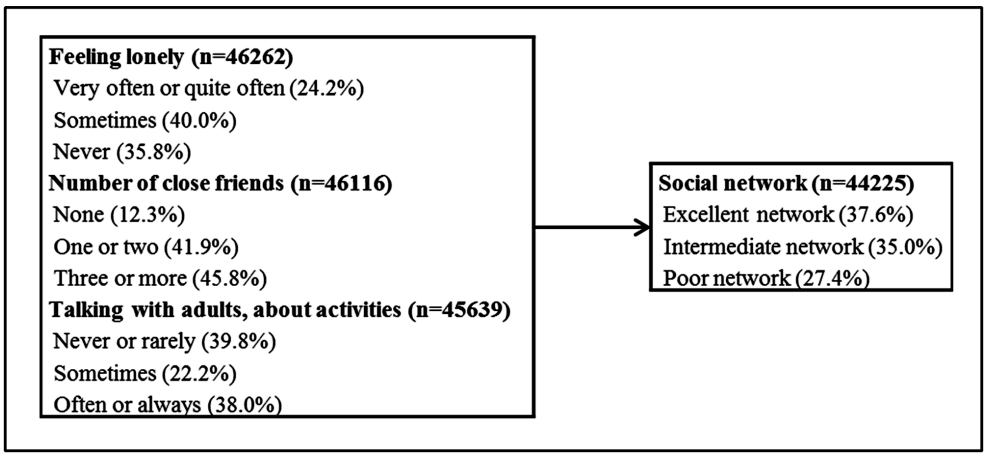

Figure 9. From the original variables used for the construction of the "social network" indicator to the indicator used.

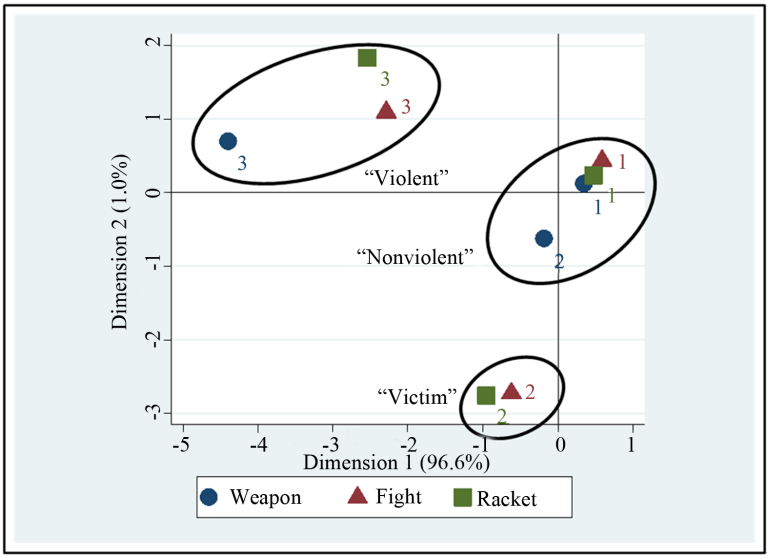

Figure 10. MCA coordinate plot for the creation of the "violence" indicator.

dinate plot, we have computed the three levels of the indicator. These three levels were arbitrarily named "Unviolent profile", "Victim profile", "Violent profile"(**Figure 11**).

2.3.9. Subjective Health

The "Subjective health" indicator was constructed by putting together the three variables from the questions: 1/ "How are you feeling at the moment?" with the three levels (1) Very happy, (2) Happy, (3) Don't feel happy or not at all happy. 2/"Would you say that your health is…" with four levels (1) Excellent/Rather good/Neither good or bad/Not so good or poor, bad) and 3/"Do you usually feel tired when you wake up in the morning to go to school?" re-categorized in three levels (Never or rarely/Sometimes/One or more times a week).

The MCA has identified two dimensions which explained 91.5% (96.6% for dimension 1 and 1.0% for the dimension 2) of the inertia among the three variables (**Figure 12**). Based on the patterns observed on the coordinate plot, we have computed the three levels of the indicator. These three levels, which present a gradient, were arbitrarily named "Good subjective health", "Intermediate subjective health", "Poor subjective health" (**Figure 13**).

2.3.10. Symptoms

About the reported symptoms during the past month, we have taken into account these nine following variables: headache/stomachache/bellyache/ backache/want anything, feeling sad, unwell/to be not quiet, stressed up/want sleep but could not/dizziness, fainting/not glad at all, to be angry in there dichotomous version ("No" vs. "Yes, one day or more than one day"). The simple addition of these scores shows a range from 0 to 9 symptoms declared. Median (P25-P75) of this distribution was equal to 5 (3 - 6) symptoms. For given more weight to the low-frequency items, we have made a weighted-frequency score. In the summation equation, we have multiplied each symptom by the inverse of its relative frequency. We have after categorized this summation score on four levels that we have called: "Not many symptoms", "Medium number of symptoms", "A lot of symptoms" and "Extreme numbers of symptoms" (**Figure 14**).

3. Statistical Analyses

Both for the dichotomous and the polytomous outcomes, proportions of injuries were reported in each level of each potential associated factor. The relationship was assessed using the Pearson's chi-square test. For the dichotomous outcome, when the proportions of these injuries increased (or decreased) in ordered categories of the potential associated factors, we applied the Cochran-Armitage test for trend. Results were considered statistically significant when $p < 0.05$. We also calculated odds ratio (OR) with their 95% confidence intervals (95%CI) to estimates the strengths of the associations. To further assess these relationships but also for taking into account

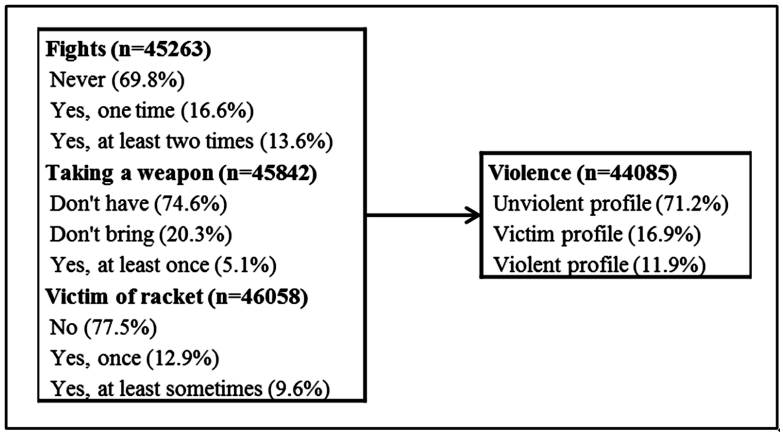

Figure 11. From the original variables used for the construction of the "violence" indicator to the indicator used.

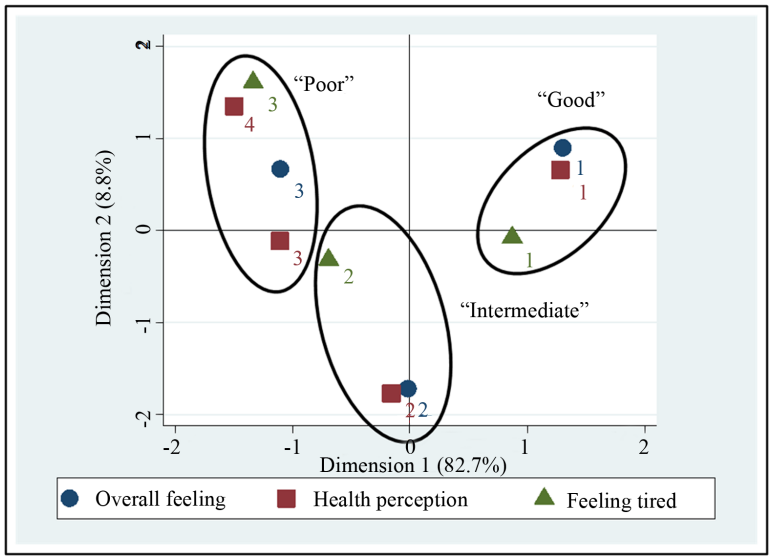

Figure 12. MCA coordinate plot for the creation of the "subjective health" indicator.

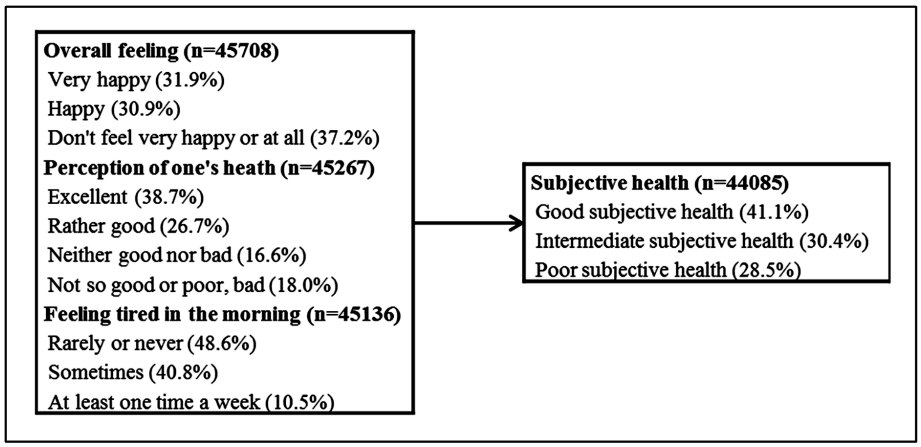

Figure 13. From the original variables used for the construction of the "subjective health" indicator to the indicator used.

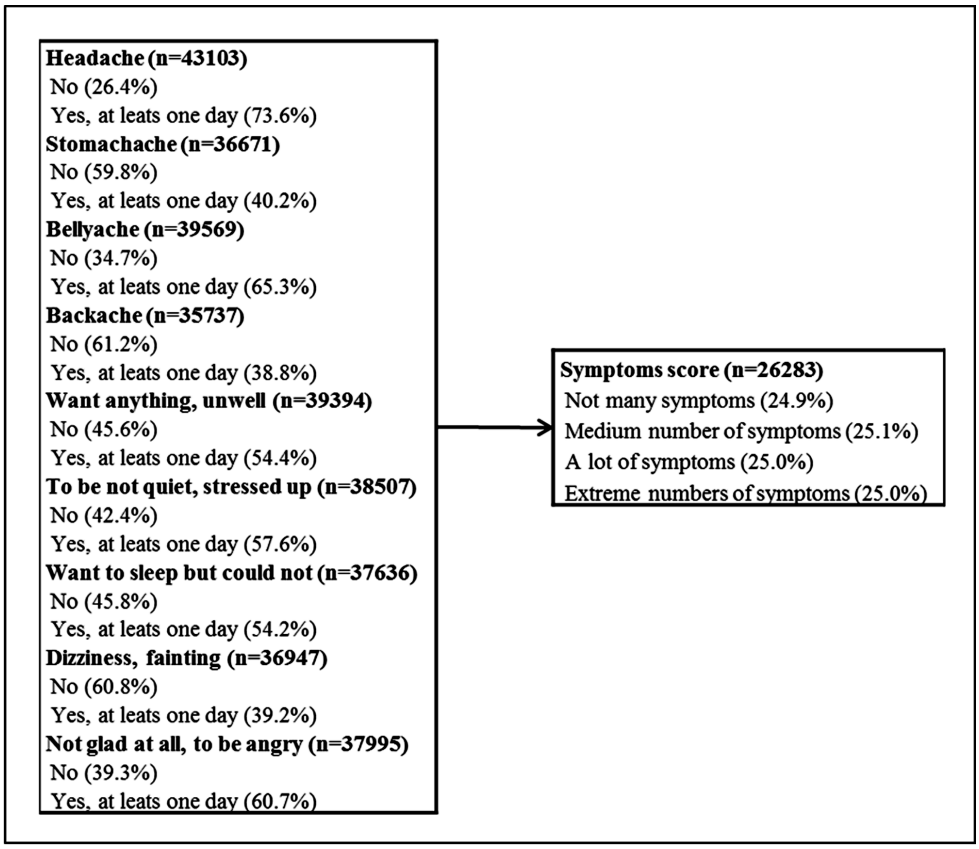

Figure 14. From the original variables used for the construction of the symptoms score to the score used.

the potentials confounding effects of some variables, a logistic regression model—for the dichotomous outcome—and a multinomial logistic regression model—for the polytomous outcome—were applied. The selection of the included variables resulted from a backward stepwise selection with a probability to remove equal to 0.05 and a probability to enter equal to 0.01. Because it is known that patterns of injuries and associated factors could differ by gender and age group, we have tested the interaction between the variables kept in the models and these two variables. The likelihood ratio tests were not statistically significant. Adjusted odds ratios, derived from the final models, were presented with their 95% confidence intervals and the p-value of the Wald's test. To assess the fit of the models, we used, for the logistic regression model, the Hosmer and Lemeshow goodness-of-fit [26] and for the multinomial regression model, the generalized Hosmer and Lemeshow goodness-of-fit [27].

4. Missing Values

We had a lot of missing values, however we have chosen to use the complete-case method [28] [29]. The comparisons between complete and incomplete cases have not shown major differences in terms of variations of proportions in the several levels of the investigated factors. So we can suppose that we are under a missing (completely) at random assumption; in that situation the complete cases used were a random sample of the original cases [28] [29]. In multivariate analyses, the nonoverlapping cases lead to the reduction of the sample size and also lead to a diminution of the power. But, because we have a large sample at the beginning (n = 47,330), the number of cases included in the multivariate models stay comfortable: n = 14,632 for the logistic regression and n = 11,968 for the multinomial regression model.

5. Results

The whole injury prevalence was equal to 45.6% (n = 44,754) and among the injured, the proportion of the sev-

eral types were equal to 33.8% for sport injuries, 32.2% for home injuries, 16.6% for traffic injuries, 11.6% for school injuries and 5.7% for work injuries (n = 20,421).

5.1. Dichotomous Outcome

Univariate analyses show that boys are more likely to report an injury and that the proportions of injuries are the lowest when the family structure is composed only by the mother and the father. We also observe a decreasing linear trend when the age increases and an increase when the number of persons in the siblings increases (**Table 1**). Regarding the socioeconomic status, in one hand, the reported injuries increase linearly with the increasing of the "occidental urban" and the "rural livestock farmer" indexes; and on the other hand, the proportion of injuries decrease linearly with the increasing of the "basic" asset index (**Table 2**).

Table 3 shows that there were more injuries reported for the unhealthy habits group, for the group uncomfortable feeling with school, for the poor subjective health group and for the victim and violent profiles. There were also linearly increases when the drugs consumption and the symptoms scores increase.

The multivariable logistic model only retains, as factors significantly associated to injuries, the gender, the age, the drug consumption score, the violent profile and the symptoms score (**Figure 15**). The strength of the associations is nearly the same that those observed in univariate; but we can though notice that odds ratios are lower for the drugs consumption score (from 1.47 (1.32 - 1.63) to 1.38 (1.18 - 1.55) for the one drug taken" level and from 2.32 (2.11 - 2.54) to 2.00 (1.77 - 2.27) for the "two or more drug taken" level) and for the violent profiles (from 1.77 (1.68 - 1.87) to 1.45 (1.32 - 1.59) for the victim profile and from 2.04 (1.92 - 2.17) to 1.60 (1.44 - 1.78) for the violent profile) (**Figure 15**).

5.2. Polytomous Outcome

The analyses by types of injuries showed that boys and the youngers were always the most at risk, except for the

Table 1. Proportions of injuries and odds ratio (95%CI) according to gender, age groups, family structure and siblings.

	n	% Injury	OR (95%CI)
Gender			**p < 0.001**
Girls	21238	41.0	1.00
Boys	22805	49.8	1.43 (1.37-1.48)
Age			**p < 0.001***
≤13 years	13641	51.0	1.72 (1.63 - 1.81)
14 - 15 years	9716	47.3	1.48 (1.40 - 1.57)
16 - 17 years	8133	43.6	1.28 (1.20 - 1.36)
≥18 years	10234	37.7	1.00
Family			**p < 0.001**
Mother and father	10565	41.8	1.00
Parents and at least someone else	7713	49.1	1.35 (1.27 - 1.43)
Only one parent (whith or whitout someone else)	12503	47.0	1.24 (1.17 - 1.31)
No parents, but at least someone else	7941	45.4	1.16 (1.09 - 1.23)
Siblings			**p < 0.001**
No sibling or between 1/3 brothers and/or sisters	12033	43.4	1.00
Between 4/6 brothers and/or sisters	13369	44.8	1.06 (1.01 - 1.13)
Seven or more brothers and/or sisters	11071	46.3	1.13 (1.07 - 1.19)

*p value from a trend test.

Table 2. Proportions of injuries and odds ratio (95%CI) according to the four asset indexes.

	n	% Injury	OR (95%CI)
"Occidental urban" index			**p < 0.001***
Lowest values	7094	43.3	1.00
Low values	7101	44.0	1.03 (0.96 - 1.10)
High values	7126	44.4	1.04 (0.98 - 1.11)
Highest values	7123	46.6	1.14 (1.07 - 1.22)
"Rural livestock farmer" index			**p < 0.001***
Lowest values	7104	41.1	1.00
Low values	7107	44.4	1.15 (1.07 - 1.22)
High values	7078	46.0	1.22 (1.14 - 1.31)
Highest values	7155	46.8	1.26 (1.18 - 1.35)
"Basic" index			**p < 0.001***
Lowest values	7134	48.2	1.00
Low values	7106	44.5	0.86 (0.80 - 0.92)
High values	7118	43.6	0.83 (0.78 - 0.89)
Highest values	7086	41.9	0.77 (0.72 - 0.83)
"Grower/farme" index			**p = 0.119**
Lowest values	7139	44.8	1.00
Low values	7105	45.2	1.02 (0.96 - 1.08)
High values	7086	44.8	1.00 (0.93 - 1.06)
Highest values	7114	43.4	0.94 (0.88 - 1.01)

*p value from a trend test.

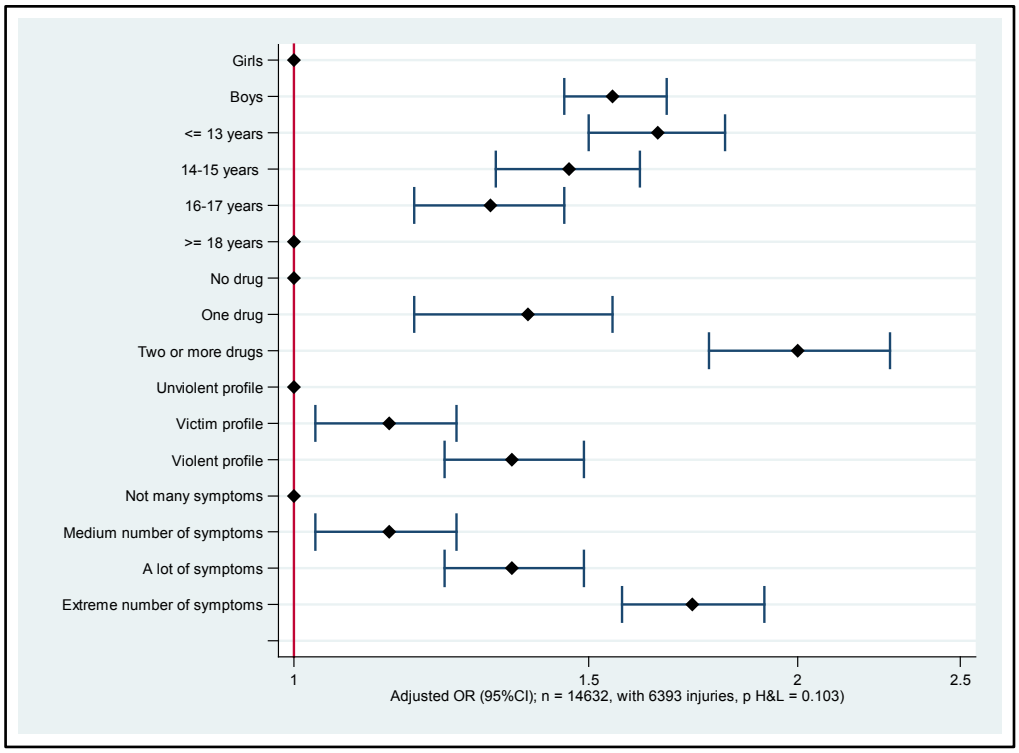

Figure 15. Adjusted OR (95%CI) derived from the multivariate logistic regression model.

Table 3. Table Proportions of injuries and odds ratio (95%CI) according to healthy habits indicator, drug consumption score, school perception indicator, social network indicator, violence indicator, subjective health indicator and symptoms score).

	n	% Injury	OR (95%CI)
"Healthy habits" indicator			**p = 0.001**
Healthy habits	16,643	45.5	1.00
Intermediate healthy habits	17,211	46.0	1.02 (0.98 - 1.06)
Unhealthy habits	7248	48.1	1.11 (1.05 - 1.17)
Drugs consumption score			**p < 0.001***
No drug taken	21,520	41.4	1.00
One drug taken	1491	51.0	1.47 (1.32 - 1.63)
Two or more drug taken	2129	62.1	2.32 (2.11 - 2.54)
"School perception" indicator			p < 0.001
Comfortable feeling with school	25,947	43.9	1.00
Intermediate feeling	9715	48.7	1.22 (1.16 - 1.27)
Uncomfortable feeling with school	4989	48.1	1.19 (1.12 - 1.26)
"Social network" indicator			**p = 0.001**
Excellent network	15,843	47.0	1.00
Intermediate network	14,680	45.1	0.92 (0.88 - 0.97)
Poor network	11,585	45.4	0.94 (0.89 - 0.98)
"Violence" indicator			**p < 0.001**
Unviolent profile	30,159	41.4	1.00
Victim profile	7051	55.6	1.77 (1.68 - 1.87)
Violent profile	4991	59.1	2.04 (1.92 - 2.17)
"Subjective health" indicator			**p < 0.001**
Good subjective health	17,227	45.5	1.00
Intermediate subjective health	12,714	45.5	1.00 (0.96 - 1.05)
Poor subjective health	11,920	46.8	1.05 (1.00 - 1.10)
Symptoms score			**p < 0.001***
Not many symptoms	6228	39.8	1.00
Medium number of symptoms	6303	43.2	1.15 (1.07 - 1.24)
A lot of symptoms	6294	47.1	1.35 (1.26 - 1.45)
Extreme numbers of symptoms	6310	51.2	1.59 (1.26 - 1.45)

*p value from a trend test.

home injuries for which one it was the girls that have the higher proportion of injuries and, in the case of the work injuries, the proportions were lower for the young children. Also for these work injuries, it was the people living without mother and father which were the most at risk (**Table 4**). Regarding the socioeconomic status, there were an increase of the sport injuries and a diminution of the work injuries with the increasing of the "oc-

Table 4. Proportion of the several types of injuries according to gender, age groups, family structure and siblings.

			Sport		Home		Traffic		School		Work
	n	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)
Gender			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
Girls	21,238	10.9	1.00	16.8	1.00	6.6	1.00	4.9	1.00	1.7	1.00
Boys	22,805	19.6	2.11 (2.00 - 2.23)	12.8	0.89 (0.84 - 0.94)	8.4	1.49 (1.39 - 1.61)	5.7	1.35 (1.24 - 1.48)	3.4	2.28 (2.00 - 2.58)
Age			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
≤13 years	13,641	16.2	1.61 (1.49 - 1.74)	18.3	2.26 (2.09 - 2.45)	7.7	1.25 (1.13 - 1.38)	7.1	2.90 (2.54 - 3.30)	1.7	0.58 (0.49 - 0.69)
14-15 years	9716	17.0	1.57 (1.50 - 1.71)	15.1	1.72 (1.58 - 1.89)	7.5	1.14 (1.02 - 1.26)	5.4	2.06 (1.78 - 2.38)	2.3	0.74 (0.77 - 1.08)
16-17 years	8133	15.7	1.36 (1.24 - 1.48)	13.6	1.46 (1.33 - 1.60)	7.0	0.99 (0.88 - 1.11)	4.3	1.51 (1.29 - 1.76)	3.0	0.92 (0.77 - 1.08)
≥18 years	10,234	12.8	1.00	10.3	1.00	7.8	1.00	3.1	1.00	3.7	1.00
Family			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
Mother and father	10,565	14.5	1.00	14.1	1.00	6.9	1.00	4.3	1.00	1.2	1.00
Parents and at least someone else	7713	17.1	1.35 (1.24 - 1.47)	15.8	1.28 (1.17 - 1.39)	8.1	1.35 (1.20 - 1.51)	6.1	1.63 (1.42 - 1.86)	2.1	1.21 (0.98 - 1.50)
Only one parent	12,503	15.7	1.19 (1.10 - 1.16)	15.2	1.18 (1.09 - 1.27)	7.6	1.20 (1.09 - 1.33)	5.9	1.52 (1.35 - 1.72)	2.7	1.49 (1.25 - 1.78)
No parents, but at least someone else	7941	14.4	1.06 (0.97 - 1.16)	14.4	1.09 (1.00 - 1.19)	7.8	1.21 (1.08 - 1.35)	5.4	1.36 (1.18 - 1.56)	3.4	1.83 (1.52 - 2.20)
Siblings			**p = 0.003**		**p = 0.016**		**p = 0.001**		**p < 0.001**		**p = 0.491**
No sibling orbetween 1/3 brothers and/or sisters	12,033	14.5	1.00	14.0	1.00	7.7	1.00	4.6	1.00	2.5	1.00
Between 4/6 brothers and/or sisters	13,369	15.8	1.12 (1.04 - 1.20)	15.0	1.10 (1.02 - 1.18)	6.9	0.91 (0.82 - 1.00)	4.6	1.04 (0.92 - 1.17)	2.5	1.00 (0.86 - 1.18)
Seven or more brothers and/or sisters	11,071	15.4	1.12 (1.03 - 1.21)	14.6	1.10 (1.02 - 1.19)	8.0	1.09 (0.99 - 1.20)	5.7	1.32 (1.17 - 1.49)	2.6	1.09 (0.93 - 1.29)

cidental urban" index. For the "rural livestock farmer" index, the proportion of traffic, school and work injuries gone up with the increase of this index. We can also observe that school injuries diminished with the augmentation of the basic index. Finally, work injuries augmented with the increasing of the "grower/farmer" index, whereas the sport and traffic injuries decreased (**Table 5**). Concerning the drug consumption, the violence indicator and the symptoms score, the situation goes in the same direction for all types of injuries but with variable intensities. Sport and school injuries decreased with the diminution of the social network indicator and work injuries increased when the subjective health indicator goes toward poorest (**Table 6**). The multivariable multinomial logistic model has retained, as significantly associated, the same factors as those obtained in the investigation of the dichotomous outcome; however the socioeconomic indexes were in addition to in the model. Differences with the univariate analyses were that, adjusted for all the variables included in the model, gender was no longer significantly associated to home injuries and the strength of the associations with the drug consumption score was weaker (**Table 7**).

6. Discussion

In order to contribute to the literature on children and adolescents health behaviors, we carry out this study using existing data from the "First Survey Health Young People" which was performed at the end of 2008 in Cameroon. Our aims were to establish profiles of young "at risk" of injuries, first, on an overall point of view and, secondly, for some types of injuries (e.g. home injuries, sport injuries, leisure injuries, road traffic injuries).

Table 5. Proportion of the several types of injuries according to the four asset indexes.

			Sport		Home		Traffic		School		Work
	n	%	OR (95%IC)	%	OR (95%IC)	%	OR (95%IC)	%	OR (95%IC)	%	OR (95%IC)
"Occidental urban" index			**p < 0.001**		**p = 0.014**		**p = 0.001**		**p = 0.057**		**p < 0.001**
Lowest values	7094	13.1	1.00	14.5	1.00	7.2	1.00	4.8	1.00	3.7	1.00
Low values	7101	14.3	1.11 (1.00 - 1.22)	14.9	1.04 (0.94 - 1.14)	6.8	0.96 (0.84 - 1.10)	4.5	0.95 (0.81 - 1.11)	3.4	0.93 (0.77 - 1.11)
High values	7126	16.6	1.29 (1.17 - 1.42)	13.0	0.91 (0.83 - 1.00)	7.6	1.07 (0.94 - 1.22)	4.9	1.04 (0.89 - 1.21)	2.4	0.65 (0.53 - 0.79)
Highest values	7123	17.0	1.38 (1.25 - 1.52)	14.6	1.06 (0.96 - 1.17)	8.3	1.22 (1.08 - 1.39)	5.3	1.17 (1.00 - 1.36)	1.5	0.42 (0.33 - 0.52)
"Rural livestock farmer" index			**p = 0.114**		**p < 0.001**		**p = 0.002**		**p < 0.001**		**p < 0.001**
Lowest values	7104	15.7	1.00	13.3	1.00	6.8	1.00	3.7	1.00	1.6	1.00
Low values	7107	15.0	1.01 (0.92 - 1.11)	14.6	1.16 (1.05 - 1.28)	7.6	1.18 (1.04 - 1.35)	4.8	1.38 (1.17 - 1.63)	2.4	1.62 (1.30 - 2.06)
High values	7078	14.6	1.01 (0.92 - 1.11)	15.1	1.24 (1.13 - 1.37)	7.6	1.22 (1.07 - 1.39)	5.1	1.53 (1.30 - 1.80)	3.6	2.51 (2.00 - 3.15)
Highest values	7155	15.7	1.11 (1.00 - 1.22)	14.0	1.17 (1.06 - 1.29)	7.8	1.28 (1.12 - 1.45)	5.8	1.76 (1.50 - 2.07)	3.3	2.34 (1.86 - 2.94)
"Basic" index			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p = 0.173**
Lowest values	7134	15.8	1.00	15.2	1.00	7.9	1.00	7.0	1.00	2.4	1.00
Low values	7106	15.5	0.92 (0.84 - 1.00)	14.0	0.86 (0.78 - 0.94)	7.9	0.93 (0.82 - 1.05)	4.6	0.62 (0.54 - 0.72)	2.5	0.94 (0.76 - 1.17)
High values	7118	15.2	0.88 (0.80 - 0.97)	14.1	0.85 (0.77 - 0.94)	7.2	0.84 (0.74 - 0.95)	4.3	0.57 (0.49 - 0.66)	2.8	1.07 (0.87 - 1.31)
Highest values	7086	14.6	0.82 (0.75 - 0.90)	13.8	0.81 (0.74 - 0.89)	6.8	0.77 (0.68 - 0.88)	3.5	0.45 (0.38 - 0.52)	3.2	1.17 (0.96 - 1.43)
"Grower/farmer" index			**p = 0.009**		**p = 0.303**		**p = 0.177**		**p = 0.019**		**p = 0.091**
Lowest values	7139	16.4	1.00	14.1	1.00	7.8	1.00	4.1	1.00	2.5	1.00
Low values	7105	15.4	0.95 (0.86 - 1.04)	14.6	1.04 (0.95 - 1.15)	7.7	0.98 (0.87 - 1.11)	5.1	1.24 (1.06 - 1.46)	2.5	1.01 (0.82 - 1.25)
High values	7086	15.0	0.92 (0.83 - 1.00)	14.4	1.02 (0.93 - 1.13)	7.3	0.93 (0.82 - 1.06)	5.1	1.25 (1.07 - 1.47)	3.0	1.23 (1.00 - 1.50)
Highest values	7114	14.3	0.85 (0.78 - 0.94)	13.8	0.95 (0.86 - 1.05)	7.1	0.88 (0.77 - 1.00)	5.1	1.22 (1.04 - 1.43)	3.0	1.20 (0.98 - 1.47)

The whole injury prevalence was equal to 45.6% (n = 44754) and among the injured, the proportion of the several types were equal to 33.8% for sport injuries, 32.2% for home injuries, 16.6% for traffic injuries, 11.6% for school injuries and 5.7% for work injuries (n = 20421). To the best of our knowledge, few studies have investigated several types of injuries – and their associated factors – inside the same study [14] [30] [31]. On their paper on the epidemiology of non-fatal injuries among youth in 11 European countries participating to the HBSC cross national survey, Molcho [30] and colleagues have found that most injuries occurred at home and during sport activity. We have also found these two principal types of injuries in our study. They also found school and street as an important place of injuries but they don't speak about work injuries. The difference probably came from the fact that the study was based on European and American data, high income countries in which the young have generally no need to work during their school years. Then again, in his study focusing on prevalence and social correlates of injury among in-school adolescents in Botswana, Peltzer [32] found approximately 9% of "doing work" as activity leading to the injury. He also found, as involved activities, "playing

Table 6. Proportion of the several types of injuries according to healthy habits indicator, drug consumption score, school perception indicator, social network indicator, violence indicator, subjective health indicator and symptoms score.

			Sport		Home		Traffic		School		Work
	n	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)
"Healthy habits" indicator			**p = 0.625**		**p < 0.001**		**p < 0.001**		**p = 0.823**		**p = 0.002**
Healthy habits	16,643	15.8	1.00	14.6	1.00	7.4	1.00	5.3	1.00	2.4	1.00
Intermediate healthy habits	17,211	15.8	1.01 (0.95 - 1.07)	14.7	1.01 (0.95 - 1.07)	7.5	1.02 (0.94 - 1.11)	5.4	1.02 (0.93 - 1.13)	2.7	1.11 (0.97 - 1.27)
Unhealthy habits	7248	14.6	0.97 (0.89 - 1.05)	16.2	1.17 (1.07 - 1.26)	8.9	1.26 (1.14 - 1.40)	5.3	1.04 (0.92 - 1.18)	3.1	1.36 (1.15 - 1.60)
Drugs consumption score			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
No drug taken	21,520	14.2	1.00	13.8	1.00	7.0	1.00	4.2	1.00	2.3	1.00
One drug taken	1491	16.6	1.40 (1.20 - 1.62)	16.2	1.41 (1.21 - 1.64)	9.1	1.55 (1.28 - 1.88)	6.0	1.72 (1.37 - 2.16)	3.0	1.55 (1.13 - 2.12)
Two or more drug taken	2129	19.5	2.11 (1.87 - 2.39)	19.5	2.21 (1.95 - 2.50)	8.8	1.93 (1.64 - 2.89)	10.4	3.82 (3.24 - 4.50)	4.0	2.62 (2.06 - 3.34)
"School perception" indicator			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
Comfortable feeling with school	25,947	14.9	1.00	14.4	1.00	7.2	1.00	5.1	1.00	2.3	1.00
Intermediate feeling	9715	16.9	1.24 (1.17 - 1.33)	15	1.14 (1.06 - 1.22)	8.4	1.27 (1.16 - 1.39)	5.6	1.21 (1.09 - 1.34)	2.9	1.40 (1.18 - 1.58)
Uncomfortable feeling with school	4989	15.3	1.11 (1.01 - 1.21)	15.5	1.16 (1.06 - 1.26)	8.2	1.24 (1.10 - 1.39)	5.5	1.17 (1.02 - 1.34)	3.7	1.71 (1.44 - 2.03)
"Social network"indicator			**p < 0.001**		**p = 0.570**		**p = 0.047**		**p < 0.001**		**p = 0.005**
Excellent network	15,843	16.6	1.00	14.8	1.00	7.6	1.00	5.9	1.00	2.2	1.00
Intermediate network	14,680	15.4	0.90 (0.84 - 0.96)	14.8	0.97 (0.91 - 1.03)	7.3	0.93 (0.85 - 1.01)	4.8	0.79 (0.71 - 0.87)	2.8	1.20 (1.03 - 1.38)
Poor network	11,585	14.3	0.83 (0.77 - 0.89)	14.8	0.97 (0.90 - 1.04)	8.1	1.04 (0.95 - 1.14)	5.3	0.87 (0.78 - 0.97)	2.9	1.27 (1.09 - 1.48)
"Violence" indicator			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
Unviolent profile	30,159	13.7	1.00	14.2	1.00	6.7	1.00	4.4	1.00	2.3	1.00
Victim profile	7051	18.7	1.80 (1.67 - 1.94)	15.6	1.45 (1.34 - 1.56)	10.2	1.99 (1.81 - 2.18)	7.2	2.14 (1.92 - 2.38)	4.0	2.23 (1.93 - 2.57)
Violent profile	4991	21.4	2.23 (2.06 - 2.42)	17.4	1.76 (1.61 - 1.91)	9.6	2.04 (1.83 - 2.28)	8.1	2.63 (2.34 - 2.97)	2.6	1.58 (1.30 - 1.92)
"Subjective health" indicator			**p = 0.024**		**p = 0.251**		**p < 0.001**		**p = 0.022**		**p < 0.001**
Good subjective health	17,227	16.0	1.00	15.1	1.00	6.9	1.00	5.8	1.00	1.8	1.00
Intermediate subjective health	12,714	15.9	0.99 (0.93 - 1.06)	14.3	0.95 (0.89 - 1.02)	7.6	1.10 (1.01 - 1.21)	5.0	0.87 (0.79 - 0.97)	2.7	1.50 (1.28 - 1.75)
Poor subjective health	11,920	14.3	0.91 (0.85 - 0.98)	14.8	1.00 (0.94 - 1.07)	8.8	1.31 (1.19 - 1.43)	5.1	0.90 (0.81 - 1.00)	3.8	2.22 (1.91 - 2.57)
Symptoms score			**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**		**p < 0.001**
Not many symptoms	6228	14.4	1.00	13.0	1.00	6.3	1.00	4.1	1.00	2.0	1.00
Medium number of symptoms	6303	15.5	1.14 (1.03 - 1.26)	13.8	1.12 (1.01 - 1.25)	7.0	1.17 (1.01 - 1.35)	4.5	1.17 (0.98 - 1.39)	2.5	1.34 (1.06 - 1.71)
A lot of symptoms	6294	16.1	1.27 (1.15 - 1.41)	14.4	1.26 (1.13 - 1.40)	7.8	1.40 (1.22 - 1.61)	5.9	1.67 (1.41 - 1.97)	2.9	1.68 (1.33 - 2.12)
Extreme numbers of symptoms	6310	16.3	1.39 (1.26 - 1.54)	16.5	1.60 (1.41 - 1.74)	9.3	1.81 (1.58 - 20.8)	5.7	1.74 (1.47 - 2.06)	3.4	2.11 (1.68 - 2.65)

Table 7. Table Adjusted OR (95%CI) derived from the multivariate multinomial logistic regression model (n = 11968, with 1792 Sport, 1666 Home, 873 Traffic, 535 School, 319 Work injuries).

	Sport	Home	Traffic	School	Work
(p H&L = 0.461)	**ORa (95%CI)**	**ORa (95%CI)**	**ORa (95%CI)**	**ORa (95%CI)**	**ORa (95%CI)**
Gender [Ref: Girls]	**p < 0.001**	**p = 0.243**	**p < 0.001**	**p < 0.001**	**p < 0.001**
Boys	2.53 (2.25 - 2.85)	0.94 (0.84 - 1.05)	1.87 (161 - 2.17)	1.42 (1.18 - 1.71)	2.62 (2.03 - 3.38)
Age (years) [Ref: ≥18 years]	**p < 0.001**	**p < 0.001**	**p = 0.684**	**p < 0.001**	**p = 0.084**
≤13	1.47 (1.26 - 1.71)	2.12 (1.81 - 2.47)	1.12 (0.92 - 1.37)	2.47 (1.89 - 3.23)	0.80 (0.58 - 1.10)
14 - 15	1.54 (1.26 - 1.71)	1.68 (1.42 - 1.98)	1.06 (0.86 - 1.30)	1.78 (1.33 - 2.38)	0.77 (0.55 - 1.08)
16 - 17	1.37 (1.16 - 1.61)	1.47 (1.24 - 1.75)	1.03 (0.83 - 1.27)	1.41 (1.03 - 1.92)	1.15 (0.84 - 1.55)
"Occidental urban" index [Ref: Lowest]	**p = 0.04**	**p = 0.002**	**p = 0.005**	**p = 0.044**	**p < 0.001**
Low values	0.99 (0.84 - 1.16)	1.07 (0.91 - 1.26)	0.76 (0.61 - 0.94)	0.96 (0.72 - 1.27)	0.78 (0.58 - 1.06)
High values	1.14 (0.97 - 1.34)	0.81 (0.68 - 0.96)	1.04 (0.84 - 1.28)	1.34 (1.02 - 1.74)	0.77 (0.56 - 1.06)
Highest values	1.20 (1.02 - 1.41)	1.06 (0.90 - 1.25)	1.12 (0.91 - 1.37)	1.22 (0.94 - 1.59)	0.45 (0.30 - 0.65)
"Rural livestock farmer" index [Ref: Lowest]	**p = 0.593**	**p = 0.087**	**p = 0.367**	**p = 0.003**	**p < 0.001**
Low values	1.05 (0.89 - 1.22)	1.00 (0.85 - 1.18)	1.11 (0.89 - 1.37)	1.25 (0.94 - 1.66)	1.42 (0.96 - 2.09)
High values	1.09 (0.93 - 1.27)	1.12 (0.95 - 1.31)	1.08 (1.35)	1.58 (1.20 - 2.07)	2.08 (1.44 - 3.00)
Highest values	0.99 (0.85 - 1.15)	0.91 (0.78 - 1.06)	1.20 (0.98 - 1.47)	1.53 (1.18 - 1.98)	1.82 (1.26 - 2.63)
"Basic" index [Ref: Lowest]	**p = 0.135**	**p = 0.772**	**p = 0.344**	**p < 0.001**	**p = 0.828**
Low values	1.18 (1.01 - 1.37)	0.97 (0.83 - 1.14)	1.16 (0.95 - 1.42)	0.89 (0.70 - 1.13)	1.06 (0.75 - 1.51)
High values	1.17 (1.00 - 1.37)	1.05 (0.90 - 1.23)	0.98 (0.80 - 1.21)	0.72 (0.56 - 0.93)	1.13 (0.80 - 1.58)
Highest values	1.08 0.91 - 1.27)	1.04 (0.88 - 1.23)	099 (0.80 - 1.24)	0.56 (0.42 - 0.75)	1.17 (0.83 - 1.64)
"Grower/farmer" index [Ref: Lowest]	**p = 0.017**	**p = 0.429**	**p = 0.419**	**p = 0.236**	**p = 0.584**
Low values	1.01 (0.87 - 1.17)	0.97 (0.83 - 1.13)	1.00 (0.82 - 1.23)	1.27 (0.97 - 1.65)	0.91 (0.64 - 1.28)
High values	0.94 (0.81 - 1.10)	0.91 (0.78 - 1.06)	0.90 (0.73 - 1.10)	1.19 (0.91 - 1.55)	1.13 (0.82 - 1.57)
Highest values	0.81 (0.69 - 0.94)	0.90 (0.77 - 1.05)	0.88 (0.71 - 1.07)	1.28 (0.99 - 1.66)	1.07 (0.77 - 1.47)
Drugs consumption score [Ref: No drug taken]	**p < 0.001**	**p < 0.001**	**p < 0.001**	**p < 0.001**	**p < 0.001**
One drug taken	1.32 (1.07 - 1.64)	1.42 (1.15 - 1.76)	1.22 (0.92 - 1.62)	1.48 (1.05 - 2.08)	1.30 (0.84 - 2.01)
Two or more drug taken	1.90 (1.57 - 2.30)	2.04 (1.68 - 2.47)	1.66 (1.29 - 2.13)	2.91 (2.26 - 3.75)	2.18 (1.51 - 3.14)
"Violence" indicator [Ref: Unviolent profile]	**p < 0.001**	**p < 0.001**	**p < 0.001**	**p < 0.001**	**p < 0.001**
Victim profile	1.38 (1.19 - 1.59)	1.31 (1.12 - 1.52)	1.54 (1.28 - 1.86)	1.75 (1.39 - 2.20)	1.68 (1.27 - 2.22)
Violent profile	1.89 (1.61 - 2.21)	1.33 (1.12 - 1.58)	1.71 (1.38 - 2.12)	1.69 (1.31 - 2.19)	1.61 (1.13 - 2.31)
Symptoms score [Ref: Not many symptoms]	**p < 0.001**	**p < 0.001**	**p < 0.001**	**p < 0.001**	**p < 0.001**
Medium number of symptoms	1.15 (0.99 - 1.34)	1.12 (0.96 - 1.31)	1.19 (0.96 - 1.47)	1.22 (0.93 - 1.60)	1.22 (0.84 - 1.75)
A lot of symptoms	1.31 (1.13 - 1.53)	1.19 (1.01 - 1.39)	1.38 (1.12 - 1.71)	1.68 (1.29 - 2.19)	2.05 (1.46 - 2.90)
Extreme numbers of symptoms	1.65 (1.41 - 1.93)	1.70 (1.45 - 2.00)	2.09 (1.70 - 2.57)	2.10 (1.60 - 2.74)	2.20 (1.55 - 3.13)

a sport" (a fifth) and "riding a bicycle or a scooter" (around 1/10). In their study in four Asian countries, Peltzer and Pengpid [31] have found, like us, that there were, in terms of activity, more "playing or training for a sport" than "riding or driving in a car or in other motor vehicle"/"riding a bicycle or scooter". There was also less "doing any paid or unpaid work" than the two previous cited categories of activities.

We have observed that boys had significantly higher injury proportion than girls and that the injury rate decreased when age increased. These observations were a constant in all studies regardless the localizations of these studies [7] [13] [14] [30] [33] [34]. These results may reflect, according to Wilson [35] and colleagues, societal norms where boys are allowed more freedom than girls to explore their environments. But also, according to Morrongiello and Lasenby-Lessard [36] who have reported in their study on psychological determinants of risk taking by children that gender has been shown to have a strong influence on children's tendency to take risks, and on their injury rates. Consistent with epidemiological evidence that boys experience more frequent injuries than girls, laboratory research and studies in real-life situations show that boys engage in greater risk taking than girls. Furthermore, young children are also less adept at calculating risk they experiment with the features of their environments [15]. In the multivariate multinomial model, we have found the same tendencies for all the injury types, except for home injuries, for which the association with the gender became not significant. This result is in agreement with the analyses made by Molcho [30] and colleagues based on the data from 11 countries participating to the HBSC study.

Regarding the socioeconomic status, comparisons are a little difficult because nearly each study use its own construction/elaboration. For the overall injuries, we have found an increase of the proportion of injuries with the increasing of the rural livestock farmer index and a decrease with the decreasing of the basic index. Nevertheless, these associations did not remain in multivariate models. On the other hand, the multivariate multinomial model had shown, for the occidental urban index – corresponding for us to a conformable socio economic level, an increase of the sport injuries and a decrease of the work injuries. In the rural livestock farmer index, the highest proportions of work injuries were found for the high and the highest values of this index. Wilson [35] and colleagues, in their study in a sample of African children, have found a link between poverty and the injury risk: poor children were injured more often than others. While, Moshiro [37] and colleagues found, in their study led in Tanzania, that poverty levels were not associated with experiencing non-fatal injuries. According to Williams [12] and colleagues the link between the socioeconomic status and injury is not the same regarding the outcome taken into account. Where morbidity is the outcome, the results have been less consistent and studies failed to find any relationship with socioeconomic status. They also postulate that for adolescents, in comparison with young children, the effect of the socioeconomic status were less visible because of the influence of peer group, of young culture and because of influences of school which exert a stronger effect on health behaviors than family, home background and neighborhood factors.

Despite the fact that some studies found associations between the number of siblings in the house, with an increase of the occurrence of injuries with the augmentation of the number of brothers and/or sisters, our study has shown a modest association for the overall injuries, which had not remained in the multivariate analysis [38].

Pattusi [39] and colleagues have not found association between family structure, investigated through the dichotomous variable living with both parent or living in another situation, and the risk of injury. It is the same tendencies in the study of Starkuviene and Zaborskis [40], based on the Lithuanian HBSC data. They failed to identify significant associations between family composition and risk for injury among schoolchildren. It is the same extent for Pickett [41] and colleagues who have found modest and non-significant associations between injuries and the number of parents in residence. They found a little lower proportion of Canadian adolescents living with two parents in the injured group in comparison with those that were not injured. Contrariwise, in their study on pedestrian injuries among Hispanic children, Argan [42] and colleagues have found an increase of the injury risk with the household crowding.

Our "School perception" indicator takes into consideration the feeling about school, the kindness and helpfulness of others pupils, the truancy and the possibility to talk about homework and school with parents or tutors. In univariate analyses, our results have shown that there was more reported injuries for the school-children which reported having an intermediate or uncomfortable feeling with school compared with pupils which were in the group labeled as having comfortable feeling with school. These tendencies were the same fort each type of injuries. In our case, these associations remain not significant in multivariate analyses; this is in contrast with a number of others studies which have found association with truancy [13].

Concerning the "Social network" indicator, which takes into consideration three dimensions: the loneliness

feeling, the number of close friends and the possibilities to talk (about leisure activities but also about encountered problems) with parents or tutors, we found lower proportion of injuries in the intermediate and poor social network indictor in comparison with the group having an excellent social network. Starkuviene and Zaborskis [40] have also found a higher risk of injury for the Lithuanian schoolchildren who reported spending much time with friends. Peltzer [13], in his paper on injuries and social determinants among in-school adolescents in six African countries, has found a link between loneliness and injuries.

According to Pickett [43] and colleagues, on one hand, supportive social climates can minimize engagement in risk taking and may also protect adolescents from the occurrence of injury; and on the other hand, non-supportive environments are associated with adverse health outcomes. In our study we found lowest proportions of injuries in the intermediate and poor network in comparison with the excellent network; but this association doesn't remain in multivariate analysis.

Smoking, alcohol consumption and physical activity were the basis of our healthy habits indicator. Univariate analysis of the overall injuries had shown a higher proportion of injuries in the unhealthy group in comparison with the intermediate and the healthy habits groups but this association did not remain in the multivariable models. This may be due to the fact that we have a small proportion of unhealthy behaviors. Smoking and drunkenness were not highly prevalent in our sample, and also these young are more in a pattern of a trying behavior rather than a fixed consuming behavior. In his paper on injuries and social determinants among in-school adolescents in six African countries, Peltzer [13] also don't find a link with physical activity but he found association with smoking and drinking. It is the same observations in a Chinese cohort of students, for Zhou, Chen and Dong [44] which found an association with alcohol consumption but also with the trying smoking behavior. Muula [7] and colleagues, in their study based on the data of the Djibouti Global School-based Health Survey, found that adolescents who smoke cigarettes were more likely to report injuries. Sindelar, Barnett and Spirito [45] have demonstrated in their review on adolescent alcohol use and injury that alcohol-positive adolescents are more likely than alcohol-negative adolescents to be injured, require trauma service care and have injury complications.

Our violence indicator, based on to being engage in fights, taking weapon at school and being victim of racket, is one of the factors strongly associated with the occurrences of injuries. There were more injuries in the violent and victim profiles both in the general and by type of injuries.

Several studies have shown the links between weapon-carrying and/or physical fighting and/or bullying victimization and injuries [46]-[50]. This is a complex problem because some young are clearly engaged in violent behaviors but it is also demonstrated that the bullied young and/or the victims of extortion have reported carrying a weapon for protection and were engaged in fights because they are victim of attack from other pupils. Therefore, due to the fact that data were cross-sectional, it is impossible to assign a cause-and-effect relationship between carrying a weapon, becoming involved in fights and/or being victim of extortion. Beside these links between violent behaviors, it is also important to note that, as shown by Pickett [48] and colleagues, based on data from European countries, by Bailey [51] and colleagues in the United States, by Pengpid and Peltzer [52] in Thailand, by Muula [49] and colleagues in Venezuela, as well as by Rudatsikira [53] and colleagues in Namibia, these types of results can be a marker for a lifestyle that has inherent injury risks for boys and girls. This lifestyle, that includes fighting, has been described as the multiple risk behavior syndromes, a behavioral syndrome that can include substance use and abuse, truancy and other problem behaviors during adolescence.

In his paper on injuries and social determinants among in-school adolescents in six African countries, Peltzer [13] find a gradual association with drug use. The same observation was made by Vital [54] and colleagues. Our results go in this direction both for injuries in general and for the several types. Siziya [55] and colleagues in their paper on the socio-demographic factors related to cannabis use found that Zambian adolescents who reported to have been bullied were also likely to have used cannabis before. Knowing that there is a link between bullying and occurrence of injury, these results are important. It is also interesting to note that these results were also observed in adulthood. Miller [56] and colleagues have found that alcohol and drug abusers have a higher probability of injury, of more injury than require hospitalization, and of more injury episodes than the controls enrolled in their study. Same tendencies were found by Cherpitel [57]. It is then important to ensure that drug consumption in adolescence will be only a temporary behavior, which will not be kept in adulthood.

Our subjective health indicator, based on the overall feeling, the perception of one's health and the feeling of tiredness in the morning, despite the significantly p-value, was not really associated with the proportion of overall injuries. Regarding the injuries types, this indicator was much more associated in case of work injuries and to

a lesser extent in case of traffic injuries but these observations remained not in multivariate models. However, Zhou, Chen and Dong [44] have found an increase of the injury proportions with the increase of the self-perceived agrypnia in a cohort of Chinese students. Also, Li [58] and colleagues have shown a negative association between sleep duration and occurrence of injuries among school-aged children in rural China. Stallones, Beseler and Chen [59] have also found association between injuries and being late in school and afternoon sleepiness, among adolescent farm residents in the United States. Finally, even if Pattusi [39] and colleagues have found a higher risk of injuries among Brazilian adolescents who have reported behavioral and emotional problem, they have not found a link with self-related health.

Despite that, we have found a strong and linear association between the number of declared symptoms and the occurrences of injuries. This gradient remains significant in multivariate analyses both for the overall injuries and for the several types. Vital [54] and colleagues have also found that a psychological profile of frequent complain of some kind of distress, namely depression, anxiety, and back pain, among others, is associated with having more injury-related events. The systematic review of Turner, Mc Clure and Pirozzo [60] agreed with that observation. Chen [33] and colleagues have also found association between psychological symptoms, measured with the help of a symptom-checklist, and the happening of injuries. Eventually, Starkuviene and Zaborskis [40] have found a higher risk of injuries for the Lithuanian schoolchildren who reported unhappiness.

Although comparison with international studies is hampered by definitions of risk behavior, it would appear that there are no consistent and marked deviations in this study from the findings obtained in previous studies (conducted either in high, middle or in low income countries).

In their paper on multiple risk behavior and injury, Pickett [41] and colleagues have observed strong gradients in risk for injury according to the numbers of risk behaviors reported, so multiple risk behavior, *i.e.* the simultaneous engagement in self-reported risks such as smoking, drug and alcohol use and truancy, is a recognized individual risk factor for injury [42]. Peltzer [13] had also observed that injury risk increased consistently and strongly with the increasing number of risk behaviors. The same observation was made by Muula [7] and colleagues. They have found that injured adolescents were more likely to have multiple problems. Finally, Turner, Mc Clure and Pirozzo [60] in their systematic review on injury and risk-taking behavior have shown that risk-taking behavior, however it is measured, is associated with an increased chance of suffering from injury.

Analyzing injuries in general is interesting but for preventing them it is important to know in which activities children and students are engaged when they are injured. It is vital for injury prevention strategies [12]. Therefore, in summary, we can say that, in light of the variables studied, the "at risk" profile for having reported an injury was being a boy, being younger, having drug experiences, with violent profile, and declaring several symptoms. The "at risk" profile for having reported a sport injury was being a boy, with a highest value of "occidental urban" index, having drug experiences, with violent profile, and declaring several symptoms. The home injury profile was being younger, also with an experience of drugs consumption and an important score of symptoms declared. To be a boy, with highest "occidental urban" index and also with a record of drugs consumption as well as an important score of symptoms declared was the profile for the traffic injuries. Drugs experiences and declaring several symptoms were present the school and work profiles too, just as to be a boy. However in the "at risk" profile for school injuries, the injured people were younger, with low values of "basic" index and with a victim profile. For the work injury, be an "at risk" profile signified to be older with high values of "rural livestock farmer" index.

To see the situation in a "positive vision" is to say, as Peltzer [61] in his paper on the health behavior and protective factors among school children in four African countries, that there is an important part of the schoolchildren which are engaged in healthy behaviors (e.g. non-tobacco use, nor or moderate alcohol consumption, no drug use, physically active for at least 60 minutes per day) and these healthy behaviors are correlates with school attendance, parental or guardian connectedness, peer support at school, or parental supervision. There are links between unhealthy or risky behaviors and injuries but we also say that there are links between healthy behavior and protective factors, therefore, it is important to plan actions which aim to reduce risk behaviors and to increase protective behaviors among individuals and groups, as well as positive changes to the physical environment ("safe place to live").

7. Limitation of the Study

Several limitations of this study should be noted. First, the cross sectional study design precludes any determina-

tion of the direction of causality. Concerning the report of injuries, the 12 months recall may lead to an underestimation of injuries because of the "less serious"—those who did not result in a care—can be forgotten [16] [62]. Moreover, this First Survey—Health Young People covers a broad range of topics related to the health of youth; as such, in-depth information on the exact circumstances leading to individual injury events cannot be obtained. Despite the fact that this type of survey ranges a myriad of factors, it is obvious that the variables used can only get a partial picture of the whole phenomenon. The possibility of biased also exist: the reporting of health and risky behaviors in a self-completed questionnaire may be influenced by a desire to provide socially desirable responses. Moreover, because the study is based on school-children, we do not have data for young people and adolescents who do not attend school, the latter being known to be more likely to adopt unhealthy lifestyle, to live in a less safer environment and therefore to face multiple health risks.

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17

Outbreak Investigation of Cholera in a Slum of Northern India

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Abstract

Cholera is one of the oldest and best understood endemic diseases. An actual bacterial enteric disease, it is characterized in its severe form by sudden onset, profuse painless watery stools (rice-water stool), nausea and profuse vomiting early in the course of illness. Endemic and pandemics are strongly linked to the consumption of unsafe water, poor hygiene, poor sanitation and crowded living conditions. A rapid survey was conducted for the outbreak investigation on August 4, 2008. The objectives were to investigate the outbreak, risk factors for cholera and recommend control measures immediately. Questionnaire based random convenient sample based investigative study. 60 families were contacted by the public health students. Approximate 300 individuals were screened for cholera cases. Simultaneously six water samples were also collected from the contacted family. Microbiological test for Vibrio cholera and *E. coli* was conducted. Randomly six water samples were collected from the Rajive colony. Microbiological test for Vibrio cholera and *E. coli* was conducted from the department of Microbiology, PU. Vibrio cholera and *E. coli* were found absent, in all the samples. One sample was found positive for unidentified bacteria.

Keywords

Cholera, Slum

1. Introduction

Cholera has been present in India since ancient times. During the 19th century, several pandemics of cholera originated from India and spread to western countries. Currently the seventh pandemic which began in 1961 in Indonesia is still continuing. It has involved more than 80 countries in Asia, Africa and Europe.

Cholera is both an epidemic and endemic disease. The epidemicity and endemictiy of a disease will depend on Characteristics of the agent, and those of the system. Characteristics of the agent which influence its distribu-

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tion include its ability to survive in a given environment, its virulence, the average number of organisms required to cause infection, etc. Characteristics of the system which affect the distribution of the agent include the number of susceptible, and the opportunities it provides for transmission of the infection. Global experience has shown that the introduction of cholera into any country cannot be prevented, but cholera can create a problem only in areas where sanitation is defective.

Epidemics of cholera are characteristically abrupt and often create an acute public health problem. They have a high potential to spread fast and cause death. Often-times, by the time control measures are instituted the epidemic has already reached its peak and is waning. Thus, cholera epidemic in a community is self-limiting. It tends to decline after reaching its peak. This is attributed to the acquisition of temporary immunity, as well as due to the occurrence of a large number of sub clinical cases.

The practical successes of anticontagionists were not limited to their victories over quarantines. Their operations against "filth" increased greatly their prestige. While it was difficult for the contagionists to prove that a respective epidemic would have been even worse without quarantines; health improvements after removal of "filth" seemed to be causally related to the latter action. Barcelona and Alicante did not experience further yellow fever epidemics after such campaigns in 1827, respectively 1804. The General Board of Health could point in the cholera of 1848-1849 to the immunity of its cleaned "model houses" [1].

Peter Baldwin seeks to challenge the widely held, reductionist belief that "it was not the nature of the disease which specified how it would be prevented and limited, but the kind of political regime under epidemic attack". The more interesting question, and one that Baldwin also poses but answers less satisfactorily, is whether these dynamics determined the nature of the political systems themselves. He coins the appropriate term "neoquarantinist" to describe the panoply of measures that served to control epidemiological outbreaks as opposed to preventing their occurrence altogether. The emergence of these adaptive strategies is crucial to Baldwin's interpretation of the post-cholera period, and one cannot dispute the emphasis he places on them [2].

By the end of the 19th century, cholera epidemics no longer appeared in Europe and North America. The reasons for this are uncertain, but standards of living had risen and many communities had made major changes in sanitation practices and established permanent boards of health. As part of the transformation to the germ theory, medical thought had changed in many ways as well. In 1831, most physicians believed cholera to be a nonspecific, noncontagious miasmatic condition that favored the morally and physically predisposed. By the end of the 19th century, although the miasmatic interpretation still had influence, cholera was primarily understood to be a specific contagious disease caused by a particular microscopic organism [3].

Ideas relating sickness to personal morality have long been important in European and American thought. In the Judeo-Christian tradition, sickness has often been seen as divine punishment for sin. Cures for sexually transmitted diseases, including syphilis, have been criticized in the belief that cures would encourage immoral behavior. Moral and ethical issues associated with sex, food, drink, work, and emotions have also been connected with the possibility of contracting or spreading disease [4].

Until Robert Koch identified the cholera bacillus in 1883; science continued to favor anticontagionism. Leading anticontagionists or contingent contagionists included Max von Pettenkofer and South wood Smith. According to the contingent contagionist perspective, cholera could be contagious, but only under particular circumstances [5]. The existence of the cholera bacillus did not necessarily prove cholera's contagiousness either; some argued that the bacillus was the product of the disease, not its cause. Another issue was how to explain the existence of healthy carriers—people who had the cholera bacillus in their bodies but who were not sick. In practice, public health measures often involved a blend of contagionist and anticontagionist views.

Cholera was the classic epidemic disease of the nineteenth century, as the plague had been for the fourteenth. Its defeat was a reflection not only of progress in medical knowledge but of enduring changes in American social thought. Rosenberg has focused his study on New York City, the most highly developed center of this new society. Carefully documented, full of descriptive detail, yet written with an urgent sense of the drama of the epidemic years, this narrative is as absorbing for general audiences as it is for the medical historian. In a new Afterword, Rosenberg discusses changes in historical method and concerns since the original publication of The Cholera Years [6] [7].

Epidemic of cholera are frequent, striking adults as well as children. Epidemiological studies have shown that cholera is responsible for about 5 - 10 per cent of all acute diarrhea cases in non epidemic situation. Global experience of the current pandemic has shown that cholera can get introduced into any country but can create problem only in areas where other acute enteric infections are endemic, *i.e.* where sanitation is defective.

Although cholera occurs from time to time in Chandigarh slums, and in Tricity, Large number of reports started appearing in July, 2008 from areas in and around Chandigarh. To investigate the suspected epidemic, we have conducted a rapid survey for this outbreak investigation on August, 4, 2008.

2. Methodology

In July 2008, outbreaks of Cholera illness were reported from Rajive colony, Panchkula. This provided a challenge for the centre for public health of Panjab University, Chandigarh to identify risk factors and network with resources available in the Panchkula for outbreak response. The objectives were to investigate the outbreak, risk factors for cholera and recommend control measures immediately.

The investigation team was from centre for public health of Panjab University, Chandigarh. The team identified part of total cases that occurred in this colony by house-to-house survey. Risk factors were assessed by using a questionnaire. Laboratory investigations for microbiological test of water samples were done from the department of microbiology, Panjab University, Chandigarh.

A cross-sectional study was conducted by using random sampling method in a sample size of 300 individuals. Self structured questionnaire regarding sanitation and hygiene, quality of water used for drinking and domestic purposes was collected. About 60 families were contacted by the public health team. Approximate 300 individuals were screened for cholera cases. Simultaneously six water samples were also collected from the contacted family. Microbiological test for Vibrio cholera and *E. coli* was conducted.

It can be concluded that poor sanitary and unhygienic conditions may be responsible for the Cholera cases occurred in rainy season in of July, 2008.

3. Results

Table 1, shows that almost equal numbers of cases were observed from both sex. More cases were reported from the age group 20 - 60 years. More males were affected in <20 years of age groups as compared. And only two female cases were reported from the >60 years age group.

According to **Table 2**, Out of 17 cases, 10 cases were from conformed and suspected category. Equal numbers of cases were reported for conformed and suspected diagnoses from males and females.

Randomly six water samples were collected from the Rajive colony. Microbiological test for Vibrio cholera and *E. coli* was conducted from the department of Microbiology, Panjab University, Chandigarh. Vibrio cholera and *E. coli* were found absent, in all the samples. One sample was found positive for unidentified bacteria.

Table 1. Age group and sex distribution of cases.

Age Group	Male	Female	Total
<20 years	3	1	4
20 - 60 years	6	5	11
>60	0	2	2
Total	9	8	17

Table 2. Distribution of cases according to diagnosis.

Diagnosis	Male	Female	Total
Conformed	2	3	5
Suspected	2	3	5
Not conformed	4	3	7
Total	8	9	17

4. Discussion

The city of Hamburg was hit by one of the greatest urban disasters of the century: a cholera epidemic that within six weeks left ten thousand people dead and many more suffering the appalling symptoms of this terrible disease. Drawing on a mass of detailed source material, this book presents a graphic portrayal of a great European city in the throes of a major social and political crisis [8]. Cholera is entirely multiform, as are typhoid fever, pneumonia, cerebrospinal meningitis and all infectious diseases without exception [9].

Despite the continued discussion about the cause of cholera, over the course of the 19th century the actual treatment of the disease did not change much. Patients with families were cared for at home. Physicians, when called, would use such characteristic treatments as bleeding or opium. Homeopathic methods were popular among the middle and upper classes, as were other eclectic treatments, and all manner of dietary and hygienic regimens were promoted in newspapers and books. Those without families might find themselves in charity hospitals, which could become grim places indeed during an epidemic. Preachers gave sermons on the meaning of cholera for both individuals and society. Riots ensued due to popular revolt against mass burials [10].

As part of the transformation to the germ theory, medical thought had changed in many ways as well. In 1831, most physicians believed cholera to be a nonspecific, noncontagious miasmatic condition that favored the morally and physically predisposed [11].

The main symptom of cholera is diarrhea. Cases range from symptom less to severe infections. The majority of infections are mild or asymptomatic. Typical cases are characterized by the sudden onset of profuse, effortless, watery diarrhea followed by vomiting, rapid dehydration, muscular craps and suppression of urine. Unless there is rapid replacement of fluid and electrolytes, the case fatality may be as high as 30 to 40 per cent. The village leaders helped the investigation team in instituting standard hygienic measures for controlling the outbreak immediately

Vibrio transmission is readily possible in a community with poor environmental sanitation. The environmental factor of importance includes contaminated water and food. Flies may carry V. cholerae. Numerous social factors have also been responsible for the endemicity of cholera in India. These comprise certain human habit favoring water and soil pollution, low standards of personal hygiene, lack of education and poor quality of life.

Transmission occurs from man to man via faecally contaminated waste: Uncontrolled water sources such as well, lakes ponds, streams and rivers pose a great threat, Contaminated food and drinks: Ingestion of contaminated food and drinks have been associated with outbreaks of cholera. Bottle-feeding could be significant risk factor for infants. Fruits and vegetables washed with contaminated water can be a source of infection. After preparation, cooked food maybe contaminated through contaminated hands and flies. There is growing opinion that complex interaction of contaminated food, water and environment rather than through public drinking water supplies and direct contact: In developing countries a considerable proportion of cases may result from secondary transmission *i.e.* person to person transmission through contaminated fingers while carelessly handling excreta and vomit of patients. Incubation period is from few hours up to 5 days, but commonly 1 - 2 days.

Leakages in water pipes coupled with poor environmental sanitation were identified as reasons for contamination of drinking water. Health education, immediate repair of leaking pipes and chlorination of water supply led to an early control of the outbreak.

5. Conclusion

It can be concluded that poor sanitary and unhygienic conditions may be responsible for the Cholera cases occurred in rainy season in of July, 2008.

6. Recommendations

Taking measure given below can minimize the risk of an outbreak of cholera and its spread. There are no other alternative for the control of outbreak of Cholera.

1) Provision of safe water;
2) Adopting safe practices in food handling;
3) Sanitary disposal of human waste;
4) Personal and domestic hygienic practices;
5) Particular attention should be given in the pre-monsoon periods before the expected seasonal increase of water-borne diseases: however these measures are expected to be in place round the year;

6) Arrange random checks for water quality for coliform organisms;
7) Ensure that the health personnel are adequately trained in oral rehyderation therapy and that recommended guidelines are followed in hospitals.

The above steps are required both as long term measure to prevent Cholera, as well as measures to be taken in focal area where an outbreak is anticipated. Community participation is essential to prevent an outbreak so that safe practices are followed for storing water and for food handling.

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18

The Social Conditions in the Genesis of Preeclampsia

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Abstract

This article highlights the importance of preeclampsia as a global public health problem and the lack of a satisfactory model to explain its genesis. Scientific advances relevant to the placental pathophysiology, which have resulted in a deeper understanding of the immunological mechanisms associated to preeclampsia and have been translated into better treatment options, are also highlighted, although to date these approaches cannot explain the origin of the disease. From a theoretical approach underpinned by the concepts related to the social determinants of the health, and specifically from current psychosocial epidemiology, an alternative approach that gives account for the genesis of preeclampsia is proposed. The proposal is based in the scientific literature as well as in the work of the authors; it takes as references unfavorable socioeconomic and psychosocial conditions in pregnant women, linking these conditions to a series of failed adaptive biological processes closely related to an ineffective allostatic response by the body, which ultimately determines the occurrence of the disease.

Keywords

Preeclampsia, Psychosocial Epidemiology, Social Inequality, Allostasis, Neighborhood

1. Introduction

Preeclampsia is a serious public health problem that affects the group of pregnant women; the disease has severe obstetric and perinatal implications—for decades has been located at the international level as one of the three

major causes of maternal death—and shows prevalences varying between 2% and 8%, variations that have a clear association with the grade of socioeconomic development of the different geographical locations where inhabit women in reproductive age [1] [2].

Although studies have been conducted almost all over the world in the last decades to determine the genesis of preeclampsia [3]-[7], there is still no satisfactory explanatory model that defines and links the biological, clinical, epidemiological and psychosocial conditions that characterize women with this disease.

Clear progress has been made in the field of placental pathophysiology and pharmacological research which has resulted, on the one hand, in a better understanding of the pathophysiological mechanisms of the disease, and on the other, in the development of better therapeutic options [1] [8] [9]. However, different studies that have been performed to construct an explanatory model of preeclampsia have not reached their goal. Several tentative explanations have been put forth, among which we can mention the following: the universal distribution of the disease risk factors that differ by location and ethnicity; the objective of the studies that define the methodological design of research, such that one clinical approach will use a different strategy, which is selected due to basic or epidemiological purposes. One consequence of this is the absence of an explanatory model of the disease that integrates the findings observed with different methodological approaches.

During the latter part of the 70's in the last century, the field of psychosocial epidemiology emphasized the idea or concept of "general susceptibility", in contrast to the idea of "disease specificity" or "specific exposure". John Cassel, a representative of this movement argued that psychosocial stressors generated by different variants of human interaction, such as dominant hierarchies, social disorganization, rapid social change, and marginal status with social isolation, act as non-specific exposures that alter neuroendocrine function. From the perspective of Cassel, these psychosocial factors together explain why certain social groups are particularly affected by a wide range of diseases. Moreover, this same author considered social phenomena (social support, social networks, and social capital), which hypothetically neutralize the negative impact of unfavorable psychosocial aspects important [10] [11].

The previous assumptions have been validated in numerous investigations that have addressed a variety of health problems [12]-[16]; as a result the following have been proposed:

Basic Principles in Psychosocial Epidemiology [17].

1) The distribution of psychosocial stressors and "buffers" are related to the social position of diverse populations, with their living (home, neighborhood), and working conditions.
2) Low social status can be considered the most adverse psychological stressor.
3) Psychological stress, especially chronic, can damage the health of an individual through pathways that independently or synergistically involve the CNS, regulatory physiology, behavior, and disease.

In recent years there has been increasing interest in studying the relationship between shared physical spaces or specific geographic areas (neighborhood), and health conditions of specific populations [18] [19]. Several studies have been conducted using the same ecological approaches that relate the characteristics of physical and social context, with morbidity and mortality rates, as those of multilevel designs that relate the characteristics of the socioeconomic context with the health conditions of the inhabitants [20] [21]. It is also important to point out that there are studies documenting the positive impact of remodeling physical areas and constructing recreational areas to reduce crime rates [22] [23]. This is explained by arguing that improving conditions in a physical context enables social interaction and cohesion, and modifies the perceived environment by living in a more pleasant and safe place.

Research conducted to establish a relationship between material aspects and socioeconomic status with health conditions of the population have been consistent with better health being observed in high socioeconomic strata, although perspectives have emerged that do not accept that material conditions are the only thing that explain the different levels of health. The perceptions of wellbeing and of having a favorable status, in addition to advantageous material conditions are considered solid components of psychosocial support [24]. It has also been pointed out that these groups are generally characterized by having control over a number of situations related to their family, work and social life, a situation that increases their perception of self-worth and well-being. The opposite occurs in disadvantaged groups, in which social disadvantage is included in their perception of disadvantage and lack of autonomy and control over a number of circumstances related to their social life and work.

Sterling and Eyer in 1988 advanced the psychosocial theory by introducing a new concept: allostasis. This term refers to the regulatory systems that achieve stability through change, whose purpose is not the constancy of the different indicators or biological parameters (hormonal, immunological, vascular) but adjustment to de-

mands; this is how the body remains stable in changing environments [17]. This adjustment determines effective regulation, which involves preventing errors and minimizing costs. Both situations are achieved by the use of prior information to predict demands and adjustments to parameters, in such a way that allostasis considers the unusual value of a parameter as a response to a prediction and not as an error to defend an established point (constant). For example, oscillations in blood pressure values during the day in healthy subjects, according to different circumstances [25].

Bruce McEwen later introduced the term allostatic load, which refers to the wear and tear caused by chronic hyperactivity or hypoactivity of the systems that protect the body from internal or external stress. These systems include the autonomic nervous system, hypothalamic-pituitary-adrenal axis, and the cardiovascular, metabolic and immune systems [26] [27].

The production of allostatic mediators (hormones, chemical messengers, and neurotransmitters) occurs according to two main patterns: response to challenges or demands, as in highly stressful experiences, or as part of routine physiological functions that are controlled by daily habits such as sleep-wake cycles (regularly getting up early). Allostasis can yield to allostatic load in different ways: 1) Prolonged response. In the case of cortisol and adrenaline, there are nerve pathways that turn the system "off" when the stressor is gone. Ideally self-regulatory mechanisms must be activated when demands are high and deactivate when these disappear. When this does not occur the expression of allostatic load is imminent; 2) a lack of adaptation to repeated stressors of the same kind, with prolonged exposure to stress hormones; 3) chronic stress or "repeated hits" in response to unknown threatening events; repeated stress damages the regulatory mechanisms of allostatic response or alters the cyclical production of cortisol and adrenaline; 4) inadequate or insufficient response. An inadequate response, to cortisol, for example, can lead to overactivation of other allostatic mediators substantially altering biological regulatory mechanisms [26]. To this we must mention, genetic and epigenetic factors, characteristics of early development of the individual, or situations of the environment such as the evaluation made by individuals of their socially structured situations (threatening-rewarding, fair-unfair, with regard to their immediate circumstances and anticipated scenarios), represent conditions that are added to the influence of stress, increasing the levels of cortisol and adrenalin.

The emergence of the concepts of allostasis and allostatic load, have allowed not only a link to a variety of situations that occur in the population context of a social, economic, cultural, and psychosocial nature with the different health conditions of individuals living in these contexts, but also an explanation of the interlevel relationship of a social-individual group, that is, how the advantages or disadvantages of being part of a particular social group biologically translate [28] [29], opening a range of possibilities of cognitive nature that allow the best approach to health problems.

2. Stating the Problem

Although there have been numerous approaches to explain the genesis of preeclampsia, so far there is no explanation that has had universal acceptance. Epidemiological studies have focused on the search for risk factors that are associated with the increased frequency of the disease, and although there is an agreement about certain characteristics related to obstetric (primiparity, prenatal care), constitutional (overweight, malnutrition), genetic (family history of the disease) and epigenetic (DNA methylation of placental micro RNAs) conditions [2] [30] [31], a consistent association with the expression of the disease has not been shown. Regarding basic research, aspects of placental pathophysiology have been studied; specifically the two-stage model which states that placental failure causes systemic dysfunction, which exacerbates placental hypoxia causing clinical expression of the disease. Detailed study of the angiogenic and antiangiogenic factors involved in placental failure has allowed a better understanding of the pathophysiology of preeclampsia, but this has not resulted in an explanation of its genesis [6] [7]. Genetic testing and specifically, analysis of a variety of tentative polymorphisms associated with the disease have not yielded significant results [32] [33]. On the other hand, persistent patterns of prevalence and disease distribution over time, most often internationally in developing countries, the high occurrence within the same country in socially or economically disadvantaged groups, and more frequent disease in minority groups in multicultural countries [1] [34], are clear indicators that the genesis of preeclampsia is strongly associated with the conditions of development and social inequality of any country. This background enables an analysis from the perspective of psychosocial epidemiology, linking aspects of psychosocial stressors and psychosocial support (underlying social conditions that are present anywhere) in pregnant women and their relationship with indicators of allostasis and allostatic load.

3. Results from the Perspective of Psychosocial Epidemiology and Discussion

There exist a number of studies that theoretically can be located within the field of the psychosocial epidemiology, oriented to clarify the existing relationship between preeclampsia and unfavorable contexts located the same in institutions as in different social and cultural backgrounds [1] [35]-[41]. Likewise, it has been observed that the excessive work with little recognition [42], belonging to a subordinated ethnic group or with clear social or economic disadvantages, are conditions that represent strong stressors which—when there are not situations of familiar, social or labor support that counteract them—infringe the adaptative regulatory mechanisms.

Although it has already been well documented this relationship of an unfavorable psychosocial environment with the clinical expression of preeclampsia, it is essential to understand the expression that these unfavorable conditions have in the biological level and specifically in indicators of allostatic load in the group of preeclamptic women.

Vianna P. *et al.* [43]; propose that the distress conditions during pregnancy can occasionate the development of preeclampsia by an increase in the cortisol levels, which are associated to hypertension and endothelial damage. Hogg K. *et al.* [44], highlight that most of normal pregnancies are characterized by the absence of placental cortisol, in contrast with the observed in women with preeclampsia, in which in more than 80% the placental cortisol is detectable, indicative of the importance that the glucocorticoids have in the development of the disease. In a case-control study nested in a cohort carried-out in Mexico, in which salivary cortisol was measured to a group of teenage pregnant participants, in two stages of the gestational course, before the 20th week and after the 30th week, at the 8:00, 12:00 and 20:00 hrs, the results were higher, statistically significant in the group that got sick, in the two evaluations done during the gestational process; the cutoff point established in this study as a predictor of the disease before the 20th week through ROC curves was of 13.9 nmol/L [45].

In a case-control study conducted later also in Mexico, was observed that the salivary cortisol values obtained in the group with preeclampsia were significatively higher than the observed in the control group [46]. Although the studies directed to link the unfavorable conditions of the psychosocial environment with allostatic indicators of preeclampsia are scarce, it is considered that performing these approaches, linking the socio epidemiological characteristics with allostatic indicators of the disease will provide a better understanding of the genesis of this health problem.

4. Conclusion

The consistency observed in numerous works developed in different parts of the world, which have established a relationship between an adverse psychosocial environment—to which often underlies an unfavorable socioeconomic context—and clinical expression of preeclampsia [35]-[41], validates the proposals made about the importance of social determinants in conditions of health of the population [17] [47]. It is important to identify geographic areas and socioeconomic and cultural strata that record patterns of disease prevalence that show regularly over time, and systemize the physical and socio-economic conditions and cultural environment that tentatively represent risk conditions. It is also important to incorporate the analysis of aspects related to social cohesion and collective efficacy, among others [48], which represent reliable indicators of social support. The development of these studies will allow the spatial location of scenarios of socio-epidemiological risk of disease, which will be as diverse as social groups, hence the difficulty in finding a single explanatory model. The study of different contexts of risk explored in clinical variables, the allostatic mediators, as well as the identification and confirmation of diverse interactions in preeclampsia obtained using a systems biology approach [49], enable the construction of interlevel explanatory models (socio epidemiological—clinical—biological) more suited to the different social, economic and cultural realities in which the disease is developing.

Conflict of Interest

The authors declare that they have no conflicts of interests.

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Association of Depression and Life Satisfaction with Low Resilience among Married Women of Karachi, Pakistan

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Abstract

Background: The concept of resilience is very crucial in promoting positive psychological well-being. However, this construct was never looked among married women of Karachi, Pakistan. Therefore, this study aimed to assess the prevalence and the associated risk factors of resilience in Pakistan. Methods: It was a cross-sectional survey, using the Wagnild Resilience Scale (RS) to assess resilience, Beck Depression Inventory II (BDI-II) for measuring depression and Trait Wellbeing Inventory for determining Life Satisfaction. Systematic sampling was employed to enroll 636 participants of aged 20 to 40 years living in two urban squatter settlements of Karachi, Pakistan. Prevalence ratio was computed with their 95% confidence interval. Results: A total of 636 married women participated in the study. The average age of females with low resilience was 29.8 (5.7) whereas the mean age of females with high resilience was 31.1 (5.7). Around 90% of all the participants could speak in Urdu. The prevalence of low resilience among women was 21.9%. Moreover, the prevalence of depression among low resilience group was 43.9% whereas the mean life satisfaction score among females with low resilience was lower than females with high resilience. The females who had low resilience were younger and had no formal/informal education as compared to their counterparts. After controlling for other variables, the prevalence of low resilience was 1.78 times more among depressed females as compared to the non-depressed with a 95% CI: (1.27 - 2.51). Moreover with every one unit increase in the life satisfaction scores, the prevalence of low resilience decreased 9%. Furthermore, age and informal schooling were also found to be significantly associated with resilience. Conclusion: Depression and life satisfaction are the potential modifiable risk factors for resilience and hence we can improve resilience through interven-

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tions that may focus on reducing depression and improving satisfaction towards life. Our study also recommends that health care professionals should be educated about these modifiable risk factors to bring about a change in the society and reduce the mental health illness by promoting constructive adaptation.

Keywords

Resilience, Depression, Life Satisfaction, Married Women, Pakistan

1. Introduction

Resilience is important for a person's mental and physical health. The foundation of resilience is to promote positive psychological well-being, minimize the impact of risk factors, and enhance the protective factors that increase a person's ability to deal with the challenges of life [1]. However responding to life challenges or hardship with resilience doesn't mean that an individual will return to his/her original state after experiencing adversity; in fact this will bring an individual to an equilibrium state [2]. Resilient individuals also exhibit adaptive behavior related to social functioning, self-esteem, and somatic health and are less likely to capitulate to illness [3]. Resilience, as part of an individual's personality traits, builds on and changes over time through constant life experiences with the physical and social environment [4].

Assessing resilience in a vulnerable group is very important because high risk populations who are exposed to psychological issues are able to demonstrate their resilience in a better way. Poverty or low income is one of the possible contributors that cause vulnerability among individuals, families, and communities. Furthermore, better jobs and improved economical sustainability of the community are also the significant markers of resilience [5]. However poverty limits an individual's chance of being educated and employed which leads to weaker social integration, loss of control, depressive symptoms and fatalistic position. Hence, it is true that poverty is a kind of adversity, but not everyone is exposed to this adversity in a similar way. Those who adapt this adversity positively are the ones who are resilient [6].

Resilience protects one against negative mental health issues such as depression, helplessness, fear, anxiety and other negative emotions and therefore it helps to reduce their ill-effects [7]. Studies have shown that during adolescence people had higher resilience [8]. Hence, resilient people revert and recover their balance sooner after hardship and misfortune.

Individuals who are resilient often have a peaceful state of mind. Studies have shown that when hardships and difficulties inflict individuals, resilience has helped them to become stronger. Furthermore, evidence shows that resilience is related to enthusiasm, motivation and speedy recovery from physical or psychological traumatic events [9] [10].

Hence, resilience is a positive adaptation that leads to better health outcomes and it is not a generalized individual trait. Few individuals may demonstrate resilience when hardship inflicts them while others may not [6]. To the best of our knowledge the prevalence of resilience among married women has not been studied in South Asian population. The burden of mental illness particularly depression is increasing in Pakistan especially among females [11] [12]. The budget allocated for the treatment of mental illnesses is also minimal; hence for resource poor countries such as Pakistan, it is imperative to understand the prevailing risk factors for resilience that may help us to identify the preventive strategies to promote constructive adaptation.

Hence the objectives of our study were to determine the prevalence of low and high resilience and to evaluate the association of depression and life satisfaction with low resilience among married women of age 20 to 40 years living in urban squatter settlement of Karachi, Pakistan

2. Methods

We conducted a cross-sectional study in two selected urban squatter settlements (Shah Faisal Town and Malir Town) from 10 union councils (UCs) of Karachi, which were clustered based on their low income and one community health center. Although the above two areas had less violence as compared to other UCs but they were selected due to the feasibility. In addition, we had hired and trained the local data collectors from the same

community so people were quiet comfortable in responding to them. In Shah Faisal Town, we recruited participants from Reta Plot with the total population of 42,968. Whereas in Malir, the participants were enrolled from Kala board whose total population size was 17,997.

This study was the secondary objective of our original project whose primary objective was validation of tools for resilience. Thus the sample size (n = 636) for this study was achieved on the basis of our primary objective and the details for the sample size estimation are given elsewhere [13]. A systematic sampling technique was employed as we knew the background of the community structure and the population. The selection of the households was based on the right hand rule. Hence, every 4th house of Malir and 7th house of Shah Faisal was selected. From each house we selected only one female.

We selected our study population from the above communities because we assumed that the married females living there faced a lot of adversities. We included all those females who were currently married, gave an informed consent to participate in the study and were able to converse in Urdu. All those participants were excluded from our study; who had any psychiatric and physical illness or were on any antidepressant drugs.

Data Collection Tools

We used Wagnild's resilience scale for our study [14]. This tool has been validated in Urdu in our original study [13]. This resilience scale comprised of five core characteristics of resilience that included: purposeful life, perseverance, equanimity, self-reliance and existential loneliness. It comprised of 25 items with 7-point Likert scale to rate the individual's evaluation ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The dichotomize cut-off of resilience were <130 for low resilience and >130 for high resilience [2]. We also used a trait well- being inventory to assess life satisfaction. This tool was also validated in Urdu in Lahore, Pakistan. This tool helps to assess the wellbeing of a person. It has seven items that measures cognitive and evaluative aspects of subjective well-being in the present, past and the future. Each item is rated at 6-point Likert-type scale, ranging from 6 ("strongly agree") to 1 ("strongly disagree").

To assess depression we used a 21 item Beck Depression Inventory II (BDI II). Each item consisted of 4 options. Total scores ranged from 0 to 63; higher scores indicated a greater severity of depressive symptoms. This tool has widely been used in Pakistan as it covers the broader behavioural spectrum and is easier to understand. The dichotomize cut-off of depression were a score of <17 for no depression and >17 for depression.

The demographic profile of the participants was evaluated by a form that consisted of socio-demographic details such as: age, education, language, no of family members, type of marriage and its duration, personal health , reproductive history, working status and possession of own vehicle.

We performed analysis using Statistical Package for the Social Sciences (SPSS), version 19.0. Descriptive statistics were computed for categorical variables by computing their frequencies and the distribution of quantitative variables was computed by their means and standard deviations. Prevalence ratio (PRs) with their 95% confidence intervals (CIs) was reported using cox regression model.

All ethical considerations were taken into account. Firstly we obtained approval of the study protocol from Aga Khan University (AKU) Ethical Review Committee (ERC). Permission was also gained from the study sites. We reassured complete confidentiality to the study participants. The data was only accessible to the researchers and the responses were reported in group form and no individual case was identified.

3. Results

3.1. Description of the Study Participants

A total of 636 females were enrolled in the study. The prevalence of low resilience was 139 (21.9%) and high resilience was 497 (78.1%). **Table 1** presents the socio-demographic status of the study participants. The mean age of the study subjects was lower among females with low resilience as compared to their counterpart. 18.7% of females with low resilience and 11.9% of females with high resilience never went to school, while an educational status of higher secondary or above was similar in both the groups. A higher monthly income of >15,000 PKR (>$142.85) was similar in both the groups.

A higher number of participants with low resilience (18.7%) had no formal schooling as compared to their counterpart (11.9%). And similarly about 31.7% of females with low resilience had no informal schooling as well. The mother tongue of majority of the participants in both the groups was Urdu. Most of the participants

Table 1. Sociodemographic characteristics of the study subjects.

Socio-demographic factors	Prevalence of low resilience (n = 139) n (%)	Prevalence of high resilience (n = 497) n (%)
Age (years)		
20 - 24	25 (18)	67 (13.5)
25 - 29	46 (33.1)	127 (25.5)
30 - 34	28 (20.1)	126 (25.4)
35 and above	40 (28.8)	177 (35.6)
Age in years (Mean ± SD)	29.8 (5.7)	31.1 (5.7)
Educational Status		
No formal education	26 (18.6)	59 (11.9)
Up to secondary	84 (60.5)	328 (66)
Higher secondary or above	29 (20.9)	110 (22.1)
Monthly Income (PKR)		
<8000 (< $76.19)	28 (20.1)	75 (15.1)
8001 to 10,000 ($76.19 - $95.25)	16 (11.5)	67 (13.5)
10,001 to 12,000 ($95.25 - $114.3)	76 (54.7)	274 (55.1)
12 001 to 15,000 ($114.3 - $142.85)	10 (7.2)	32 (6.4)
>15,000 (>$142.85)	9 (6.5)	49 (9.9)
Formal Schooling		
Yes	113 (81.3)	438 (88.1)
No	26 (18.7)	59 (11.9)
Informal Schooling		
Yes	95 (68.3)	412 (82.9)
No	44 (31.7)	85 (17.1)
Mother Tongue		
Urdu	126 (90.6)	447 (89.9)
Gujrati/Mamni	7 (5.1)	31 (6.3)
Sindhi/Punjabi/Pushto/Balochi	6 (4.3)	19 (3.8)
Type of Marriage		
Arranged	125 (89.9)	439 (88.3)
Self-choice	14 (10.1)	58 (11.7)
Any gynaecological and obstetric issues		
No issues	88 (63.3)	348 (70)
Miscarriages	44 (31.7)	138 (27.8)
Other reproductive issue	7 (5)	11 (2.2)
Family Type		
Nuclear	63 (45.3)	211 (42.5)
Extended	76 (54.7)	286 (57.5)
Work Status		
Working	14 (10.1)	82 (16.5)
Not working	125 (89.9)	415 (83.5)
Husband Employed		
Not working	3 (2.2)	15 (3)
Working	136 (97.8)	482 (97)
Own Vehicle		
Yes	58 (41.7)	268 (53.9)
No	81 (58.3)	229 (46.1)

had an arranged marriage. Previous gynaecological and obstetric issues such as (miscarriages, and other reproductive issues) were similar in both the groups. Participants with low resilience were less likely to be working as compared to their counterpart. Husbands of majority of the participants in both the groups were employed. More than half (58.3%) of the participants with low resilience had no vehicle of their own.

Table 2 presents depression and life satisfaction among the study participants. It was observed that depression was more evident among females with low resilience (43.9%) versus females with high resilience (26%). Similarly mean life satisfaction score was lower among females with low resilience 20.95 (SD 4.66) as compared to females with high resilience 23.44 (SD 3.66).

3.2. Univariate Analysis

On univariate analysis as presented in **Table 3** we observed that the prevalence of low resilience was 84% higher among females who were depressed as compared to females who were not depressed. On the other hand with every 1 unit increase in the life satisfaction score the prevalence of low resilience was decreased by 10%. Moreover with every 1 year increase in age the prevalence of low resilience was decreased by 3%

Furthermore the prevalence of low resilience was 1.8 times more among females who had no informal education as compared to those who had acquired informal education. Those participants possessing no vehicles were 47% more likely to have low resilience as compared to those owning a vehicle. Formal education and years of schooling were also associated with low resilience at a p value of <0.2 and were therefore included in the multivariable analysis.

3.3. Multivariable Analysis

Table 4(a) presents the first final cox regression model which includes: Depression, age (in years) and informal schooling. It was observed that after adjusting for the other covariates the prevalence of low resilience was 1.76 times more among those who were depressed as compared to those who were not depressed. Moreover with every 1 year increase in age the prevalence of having low resilience was decreased by 4%. The prevalence of low resilience was 1.78 times more among those having no informal schooling versus those with informal schooling with CI (1.23 - 2.54). There was no interaction and confounding found in the model.

Table 4(b) presents the second final cox regression model which includes: Life satisfaction score, age (in years) and informal schooling. It was observed that after adjusting for the other covariates with every one unit increase in the life satisfaction score the prevalence of low resilience was decreased by 9%. Moreover with every 1 year increase in age the prevalence of having low resilience was decreased by 4%. The prevalence of low resilience was 1.74 times more among those having no informal schooling versus those having informal schooling with CI (1.21 - 2.5). There was no interaction and confounding found in the model.

Table 2. Depression and life satisfaction among the study participants.

Depression and life satisfaction	Prevalence of low resilience (n = 139) n (%)	Prevalence of high resilience (n = 497) n (%)
Depression		
No	78 (56.1%)	368 (74%)
Yes	61 (43.9%)	129 (26%)
Life satisfaction (Mean ± SD)	20.95 (4.66)	23.44 (3.66)

Table 3. Univariate analysis for factors associated with resilience.

Variables	Prevalence of low resilience (n = 139) n (%)	Prevalence of high resilience (n = 497) n (%)	Crude prevalence ratio (95% CI)
Depression			
No	78 (56.1%)	368 (74%)	1
Yes	61 (43.9%)	129 (26%)	1.84 (1.31 - 2.56)
Life satisfaction score	20.95 (4.66)	23.44 (3.66)	0.91 (0.88 - 0.94)
Age (in years)	29.8 (5.7)	31.1 (5.7)	0.97 (0.94 - 0.99)
Years of schooling	7.4 (4.47)	8.2 (3.99)	0.97 (0.93 - 1.004)
Formal schooling			
Yes	113 (81.3)	438 (88.1)	1
No	26 (18.7)	59 (11.9)	1.49 (0.97 - 2.28)
Informal schooling			
Yes	95 (68.3)	412 (82.9)	1
No	44 (31.7)	85 (17.1)	1.82 (1.27 - 2.60)
Possession of own vehicle			
Yes	58 (41.7)	268 (53.9)	1
No	81 (58.3)	229 (46.1)	1.47 (1.05 - 2.06)

Table 4. Multivariable analysis for factors associated with resilience. (a) Model 1; (b) Model 2.

(a)

Variables	Prevalence of low resilience (n = 139) n (%)	Prevalence of high resilience (n = 497) n (%)	Crude prevalence ratio (95% CI)	Adjusted prevalence ratio (95% CI)
Depression				
No	78 (56.1%)	368 (74%)	1	1
Yes	61 (43.9%)	129 (26%)	1.84 (1.31 - 2.56)	1.76 (1.27 - 2.51)
Age (in years)	29.8 (5.7)	31.1 (5.7)	0.97 (0.94 - 0.99)	0.96 (0.93 - 0.99)
Informal schooling				
Yes	95 (68.3)	412 (82.9)	1	1
No	44 (31.7)	85 (17.1)	1.82 (1.27 - 2.60)	1.78 (1.23 - 2.54)

(b)

Variables	Prevalence of low resilience (n = 139) n (%)	Prevalence of high resilience (n = 497) n (%)	Crude prevalence ratio (95% CI)	Adjusted prevalence ratio (95% CI)
Life satisfaction	20.95 (4.66)	23.44 (3.66)	0.91 (0.88 - 0.94)	0.91 (0.88 - 0.94)
Age (in years)	29.8 (5.7)	31.1 (5.7)	0.97 (0.94 - 0.99)	0.96 (0.94 - 0.99)
Informal schooling				
Yes	95 (68.3)	412 (82.9)	1	1
No	44 (31.7)	85 (17.1)	1.82 (1.27 - 2.60)	1.74 (1.21 - 2.50)

4. Discussion

Our study reports 21.9% prevalence of low resilience among married women aged 20 to 40 years living in Karachi, Pakistan. However, 78.1% of the participants were highly resilient. To the best of our knowledge, limited information is available about the prevalence of resilience from Pakistani context among similar population. Although studies have reported the prevalence of depression of 30% - 60% among married women in Pakistan but none of them have reported the prevalence of resilience [15] [16]. A possible explanation of our finding could be our country's situation, which has been under a constant threat of violence acts such as: bomb blast, snatching, murders and kidnapping etc. and the intensity of such adversities is increasing day by day. Making the people more or less immune to such challenges. Our study results indicated a higher prevalence of resilience among females that depicts that people are positively responding to such challenges and are therefore exhibiting adaptive and constructive behaviour. Windle also mentioned in one of his study that if one is exposed to constant adversity, it may make him/her more resilient to such challenges [17].

It is observed that among people who are less resilient, when adversity inflicts them it usually results in psychiatric disorders, which includes: post-traumatic stress disorder (PTSD) and major depressive disorder [18]. In our study, we presented two different models firstly to observe the relationship of depression with resilience and secondly to observe the relationship of life satisfaction with resilience. Resilience and depression are inversely proportional which means that individuals who are depressed are more likely to have lower resilience. A study done on African American women has shown that high resiliency score had a statistically significant inverse relationship with depressive symptoms [19]. Our study results also showed that females who were depressed had lower resilience scores which was consistent with the findings from other studies [20]-[23]. The World Health Organization (WHO) has predicted that depression will be the second biggest cause of illness by 2020 [24]. Hence, looking at the increasing trends it is very important to reduce depression by promoting training sessions for enhancement of resilience.

Moreover, our study results also indicated that means life satisfaction scores were lower among females with low resilience. It shows that if ones satisfaction towards life increases, the individual is more likely to be resilient. Studies conducted in communities have also shown that resilience has an association with life satisfaction [25]. Another study highlighted that resilient individuals are those who are socially active and when their life satisfaction scores have been assessed they usually range from mid to high scores. Hence, resilience has a positive effect on an individual's life satisfaction. The WHO emphasizes on prevention of mental health problems by

promoting positive psychological health [26]. Hence it is important to identify factors that help in promoting satisfaction, happiness and sense of fulfilment towards life, which ultimately increases successful adaptation [27].

In our study, women with low resilience were younger as compared to those with high resilience. Our study results were consistent with the finding from other studies *i.e.* with increase in age females tend to become more resilient. With time their coping mechanism becomes better and thus they are able to deal with the upcoming challenges of their life in a better way [28].

In addition, our study results also demonstrated that women who had no formal or informal education were more likely to have low resilience. Studies also report that education plays a very crucial role in enhancing resilience among females. This is due to the fact that, once a female steps out of the house to acquire education it not only broadens her horizon towards life but also helps her to get away from the misery of her life [29]. In addition, a study done by Perna's in 2012 also suggested that higher resilience was more evident among those individuals who had acquired higher education [30].

Our study also found that most women with low resilience were non-working as compared to women with high resilience. Literature also suggests that the working status of women also has an effect on the level of their resilience. As Moneith & Ford-Gilboe in 2002 found that mothers who worked full-time had higher resilience scores as compared to those who worked part-time [31]. Another study done in Pakistan in 2010 also suggests that when females were employed a significant improvement was seen in their self-efficacy [32] hence making them more resilient [33].

Our study also highlighted that majority of the women not possessing a vehicle of their own had low resilience. In our study, this variable was used this as a proxy indicator for socioeconomic status. Hardy in 2004 found that the individuals with higher income had higher resilience when they were inflicted by adversity [34]. Another study by Wagnild also suggests that the financial crisis in an individual's life may lead to discouragement, fear, and a destructive belief and he/she may perceive that his life is useless [26].

4.1. Strengths

To the best of our knowledge this study is one of the first ever study conducted on a representative sample of married women from urban squatter settlements of Karachi. Our study results can be extrapolated on urban married females of Pakistan because our population consists of 60% of married women. Moreover we used a systematic random sampling technique for enrolling our participants which is a robust method of sampling.

Moreover, we used a standardized and rigorous procedure of tool validation before it has been tested on participants. In addition, PI accompanied the data collectors in the field to ensure that the data quality should not be compromised. We have also given mental health supports in the form of referrals and counseling to those who were found depressed.

4.2. Limitations

We had several limitations in our study. Firstly reporting bias was evident in our study as there were some sensitive questions to which the females were reluctant to answer, but we tried our level best to give assurance to the participants about the privacy and confidentiality of their information. Secondly we did not inquire about the religious believes, pregnancy status and postpartum which should be taken into account as it can affect the results of resilience and depression respectively [35] [36].

5. Conclusion

This study indicates that depression and life satisfaction are potential modifiable risk factors for resilience and hence we can improve resilience through interventions that may help us in reducing depression and increasing life satisfaction [20]. Moreover, our study findings also indicated that higher educational status and socioeconomic status were also associated with resilience. Therefore, it is very essential to empower our females by getting them educated that would stabilize them not only financially but also mentally. Hence this will help them to effectively cope up with the adversities of life.

6. Recommendations

Our finding should be utilized to persuade policy makers to extend mental health support for women by encour-

aging health care professional for a health promotion model then the curative model. Our study findings also recommend that health care professionals should also be educated about these modifiable risk factors such as depression and life satisfaction. This may help us in reducing the economic and psychological burden on the society.

Ethical Approval

Ethical approval was taken from Aga Khan University Ethical Review Committee (2333-CHS-ERC-12).

Authors Contribution

SSB: was the principle investigator of this study. This was conducted as part of her MSc Epidemiology & Biostatistics thesis project. She has contributed throughout the study period. This includes study conception, design, data analysis, interpretation of data and drafted the manuscript.

NZ: supported in additional analysis of study data that is presented in the current paper. She assisted in drafting, revising and finalizing the manuscript.

IA: Senior statistician, he has made major contributions in sample size estimation, data management, analysis and interpretation of data. He has given critical feedback in drafting manuscript.

NA: Clinical psychologist has made extensive contribution during the tools translation and has given considerable input in drafting the manuscript.

RK: Professor, senior researcher and a public health nurse, she has made substantial contribution in the conception of the study and given meaningful feedback on manuscript to be published.

OP: Public Health Physician, researcher and epidemiologist, she has made significant contribution in conception and design of the study. She has given critical feedback on the manuscript.

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Quito Municipal Schools—Cohort Study: Self-Perception of Body Image and Factors Related with It

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Abstract

Self-perception of body image is one factor to be considered when planning and performing preventive initiatives and interventions in childhood and adolescence. The aim of this study was to analyse self-perception of body image in relation to body-mass index, physical inactivity, not eating breakfast, dieting, smoking and alcohol consumption or toxic habits. Materials and Methods: using data from the "Quito municipal schools" cohort study 6964 students aged from 9 to 17 years were described using a multivariate log linear model of the multidimensional table generated by the variables. A logistic regression model was then fitted to assess associations via OR. Results: 8.2% perceived themselves as overweight. Of those subjects overweight according to their BMI, 21.8% perceived themselves as such, while among those not overweight according to BMI, 96.8% considered themselves as slim or of normal weight. Among students who were dieting, 15.1% perceived themselves as overweight. Among those pupils who perceived themselves has having excess weight, the most common reasons for dieting were: lose weight (56.8%), be healthier (22.6%), and maintain current weight (8.4%). Self-perception of excess weight interacts with excess weight ($OR_{adjusted}$ 8.42; $CI_{95\%}$ 6.92 - 10.25), no breakfast ($OR_{adjusted}$ 2.83; $CI_{95\%}$ 2.13 - 3.77), diet ($OR_{adjusted}$ 2.38; $CI_{95\%}$ 1.95 - 2.89), and with all the variables except toxic habits ($OR_{adjusted}$ 1.01; $CI_{95\%}$ 0.78 a 1.29). Conclusion: Interventions to prevent obesity in childhood and adolescence ought to take account of specific determinants within the personal, behavioural and socio-environmental factors, such as the promotion of a positive body image.

Keywords

Body Image, Self-Perception, Overweight and Obesity, School Children, Ecuador

1. Introduction

Several systematic reviews have highlighted the serious problem of overweight and obesity in children and young people, based on prevalence estimates, which for most countries lie between 20% and 30% [1]. In Latin America, the prevalence of overweight or obesity estimated for the population aged 0 to 19 years is between 20% and 25%; roughly speaking, this translates into several tens of millions of affected children and adolescents [2]. The conclusion, repeatedly reached, is that preventive measures are necessary. Preventive measures for overweight in childhood and adolescence are issues that directly involve health authorities, those responsible for the health and education of children and adolescents, caregivers of primary care, and parents, not to mention the children themselves [3].

As with any chronic health problem it is very difficult to take preventive measures without knowing how it is perceived by those most affected, in this case children and adolescents. The study entitled "*Quito municipal schools cohort study*: *Baseline results*" investigating 6964 pupils between their sixth and tenth year of basic education during the 2010-2011 academic year, reported that 18.7% ($CI_{95\%}$ 17.8 - 19.6) were overweight, and 7.9% ($CI_{95\%}$ 7.6 - 8.2) were obese (excess weight: 26.6%) (Natalia Romero-Sandoval et al., 2012) [4].

In study mentioned above, self-perception of body image was reported at baseline, by 6545 pupils (93.9%) of whom 7.5% considered themselves overweight and 0.7% obese (excess weight: 8.2%); 5.4% ($CI_{95\%}$ 4.87 - 5.94) reported not breakfasting every day, with differences between the sexes: 6.8% ($CI_{95\%}$ 6.0 - 7.6) in girls, 3.7% ($CI_{95\%}$ 3.1 - 4.4) in boys, and 91.9% of pupils were sedentary or did only light physical activity.

Body image is a multidimensional construct, which broadly describes one's internal, subjective, representation of body size, outline and shape and the feelings, which accompany its characteristics, and those of its different parts [5]. Conception of body image is not only a product of internal perception but is, like so many other concepts, also influenced by context, and it is precisely in this aspect where social influence has the strongest impact [6].

In the context of the "*Quito Municipal schools cohort study*" we proposed to analyse self-perception of body image in relation to body mass index, as well as other factors such as sedentarism, not breakfasting, dieting, smoking and alcohol consumption, in order to try to understand better the behaviour of intervening factors regarding the prevalence found for self-perception of excess weight.

2. Method

2.1. Population

The present study includes 6964 pupils aged 9 to 17 years, participants of the so-called "*Quito municipal schools*" *cohort study*. The study is being conducted in 21 schools of the Quito Metropolitan District. All students matriculated in these schools participate in the study. The Quito research team developed a self-administered questionnaire. Compliance with ethical considerations and criteria of inclusion and exclusion have been explained elsewhere [4].

2.2. Variables

The anthropometric variable was the presence of excess weight (WEx-overweight or obesity) defined through the WHO classification of Body Mass Index for the population aged 5 to 19 years [7]. Dieting (Di), breakfasting (B) [8] and smoking and/or drinking (Th—toxic habits) [9] were conceptualised as dichotomic variables (yes/no). Not engaging in physical activity (Se) was dichotomised as sedentary/not sedentary based on the INTA questionnaire cutoff point [10]. The study objective variable was self-perception of body image (Au) which was

measured using a visual scale of nine silhouette images. The same ones for both males and females, which provide a subjective estimate of weight (self-perception of body image) distributed over a continuous range covering from a very slim silhouette (score = 1) to a very fat one (score = 9), with a score of 5 corresponding to a normal-weight silhouette [11]-[13]. The pupil had to choose the image which best represented their own silhouette. This scale was presented on a full page placed at the end of the questionnaire, which was self-administered. Responses were subsequently recoded into two categories: excess weight (images corresponding to overweight and obese), and not excess weight (images corresponding to thin and normal). Reasons why pupils were dieting were recorded for descriptive purposes. The other variables examined were: sex (G), and age Group (A) in two categories, 9 to 12 years and 13 to 17 years.

3. Statistical Analysis

The multivariate descriptive analysis of this study, using log linear models, aimed to simplify reality while maintaining its verisimilitude, determining which associations in the multidimensional table were significant. Binary interactions were selected by the *forward* method. Of all the models fitted, the most parsimonious was chosen (lowest number of parameters; *i.e.* highest number of degrees of freedom). Of models fitted with similar levels of parsimony we chose those that were easiest to interpret. Comparison between observed and expected frequencies was analysed using Likelihood Ratios (LR) and their significance assessed with a *p*-value greater than or equal to 0.05

On the basis of this result the associations between variables, derived from the model, are reported giving both crude and adjusted OR, 95% confidence intervals and prevalence rates (PR). Analyses were conducted using the package SPSS v.21.

4. Results

Of the total of 6964 pupils, 3708 (53.3%) were girls; 3567 (51.2%) were aged between 9 and 12 years, and 1853 (26.6%) scored for excess weight; 372/6939 (5.4%) reported not breakfasting, and 1219/6695 (18.2%) reported they were not following any type of diet. Of the 6450 pupils who answered the questions about smoking and/or alcohol consumption, 3521 (54.6%) were classified as having toxic habits, 2884/4982 (57.9%) did not engage in any physical activity, and 536 pupils of the 6545 (8.2%) who answered the question on self-perception of body image self-perceived themselves as having excess weight.

Among those whose BMI classified them as having excess weight, 382/1749 (21.8%) self-perceived themselves as such, and among those not classified as having excess weight 4642/4796 (96.8%) considered themselves to be normal or thin.

Finally, the reasons for dieting as reported by the pupils were: to be healthier 42.4%, to lose weight 31.2%, to maintain their weight 13.1%, and due to illness 5.4%. Among pupils dieting 155 (15.1%) self-perceived themselves with excess weight, and 870 (84.9%) dieted but did not perceive themselves as having excess weight.

Among those pupils who perceived themselves has having excess weight, the most common reasons for dieting were: lose weight 88/155 (56.8%), be healthier 35 (22.6%), and maintain current weight 13 (8.4%). Among those who perceived themselves as normal, the reasons for dieting were: be healthier 368 (42.3%), lose weight 270/870 (31.0%) and maintain current weight 120 (13.8%).

A log-linear analysis of the eight-dimensional table resulted in the model presented below, Equation (1).

$$\begin{aligned}\ln f_{ijklmno} = {} & Cte + Au + WEx + Di + A + G + B + Se + Th + Au*WEx + Au*Di \\ & + Au*A + Au*G + Au*B + Au*Se + Au*Th + Di*WEx + Di*Th\end{aligned} \quad (1)$$

The LR of this model was 257.76, with 225 degrees of freedom and p value 0.066.

As may be appreciated, two binary interaction terms in the model are not associated with self-perception, but necessary in order to fit the model: dieting with excess weight (*Di*WEx*), and dieting with toxic habits (*Di*Th*). The association between dieting and excess weight showed that among those following a diet (1519; 18.21%), 41.92% had excess weight, whereas among the 5476 (81.79%) not dieting 23.32% had excess weight (OR_{crude} 2.37 $CI_{95\%}$ 2.08 - 2.70; PR 1.80 $CI_{95\%}$ 1.24 - 1.95). the association between dieting and toxic habits showed that among those following a diet (1519; 18.21%), 41.92% had excess weight, whereas among the 5476 (81.79%) not dieting 23.32% had excess weight (OR_{crude} 2.37 $CI_{95\%}$ 2.08 - 2.70; PR 1.80 $CI_{95\%}$ 1.24 - 1.95). These latter two interac-

tions do not have any additional effect on the relationships between self-perception and the remaining variables since the terms *Au*Di*WEx* and *Au*B*WEx* were not significant.

Table 1 describes the binary associations between self-perception of body image and the rest of variables, providing crude OR with its $CI_{95\%}$, and the ratios of proportions. All variables are associated with self-perception of excess weight; for example the probability of self-perception of excess weight is 68% more in women than in men.

Table 2 presents adjusted OR for the associations between self-perception of body image and the other variables in the model. Self-perception of excess weight interacts with excess weight ($OR_{adjusted}$ 8.42; $CI_{95\%}$ 6.92 - 10.25), no breakfast ($OR_{adjusted}$ 2.83; $CI_{95\%}$ 2.13 - 3.77), diet ($OR_{adjusted}$ 2.38; $CI_{95\%}$ 1.95 - 2.89), and with all the variables. In the case of students who had toxic habits, the association with self-perception of excess weight had a non-significant adjusted OR of 1.01 ($CI_{95\%}$ 0.78 - 1.29).

Table 1. Crude associations between self-perception of body image and the study variables.

Variable		n (%)	Self-perception of excess weight (%)	OR_{crude}	$CI_{95\%}$	PR[a]	$CI_{95\%}$
Gender (G)	Male	3042 (46.48)	5.98	1.77	1.47 - 2.13	1.68	1.43 - 2.01
	Female	3503 (53.52)	10.11				
Age group (A) (years)	9 to 12	3350 (51.18)	6.00	1.83	1.53 - 2.20	1.75	1.48 - 2.07
	13 to 17	3195 (48.82)	10.49				
Weight excess (WEx)	Yes	1749 (26.72)	21.84	8.42	6.92 - 10.25	6.80	5.68 - 8.13
	No	4796 (73.28)	3.21				
Breakfast (B)	Yes	6181 (94.71)	7.57	2.83	2.13 - 3.77	2.49	1.97 - 3.15
	No	345 (5.29)	18.84				
Diet (Di)	Yes	1150 (18.22)	14.70	2.38	1.95 - 2.89	2.16	1.83 - 2.58
	No	5162 (81.78)	6.80				
Toxic habits (Th)	Yes	3431 (54.62)	9.09	1.28	1.06 - 1.53	1.25	1.06 - 1.48
	No	2851 (45.38)	7.26				
Sedentarism (Se)	Yes	2717 (57.83)	9.16	1.54	1.23 - 1.92	1.49	1.21 - 1.83
	No	1981 (42.17)	6.16				

[a]PR = Prevalence Rate.

Table 2. Adjusted associations between self-perception of body image and study variables.

	$OR_{adjusted}$[a]	$CI_{95\%}$	*p* value
Gender (G)	1.70	1.32 - 2.18	<0.001
Age group (A)	2.84	2.19 - 3.70	<0.001
Excess weight (WEx)	10.76	8.30 - 13.95	<0.001
Breakfast (B)	1.55	1.01 - 2.38	0.044
Diet (Di)	1.49	1.14 - 1.96	0.004
Toxic habits (Th)	1.01	0.78 - 1.29	0.96
Sedentarism (Se)	1.60	1.24 - 2.06	<0.001

[a]Reference categories: male, 9 to 12 years, no excess weight, yes breakfast, no diet, no toxic habits, no sedentarism.

5. Discussion

The perception of one's body image constitutes a representation defined based on life history and the affective-social-historic context of the moment, and therefore it refers to a set of representations, perceptions, feelings and attitudes which the individual has elaborated with respect to their body during its existence, through a variety of habits and external influences [14]. In this study we proposed to analyse the interactions of a series of habits which should differentiate the perception of body image in overweight or obese children and adolescents. The use of the log-linear model allowed us to obtain information about binary interactions, which would have gone unnoticed if tackled using logistic regression modelling.

Two associations, while not related with the body image self-perception variable, contribute when fitting the model by providing interesting information about the behaviour of these pupils. These two associations (of dieting with excess weight, of dieting with toxic habits) indicate a true higher presence of excess weight among the pupils who declared dieting. This statistical association, while it may not be causal, leads one to ask whether they dieted because of excess weight, or whether the diet itself caused a weight gain. Similarly, the association between toxic habits and dieting could be interpreted as an increase in toxic habits among school children who report dieting. In 2012 we published, for this group of pupils, the association between excess weight and not breakfasting, as it was found that the crude OR for weight excess and not breakfasting of 1.44 (CI 95% 1.16 - 1.80) was strengthened after adjustment by age, sex, family type, family stage, sedentarism and health zone: OR 1.54 (CI 95% 1.16 - 2.05) [15].

The present analysis of self-perception of body image revealed a high percentage of pupils who perceive themselves erroneously (21.8% among those with excess weight), results similar to those found in other Latin American reports [16] [17]. Self-perceiving body image as overweight or obese was in all cases more common among the pupils who were any of: female, aged over 12 years (*i.e.* 13 to 17 years), did not breakfast, dieted, or sedentary. The fact of having toxic habits loses significance after adjustment for all the other variables.

Of all the variables analysed, the situation which presented the strongest association with self-perception of weight was the excess of measured weight, this tendency persisting when comparing the crude OR (8.42) with the adjusted OR in the model (10.76). These findings are of concern, above all if we consider that the majority of pupils with excess weight (overweight and obese) do not perceive themselves as such, making it more difficult to understand the guidance measures and the effect of counseling.

On the other hand it is noteworthy that a considerable percentage of pupils who perceive themselves as having excess weight follow a diet to reduce weight, do not breakfast, and are sedentary. Despite not perceiving themselves as having excess weight, some pupils still diet; moreover it is also serious that in more than half, the reason given for dieting was to live a healthier life.

Those adolescent females who do not breakfast, tend to eat more, eat fast and do no exercise, are the ones most likely to over-estimate their body image [18]. Not eating breakfast has been associated with dissatisfaction with body image and with ignorance about what is meant by healthy eating [19]. Differences in the prevalence of overweight/obesity with the perception of body image can be explained by differences in age, diet, habits dietetics and life and socio-economic level [20]. Differences in the prevalence of excess weight recorded by measuring BMI and perceived body image have clinical implications, including eating disorders. This aspect should be considered in efforts to advance guidance to adolescents and their families [21].

Interventions to prevent childhood and adolescent obesity should tackle specific determinants, within the set of personal, behavioural and socio-environmental factors, such as promotion of a positive image of the body, and reduction of unhealthy weight controlling behaviours [22].

Limitations

We recognise that in this study the measurement of perception of body image, which may depend on the scale used, could introduce a variety of restrictions on the associations reported.

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Depression, Anxiety and Stress among Undergraduate Students: A Cross Sectional Study

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Abstract

Background: The prevalence of moderate to extremely severe level of depression, anxiety and stress among undergraduate students in Malaysia was ranging from 13.9% to 29.3%, 51.5% to 55.0% and 12.9% to 21.6% respectively. Medical students have been shown to be more inclined to emotional disorders, especially stress and depression, as compared to their non-medical peers. Therefore, the objective of this cross-sectional study was to determine the prevalence of depression, anxiety and stress among undergraduate students in Melaka Manipal Medical College. Methods: Self-administered questionnaires consisted of 3 sections: demographic data, socioeconomic data and DASS 21 questions. Data processing was performed using Microsoft Excel 2010. The psychological status was categorized according to the presence or absence of depression, anxiety and stress. The data were analyzed using Epi Info™ 7.1.4 and SPSS. Student's t-test, Fisher Exact and Chi-square test were used to analyze the associations. P-value of <0.05 was considered as statistically significant. Multiple logistic regression was used to calculate the adjusted Odd Ratio. Results: A total of 397 undergraduates participated in this study. The prevalence of the depression, anxiety and stress, ranging from moderate to extremely severe, was 30.7%, 55.5%, and 16.6% respectively. Multiple logistic regression shows significant associations between relationship status, social life and total family income per month with depression. Only ethnicity has been shown to be significantly associated with anxiety. There are significant associations between ethnicity and total family income per month with stress. No other factors have been found to be significantly associated. Conclusion: Depression, anxiety and stress have a high detrimental effect to individual and society, which can lead to negative outcomes including medical dropouts, increased suicidal tendency, relationship and marital problems, impaired ability to work effectively, burnout and also existing problems of health care provision. With that, there is a need for greater attention to the psychological wellbeing of undergraduate students to improve their quality of life.

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Keywords

Prevalence, Depression, Anxiety, Stress, Undergraduates, Melaka Manipal Medical College

1. Introduction

According to WHO definition, "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [1]. Many people perceive health as being physically well and free of any diseases, and thus they have neglected the importance of mental health. Therefore, mental health is an irreplaceable aspect of health. Poor mental health will lead to many life threatening diseases such as cardiovascular disease deaths, deaths from external causes or even cancer deaths, which was only associated with psychological distress at higher levels [2].

Depression, anxiety and stress levels in the community are considered as important indicators for mental health. Failure to detect and address to these emotional disorders will unfortunately lead to increased psychological morbidity with undesirable impacts all through their professions and lives [3].

In public medical universities, the prevalence of depression and anxiety ranged from 10.4% to 43.8% and 43.7% to 69% respectively. However, the prevalence of depression and anxiety among private medical students has been estimated to be 19% to 60% and 29.4% to 60% respectively [4]. In Hong Kong, a web-based survey of stress among the first-year tertiary education students found that 27% of the respondents were having stress with moderate severity or above [5]. While in India, a study was conducted to focus on the prevalence of current depression, anxiety, and stress-related symptoms among young adults, ranging from mild to extremely severe, which was 18.5%, 24.4%, and 20% respectively. Clinical depression was present in 12.1% and generalized anxiety disorder in 19.0%. Co-morbid anxiety and depression were high, with about 87% of those having depression also suffering from anxiety disorder [6].

A research conducted in Malaysia showed that the prevalence of moderate to extremely severe level of depression, anxiety and stress among undergraduate students was ranging from 13.9% to 29.3%, 51.5% to 55.0% and 12.9% to 21.6% respectively [7] [8].

With respect to the source of stressors, the top ten stressors chosen by the students were mainly academic and personal factors [9]. As indicated by Porter, there were up to 60% of university dropouts recorded; the majority of these students leave within the first two years. Steinberg and Darling specified that 50% of university students who consulted mental health service complained of challenges in study, anxiety, tension, and depression which contributed to poor grades in courses [10].

In Malaysia, tertiary learning institutions offering medical degrees have expanded in numbers in the previous couple of years to meet the nation's demand for more graduate doctors and medical personnel. All things considered, the environment of medical education and practice has long been viewed as a distressing factor [11]. Medical students have been shown to be more inclined to emotional disorders, especially stress and depression, as compared to their non-medical peers.

Therefore, we conducted the cross-sectional study to determine the prevalence of depression, anxiety and stress among undergraduate students in Melaka Manipal Medical College.

2. Methodology

This cross-sectional study was done among undergraduate students, from September to October 2014 in Melaka Manipal Medical College (Melaka Campus), Malaysia.

We calculated the sample size using prevalence of 55.0% [7]. With the 95% CI and precision of 5%, we require a total sample size of 384 students. After accommodate the non-response rate of 10%, we distributed 430 sets of the questionnaires. A total of 397 undergraduate students participated in this study. Written informed consent was taken from every participant. The students who were absent for class on the day of data collection were excluded from this study.

This study helps to arbitrate the differences in psychological distress with respect to the demographic variables among MMMC students. There are several stress reducing factors (stress busters) and are divided into 6 groups: friends, gym workouts, physical factors, co-curricular activities, teacher's patronage and personal hobbies.

Self-administered questionnaires consisted of 3 sections: Demographic data, socioeconomic data and DASS 21 questions. Demographic data consists of 8 questions based on personal details: age, gender, ethnicity, study course, residence, relationship status, academic performance and social life status. The socioeconomic data include parental marital status and total family income per month.

The Depression Anxiety Stress Scale (DASS 21, Psychology Foundation of Australia) was used to screen mental health problems among the population [12]. The DASS 21 is a 21 item self report questionnaire devised to measure and assesses the severity of a range of symptoms common to depression, anxiety and stress. However, it is not a categorical measure of clinical diagnoses of the said conditions [13].

In completing the DASS 21 questionnaire, the individual is required to indicate the presence of a symptom over the previous week. DASS 21 consists of 21 questions in total which was designated for participants to specify their emotional level for each statement. In total, there are 7 items for each depression, anxiety and stress assessment [14]. Each item is scored from 0 (did not apply to me at all over the last week) to 3 (applied to me very much or most of the time over the past one week) [15]. Because the DASS 21 is a short form version of the DASS (the Long Form has 42 items), the final score of each item groups (depression, anxiety and stress) must be multiplied by two (×2) [12]. The minimum score is zero and the maximum score is 42. The final score of DASS can be categorized as in **Table 1**.

Studies have shown that the DASS 21 score have validity in the measurement of the degree of depression, anxiety and stress in the person. It also has high reliability in terms of usage in a clinical and non-clinical setting [16] [17].

Data processing was performed using Microsoft Excel 2010. The psychological status was categorized according to the presence or absence of depression, anxiety and stress. Data was analyzed using Epi Info™ 7.1.4 and SPSS. Descriptive statistics such as frequency (%), mean and standard deviation (SD) were also described. The Student's t-test, Fisher's exact test and Chi-square test were used for bivariate analysis. The variables which had P-value < 0.1 were included in multiple logistic regression analysis. P-value of <0.05 was considered as statistically significant.

The study was carried out by giving a brief introduction on the purpose of the research and the procedures involved prior to distribution of questionnaire. Participants were then informed about their rights to not participate in the study and written consent was taken before they answered the questionnaire. Confidentiality of participants' information given was preserved. This study was conducted under the permission of the research committee of Melaka Manipal Medical College (MMMC).

3. Results

Table 2 shows the descriptive statistics of demographic and socioeconomic factors among respondents. The average age of the respondents is 21.9 years old with a range of 18 to 24 years old. 63.2% of the respondents are female and the remaining 36.8% are male respondents. Chinese contribute to the largest portion of the ethnic group (34.5%), followed by Malay (33.3%), Indian (28.5%) and lastly others (3.8%). Many of the respondents are single (73.8%), followed by those who are in the relationship (26.2%). For the academic performance, 2.8% and 28.0% of the respondents are very satisfied and satisfied with their results respectively. However, most of the respondents (69.3%) have least satisfaction with their performance. Besides, 7.1% respondents are very satisfied with their social life, 49.1% are just satisfied, while 43.8% has least satisfaction.94.5% of the respondents' parents are happily married, 3.5% respondents are either orphan or from single parent family.

Table 1. Severity of depression, anxiety and stress.

Rating	Depression	Anxiety	Stress
Normal	0 - 9	0 - 7	0 - 14
Mild	10 - 13	8 - 9	15 - 18
Moderate	14 - 20	10 - 14	19 - 25
Severe	21 - 27	15 - 19	26 - 33
Extremely Severely	28+	20+	37+

Table 3 shows the prevalence of depression, anxiety and stress among undergraduates. Depression, anxiety and stress are divided into 5 categories, which are normal, mild, moderate, severe and extremely severe. In depression, 54.2% of the respondents are normal while 15.1%, 20.9%, 6.3% and 3.5% of the respondents have mild, moderate, severe and extremely severe depression respectively. Mean ± Standard Deviation for depression score is 9.8 ± 7.9. For the anxiety status, 36.0% of the respondents are free from it while the rest, ranging from

Table 2. Descriptive statistics of socio-demographic factors among medical undergraduates (n = 397).

Variables	Numbers (%)
Age (Mean ± Std Deviation)	21.9 ± 2.2
Gender	
Female	251 (63.2)
Male	146 (36.8)
Ethnicity	
Chinese	137 (34.5)
Malay	132 (33.3)
Indian	113 (28.5)
Others	15 (3.8)
Relationship Status	
In a relationship	104 (26.2)
Single	293 (73.8)
Academic Performance	
Satisfied	111 (28.0)
Least satisfied	275 (69.3)
Very satisfied	11 (2.8)
Social Life	
Satisfied	195(49.1)
Least satisfied	174 (43.8)
Very satisfied	28 (7.1)
Parental Status	
Married	375 (94.5)
Orphan/Single parent	22 (3.5)

Table 3. Prevalence of depression, anxiety and stress among undergraduates (n = 397).

Variables	Number (%)
Depression	
Normal	215 (54.2)
Mild	60 (15.1)
Moderate	83 (20.9)
Severe	25 (6.3)
Extremely severe	14 (3.5)
Mean ± Std Deviation	9.8 ± 7.9
Anxiety	
Normal	143 (36.0)
Mild	34 (8.6)
Moderate	121 (30.5)
Severe	4.0 (10.1)
Extremely severe	59 (14.9)
Mean ± Std Deviation	11.0 ± 7.7
Stress	
Normal	270 (68.0)
Mild	61 (15.4)
Moderate	43 (10.8)
Severe	20 (5.0)
Extremely severe	3 (0.8)
Mean ± Std Deviation	12.7 ± 12.8

8.6% to 30.5% have mild to extremely severe anxiety. Mean ± Standard Deviation for anxiety score is 11.0 ± 7.7. Moreover, 68.0% of the respondents do not have any stress. Those who are with mild level of stress consist of 15.4%, followed by moderate level of stress (10.8%), severe level of stress (5.0%) and lastly extremely severe level of stress (0.8%). Mean ± Standard Deviation for stress score is 12.7 ± 12.8.

Table 4 shows the association between socio-demographic factors and depression, anxiety and stress among the respondents. There are no significant association between socio-demographic factors and depression. However, the students who are least satisfied to social life (Unadjusted OR 2.0; 95% CI 1.3 - 3.1) and the students who have total family income of <RM1000 per month (Unadjusted OR 3.4; 95% CI 1.0 - 11.3) are significantly more likely to have depression. Regarding anxiety, there are no significant association between socio-demographic factors and anxiety, but Malay students are significantly more likely to have anxiety (Unadjusted OR 2.1; 95% CI 1.2 - 3.4). Regarding stress, there are no significant association between socio-demographic factors and stress. However, the students who are least satisfied to social life (Unadjusted OR 1.6; 95% CI 1.0 - 2.4) and the students who have total family income of <RM1000 per month (Unadjusted OR 6.2; 95% CI 1.9 - 20.7) are significantly more likely to have stress.

The variables which had P-value < 0.1 in bivariate analysis were included in multiple logistic regression analysis. **Table 5** shows the multiple logistic regression analysis of socio-demographic factors and depression,

Table 4. Bivariate analysis of socio-demographic factors and depression, anxiety and stress.

Variables	Depression (n = 182) Unadjusted OR (95% CI)	Anxiety (n = 256) Unadjusted OR (95% CI)	Stress (n = 127) Unadjusted OR (95% CI)
Age[t] (Mean ± SD)	22.1 ± 2.0	22.0 ± 2.3	22.1 ± 2.0
Sex[C]			
Female	1 (Reference)	1 (Reference)	1 (Reference)
Male	1.0 (0.7 - 1.6)	0.9 (0.6 - 1.4)	0.8 (0.5 - 1.2)
Ethnicity[C]			
Chinese	1 (Reference)	1 (Reference)	1 (Reference)
Malay	1.5 (0.9 - 2.4)	2.1 (1.2 - 3.4)**	1.8 (1.1 - 3.1)
Indian	1.4 (0.8 - 2.3)	1.6 (0.9 - 2.7)	1.4 (0.8 - 2.4)
Others	1.3 (0.4 - 3.8)	0.9 (0.3 - 2.7)	1.5 (0.5 - 4.6)[F]
Study Course[C]			
FIS	1 (Reference)	1 (Reference)	1 (Reference)
MBBS	1.6 (1.0 - 2.6)	0.9 (0.6 - 1.5)	1.3 (0.8 - 2.3)
Residence[C]			
Non-hostelile	1 (Reference)	1 (Reference)	1 (Reference)
Hostelite	1.0 (0.6 - 1.4)	1.0 (0.7 - 1.5)	0.8 (0.5 - 1.2)
Relationship Status[C]			
In a relationship	1 (Reference)	1 (Reference)	1 (Reference)
Single	1.4 (0.9 - 2.1)	1.5 (1.0 - 2.4)	0.9 (0.6 - 1.5)
Academic Performance[C]			
Satisfied	1 (Reference)	1 (Reference)	1 (Reference)
Least satisfied	1.5 (1.0 - 2.4)	1.4 (0.9 - 2.2)	1.2 (0.8 - 2.0)
Very satisfied[F]	1.3 (0.4 - 4.6)	0.8 (0.2 - 3.0)	1.4 (0.4 - 5.1)
Social Life[C]			
Satisfied	1 (Reference)	1 (Reference)	1 (Reference)
Least satisfied	2.0 (1.3 - 3.1)***	1.5 (0.9 - 2.2)	1.6 (1.0 - 2.4)*
Very satisfied	0.6 (0.3 - 1.5)	0.6 (0.3 - 1.4)	0.7 (0.3 - 1.8)
Parental Status[C]			
Married	1 (Reference)	1 (Reference)	1 (Reference)
Orphan/Single parent	0.8 (0.3 - 1.9)	0.5 (0.2 - 1.3)	0.6 (0.2 - 1.7)
Total Family Income per Month[C]			
>RM6000	1 (Reference)	1 (Reference)	1 (Reference)
<RM1000	3.4 (1.0 - 11.3)*	2.0 (0.5 - 7.5)[F]	6.2 (1.9 - 20.7)[F]**
RM1000 - RM3000	1.1 (0.6 - 1.9)	1.1 (0.6 - 1.9)	1.1 (0.6 - 2.0)
RM3001 - RM6000	1.3 (0.8 - 2.1)	0.8 (0.5 - 1.3)	1.2 (0.8 - 2.0)

[t]Student's t-test; [C]Chi-square; [F]Fisher exact; *P value < 0.05; **P value < 0.01; ***P value < 0.001.

Table 5. Multiple logistic regression analysis of socio-demographic factors and depression, anxiety and stress.

Variables	Depression Adjusted OR (95% CI)	Anxiety Adjusted OR (95% CI)	Stress Adjusted OR (95% CI)
Ethnicity			
Chinese	1 (Reference)	1 (Reference)	1 (Reference)
Malay	1.5 (0.9 - 2.4)	2.1 (1.2 - 3.6)**	2.0 (1.2 - 3.5)*
Indian	1.6 (1.0 - 2.8)	1.5 (0.9 - 2.6)	1.5 (0.8 - 2.6)
Others	2.0 (0.6 - 6.0)	1.0 (0.3 - 2.9)	1.8 (0.5 - 5.8)
Study Course			
FIS	1 (Reference)	1 (Reference)	1 (Reference)
MBBS	1.7 (1.0 - 3.2)	0.7 (0.4 - 1.3)	1.1 (0.6 - 2.1)
Relationship Status			
In a relationship	1 (Reference)	1 (Reference)	1 (Reference)
Single	1.6 (1.0 - 2.7)*	1.5 (0.9 - 2.4)	1.0 (0.6 - 1.6)
Academic Performance			
Satisfied	1 (Reference)	1 (Reference)	1 (Reference)
Least satisfied	0.9 (0.5 - 1.6)	1.3 (0.7 - 2.23)	0.9 (0.5 - 1.6)
Very satisfied	1.8 (0.4 - 7.0)	1.3 (0.4 - 4.9)	2.0 (0.5 - 7.9)
Social life			
Satisfied	1 (Reference)	1 (Reference)	1 (Reference)
Least satisfied	2.1 (1.3 - 3.5)**	1.5 (0.9 - 2.4)	1.6 (1.0 - 2.7)
Very satisfied	0.5 (0.2 - 1.3)	0.6 (0.2 - 1.3)	0.5 (0.2 - 1.4)
Total Family Income per Month			
>RM6000	1 (Reference)	1 (Reference)	1 (Reference)
<RM1000	3.8 (1.0 - 13.8)*	2.8 (0.7 - 11.2)	7.7 (2.1 - 28.2)**
RM1000 - RM3000	1.0 (0.5 - 1.8)	1.0 (0.5 - 1.8)	1.0 (0.6 - 2.0)
RM3001 - RM6000	1.3 (0.8 - 2.0)	0.8 (0.5 - 1.2)	1.2 (0.7 - 2.0)

*P value < 0.05; **P value < 0.01; ***P value < 0.001.

anxiety and stress. Regarding depression, the students who are single (Adjusted OR 1.6; 95% CI 1.0 - 2.7), least satisfied to social life (Adjusted OR 2.1; 95% CI 1.3 - 3.5) and having total family income <RM1000 per month (Adjusted OR 3.8; 95% CI 1.0 - 13.8) are significantly more likely to have depression. However, there are no significant association between other socio-demographic factors and depression. Similarly, there are no significant association between socio-demographic factors and anxiety, but Malay students are significantly more likely to have anxiety (Adjusted OR 2.1; 95% CI 1.2 - 3.6). Regarding stress, Malay students are significantly more likely to have stress (Adjusted OR 2.0; 95% CI 1.2 - 3.5) and having total family income <RM1000 per month (Adjusted OR 7.7; 95% CI 2.1 - 28.2). There are no significant association between other socio-demographic factors and stress.

4. Discussion

The objective of the study is to determine the prevalence of depression, anxiety and stress among undergraduate students in Malaysia. In the present study, prevalence for moderate to extremely severe depression, anxiety and stress are 30.7%, 55.5%, and 16.6% respectively. This is lower than one study done among Malaysian university students whereby the percentages are 37.2%, 63.0%, and 23.7% for depression, anxiety and stress [18]. A higher prevalence of depression, anxiety and stress could be attributed to the fact that enormous syllabus has to be covered in a limited time period, sudden change in their style of studying, thought of appearing or failing in exams, inadequate time allocated to clinical posting have become the main factors. Furthermore, social stress such as relationship with peer groups, hostel friends, displacement from home and financial problem have also potentially psychologically influence undergraduate students greatly. This study is conducted done to determine the differences in elevated psychological distress with respect to the demographic variables among MMMC students.

To the best of our knowledge, no study has found association between relationship status and depression. We hypothesised that single individuals are more likely to have depression due to the fact that they may lack a partner to express their daily stressors, thereby lacking social support and social buffer. Social life has invariably

been associated with depression. It has been shown that individuals, who are satisfied with their social life and thus, a good social support, has a good social support, has shown more resilience to stressors in life, hence acting as a life buffer. This minimizes the risk of developing depression [19] [20]. In the present study, students with total family income per month of less than RM1000 are more likely to have depression. This is consistent with studies which also shows that lower socioeconomic status are strongly associated with major depressive disorder and depressive symptomatology [21]. Lefkowitz *et al*. also found that lower family income are associated with higher prevalence of childhood depression [22]. Students with lower total family income per month may encounter problem with everyday's expenses and thus contributing to the precipitating factors for depression.

Malay ethnicity has been shown to be significantly more likely in developing anxiety and stress. According to Khadijah Shamsuddin *et al*., they found that Malay ethnicity has a higher stress score on DASS as compared to their other ethnic counterparts [18]. This could be due to cultural differences. We postulate that Malays are more susceptible to stress due to cultural factors. However, this is in contradiction to an earlier study on medical students in a Malaysian university, which reported no difference in emotional distress among Malays, Chinese, Indians and students from other ethnicity [23]. Total family income per month less than RM1000 is significantly associated with risk of having stress. We postulate that this to be due to addition of stressors to the lives of students, particularly to sustain everyday's living expenditures as well as the already-costly medical education. One study has also shown that socioeconomic status, especially parents' education and income, indirectly relates to children's academic achievement through parents' belief and behaviours [24].

Our study did not find any significant association between age, sex, study course, residence, academic performance and parental status with depression, anxiety and stress.

To pinpoint some limitations of our study, we had chosen an analytical cross-sectional study which has the disadvantage of being unable to establish the incidence rate of the mental health status of MMMC students. We can only determine the prevalence of the psychological distress among the students. Besides, lack of baseline information concerning mental status of medical students has become a limitation of our study. Since our study was done only among the medical students from a single private medical college, who are more likely to have high levels of stress, selection bias might be present. Associations among all these might not be representative of the general population because this study is only focus on undergraduates.

Other than this, the students may not remember the events happened last week which might disturb their emotion. Also, the life events happen might not cause an immediate change in an individual's mental status. Hence, to understand the temporal relationship and the mechanism of how these risk factors may affect one's mental state, it will require not only longitudinal data throughout the lifetime but also regular assessment of individual's mental health with the consistent measurement of level of exposure to each risk factor intermittently.

Emotional disturbances in the form of depression, anxiety and stress exist are existing in high rate among undergraduate science students that require early intervention [25]. We recommend that to achieve a healthy life as per define by WHO [1], students are encouraged to spend adequate time on their social and personal lives and emphasize the importance of health promoting coping strategies which might be helpful in overcoming stress throughout their medical condition. Academy management-wise, a student counseling centre with adequate facilities and qualified staff should be established in the campus to provide a medium for students to seek appropriate help for mental health problems. Also, preventive programming efforts should be introduced and begin early in medical education and address a wide variety of concerns from academic to interpersonal relationship and financial worries. Early signs of depressive symptoms among students should be addressed. Intervention will help students to cope with stress to make a smooth transition through medical college and also to adjust to different learning environments during different phases of medical education.

5. Conclusion

In conclusion, depression, anxiety and stress have a high detrimental effect to individual and society, which can lead to negative outcomes including medical dropouts, increased suicidal tendency, relationship and marital problems, impaired ability to work effectively, burnout and also existing problems of health care provision. With that, there is a need for greater attention to the psychological wellbeing of undergraduate students to improve their quality of life.

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Reducing Participation Bias in Case-Control Studies: Type 1 Diabetes in Children and Stroke in Adults

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Abstract

Background: Case-control studies have been used extensively in determining the aetiology of rare diseases. However, case-control studies often suffer from participation bias in the control group, resulting in biased odds ratios that cause problems with interpretation. Participation bias can be hard to detect and is often ignored. Methods: Population data can be used in place of the possibly biased control group, to investigate whether participation bias may have affected the results in previous studies, or in place of controls in future studies. We demonstrate this approach by re-analysing and comparing the results of two case-control studies: Type 1 diabetes in Yorkshire children and stroke in Indian adults. Findings: Using population data to represent the control groups reduced the width of the confidence intervals given in the original studies and confirmed the findings for the two diabetes risk factors used; caesarean birth (odds ratio (OR) = 2.12 (1.53, 2.95) compared with 1.84 (1.09, 3.10)) and amniocentesis (OR = 3.38 (2.09, 5.47) compared with 3.85 (1.34, 11.04)). The three stroke risk factors investigated were found to have increased odds ratios when using population data; hypertension (OR = 5.645 (5.639, 5.650) compared with 3.807 (2.114, 6.856)), diabetes (OR = 12.212 (12.200, 12.224) compared with 3.473 (1.757, 6.866)) and smoking (OR = 5.701 (5.696, 5.707) compared with 2.242 (1.255, 4.005)). Interpretation: Participation bias can greatly affect the results of a study and cause some potential risk factors to be over- or underestimated. This approach allows previous studies to be investigated for participation bias and presents an alternative to a control group in future studies, while improving precision.

Keywords

Case-Control, Diabetes, Participation Bias, Stroke, Selection Bias

1. Introduction

Participation bias, a subset of selection bias, affects many study types and is often ignored by authors [1]. It is well documented that case-control studies can be affected by participation bias in the control group [2]-[4], which can result in an over- or underestimation of odds ratios [5].

In recent years, routine data has become more widely available; partially due to advances in technology, increased routine data collection and emphasis on data sharing, along with the recent move towards and focus on Big Data. Linked data sources such as hospital episode statistics (HES) [6], the clinical practice research database (CPRD) [7] and Research One [8] are allowing information to be shared more easily and further research to be carried out. Often these databases hold much more information, on a greater number of people, than could easily be collected through a study. Some census databases also contain information relating to every member in a population [9] [10].

We propose the use of population data in place of control data, along with the case data from a case-control study. We demonstrate this method by reanalysing a Yorkshire childhood diabetes case-control study and an Indian study of stroke. We explain how potential participation bias can be identified and show how to improve precision of the estimated odds ratios. We therefore present a method to reduce the amount of bias from the control group; which can be used in place of controls in future case-control studies to save time and resources, or as an approach to evaluate the results from previous studies.

2. Methods

2.1. The Data

The diabetes data set used was taken from a case-control study [11], which had recorded cases of children under 16 years diagnosed with insulin-dependent diabetes mellitus (IDDM), or Type 1 diabetes, while resident in the area of the former Yorkshire Regional Health Authority, since 1978, with data collected 1993-1994. The stroke data set used 100 computed tomography (CT) proved cases of stroke, with age and sex matched controls, from hospital attendees in India [12]. These data sets have been used to demonstrate the effect of participation bias on the analysis of risk factors, and the potential for population data to provide improved estimates. The published results have been compared with results generated when population data is used in place of control data.

2.2. The Population Data

There are three values required from the population for each odds ratio replicated, which must be correct for the time and location of the original study:

1) The exposure in the population;
2) The size of the population;
3) The number of cases in the population.

For these examples, various sources were used, but all were publicly accessible to demonstrate the ease of the method (**Table 1**). However, more recent or detailed data could be obtained from previous studies or databases if available, which would be likely to improve the accuracy of the results.

2.3. The Proposed Method

The steps required to use population data in place of control data are as follows:

1) Use the population and case numbers to calculate the number of controls.
2) Use the exposed population and exposed case data to calculate the number of exposed controls.
3) Use the previous steps to calculate the remaining number of unexposed population, cases and controls.
4) Use these values to calculate odds ratios from a contingency table or using logistic regression.

These steps are shown below for the caesarean exposure in the diabetes data set as an example. This was repeated for exposures in both the diabetes and stroke data sets, using the methods used in the original study. The odds ratios published were also replicated, with all calculations using R [22].

Example, Caesarean:

$$\text{population} = \text{cases} + \text{controls}$$
$$774{,}840 = 248 + \text{controls}$$
$$774{,}840 = 248 + 774{,}592$$

Table 1. Population data used for the proposed method.

Diabetes data set			
Required population data	Specific requirement	Value collected	Source
1. Exposure in the population	Caesarean births in Yorkshire	9% of births	Birth Choice UK website [13]
	Amniocenteses in Yorkshire	15,000 in Britain each year	Cambridge Fetal Care [14]
2. Size of the population	Number of children in Yorkshire	774,840	Office of population censuses and surveys [15]
3. The number of cases in the population	Diabetes cases in Yorkshire	248	Yorkshire Childhood Diabetes Register [11]
Stroke data set			
Required population data	Specific requirement	Value collected	Source
1. Exposure in the population	Hypertension in India	23%	World Health Statistics [16]
	Diabetes in India	65.1 million	International Diabetes Federation [17]
	Smoking in India	14.925%	World Bank [18] [19]
2. Size of the population	Population size of India	1.237 billion	World Bank [20]
3. The number of cases in the population	Stroke cases in India	18,012,222	Rightdiagnosis.com [21]

$$\text{exposed population} = \text{exposed cases} + \text{exposed controls}$$

$$(0.09 \times 774{,}840) = \left(\frac{34}{196} \times 248\right) + \text{exposed controls}$$

$$69{,}736 = 43 + 69{,}693$$

$$\text{not exposed population} = \text{not exposed cases} + \text{not exposed controls}$$

$$(774{,}840 - 69{,}736) = (248 - 43) + (774{,}592 - 69{,}693)$$

$$705{,}104 = 205 + 704{,}899$$

This can be written generally; let P be the number of people in the population of interest, D be the disease of interest, E be the exposure of interest, a be the number of exposed cases and c be the number of unexposed cases. Values from the population can then be substituted into the equations below. The necessary steps are in bold.

$$P = P_{D=1} + P_{D=0}$$

$$\boldsymbol{P_{D=0} = P - P_{D=1}}$$

$$P_{E=1} = P_{D=1,E=1} + P_{D=0,E=1}$$

$$P_{D=1,E=1} = \frac{a}{a+c} \times P_{D=1}$$

$$\boldsymbol{P_{D=0,E=1} = P_{E=1} - P_{D=1,E=1}}$$

$$P_{E=0} = P_{D=1,E=0} + P_{D=0,E=0}$$

$$\boldsymbol{P_{E=0} = P - P_{E=1}}$$

$$\boldsymbol{P_{D=1,E=0} = P_{D=1} - P_{D=1,E=1}}$$

$$\boldsymbol{P_{D=0,E=0} = P_{D=0} - P_{D=0,E=1}}$$

3. Results

Table 2 shows the odds ratios and confidence intervals calculated using the population values, along with the

Table 2. Odds ratios and 95% confidence intervals comparing the published odds ratios with those generated using population data.

Data set	Exposure of interest	Published odds ratio (95% confidence interval)	Population data odds ratio (95% confidence interval)
Diabetes	Caesarean	1.81 (1.07, 3.04)	2.12 (1.53, 2.95)
	Amniocentesis	3.85 (1.34, 11.04)	3.38 (2.09, 5.47)
Stroke	Hypertension	3.807 (2.114, 6.856)	5.645 (5.639, 5.650)
	Diabetes	3.473 (1.757, 6.866)	12.212 (12.200, 12.224)
	Smoking	2.242 (1.255, 4.005)	5.701 (5.696, 5.707)

published odds ratios from the corresponding original study. It can be seen from **Table 2** that the population odds ratios support the findings from the original analysis of significantly raised odds ratios for birth by caesarean and amniocentesis in the diabetes data set. The results for the stroke data set all have increased odds ratios for the population data when compared with the initial study, however the confidence intervals of the hypertension population odds ratio and the published odds ratio do overlap. This could suggest support from the population data for the hypertension odds ratio but possible disagreement between the published and population odds ratios for the exposures diabetes and smoking; with greater disagreement when considering diabetes. One possible cause for this disagreement could be participation bias. Note the controls in the Indian stroke study were hospital attendees; this could have resulted in Berkson's bias [23], since those who smoke, have hypertension, or have diabetes, may have associated conditions requiring hospital admission. This higher proportion of smokers, hypertensive controls and diabetics in the control group than in the population would have resulted in lower odds ratios in the published results. Hence participation bias is likely to have occurred.

Table 2 also shows the population odds ratios have much narrower confidence intervals than the published odds ratios. This corresponds to the increase in the number of subjects considered in the population odds ratios compared with the number in the original case-control study.

4. Discussion

Participation bias can cause the results from studies to be inaccurate [5], especially in case-control studies where certain potential controls are more likely to participate than others. Researchers who may wish to use our method in place of, or in conjunction with, case-control studies, may have access to medical records or similar information which is likely to give more accurate odds ratios which are less affected by participation bias. In addition, the proposed method allows the identification of participation bias, as shown in the Indian stroke example, where Berkson's bias has been suggested. The method can also be extended to allow for matching in the original study, by stratifying or adding the confounder to the regression model, using more detailed population data, such as young and old stroke cases or male and female smokers.

Approximations may need to be made when data are available but not in the required format. For example, it was assumed that the number of 15 year old in Yorkshire was approximately a fifth of the 15 - 19 year old Yorkshire population [15]. Matched case-control studies may also be more time-consuming as more detailed population data are required, along with the confounding variable data for the cases. The case data will be available for new studies, but may not always be available for past studies. This was true for the Indian stroke study, where an unmatched analysis was required as an approximation, since the details linking the confounding variables to the cases were not published. As data availability has increased over the last few decades and census questions have become more detailed, similar population data for studies more recent than the diabetes study may be more readily available. It can, however, still be used as a tool to revisit older studies to confirm or question their findings. It is also likely that those working in these research areas would have access to databases or information from previous studies, allowing more accurate population data to be used. There will be circumstances where the required relevant population data will not be available and then a case-control study would be preferable.

This proposed method of using population data is very simple and quick to apply; far cheaper and easier than recruiting controls for a case-control study. This approach allows the study time and resources to be focused on

the collection of case data, giving a larger sample of cases than previously possible. The method allows an efficient way to conduct a new large study, with less effort in the control group than previously required. The population data, if carefully selected, is likely to have reduced participation bias when compared with the corresponding control data, yielding more accurate results and increasing the chances of determining the true cause of a disease. Ideal sources of population data are those which capture information from the entire population of interest and which are considered to be reliable. Examples include population wide health databases or appropriate census data. However, if a population value is used and later thought to be inaccurate, the calculations can easily be rerun to generate improved estimates. The larger sample sizes resulting from this approach also generate narrower confidence intervals, allowing easier categorisation of the variables to significant protective factor, significant risk factor or insignificant risk or protective factor. All steps in the method were conducted using case information only in the paper, without the need for the original data set. Therefore, this analysis could be repeated for all variables published, to see whether any potential risk factors have been miscategorised. This method can support the findings from the study, or identify any potential bias in the results.

Identifying the true causes or risk factors of a disease is an important step towards developing a cure or preventing others from becoming cases. Case-control studies are a useful study design to help find the causes of a rare disease, but they can be affected by participation bias. A simple amendment to the method, such as the one proposed here, could help to yield more accurate results and move closer towards discovering the cause of the disease.

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23

Epidemiology of School-Related Injuries in Belgium. A Better Knowledge for a Better Prevention

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Abstract

The landmark Convention on the Rights of the Child states that children around the World have right to safe environment. In Belgium, as in many countries, children spend, on average, 4.5 weekdays at school, during nearly 8 hours per day. Studies have shown that, the risk of school-related injury exceeds the risk during leisure time. Literature reports that school accidents account for 10 to 30% of all accidents among pupils. Despite that, few papers treat of the school-related injuries. Consequently, based on 1540 accidents forms from an insurance company, injury places, mechanisms involved, body parts injured and nature of injuries were described. Head injuries, upper and lower limbs injuries were investigated in more details. Pearson's chi-square test was used to assess the relationships between the variables and multivariate logistic regression models were used to study the three specific types of injuries cited above. Gender ratio (M/F) was equal to 1.6 with 25.9% of children under 6 years, 29.4% of 6 - 9 years, 26.9% of 10 - 12 years and 17.8% from 13 years or more. The major places of injuries were the playground (56.9%) and the physical education (19.7%). Falls were observed in 52.1% of cases and contacts were reported in 24.3%. The head injuries account for 40.6%, the upper limbs for 32.0% and the lower limbs injuries for 20.2%. The bruises and the scratches were observed in 23.8% and the wounds in 21.5%. Fractures were reported in 16.1%. In conclusion, having a routine access to the data from the insurance companies could be an important source of information for an injury surveillance system in which the school injuries will be included. Taking into account this data will require an awareness of all the concerned persons about the relevance of such a system and a harmonization of the accidental forms.

Keywords

School-Related Injuries, Injury Determinants, Cross-Sectional Survey, Epidemiology

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1. Introduction

The landmark Convention on the Rights of the Child states that children around the World have a right to a safe environment and to protection from injury and violence [1]-[3].

Despite that, injury and violence is a major killer of children throughout the world, responsible for about 950,000 deaths in children and young people under the age of 18 years each year. In addition to the deaths, tens of millions of children require hospital care for non-fatal injuries. Many are left with some form of disability, often with lifelong consequences; therefore the injury is often graphically represented as a pyramid, with, at the top, the smallest group corresponding to the fatal injury group, with, in the middle, the hospitalized injuries and with, at the base, the largest group corresponding to the non-hospitalized injuries [2] [4].

The literature on injuries is frequently focused on childhood injuries or school-aged injuries in general, but also on some specific types as the road traffic injuries or the sport related injuries and; in comparison with this literature, few papers treat of the school-related injuries and some of these existing papers are really old [5]-[8]. Yet, time dedicated to school years is important in child life. In Belgium, as observed in others countries, "*compulsory education covers all children of compulsory school age*, *domiciled or resident in Belgium*, *without distinction of status* (*cf. Act of* 29 *June* 1983 *on compulsory education*). *The minor is subject to compulsory education for a period of twelve years beginning in the school year which starts in the year he reaches the age of six years ending at the end of the school year in the year in which he reaches the age of eighteen years.*" [9]. Therefore, children will spend a substantial part of their time at school. In Belgium, on average, children stay 4.5 days of their week at school, during nearly 8 hours per day. Some studies have shown that, the risk of injury at school, calculated per hour, exceeds the risk during leisure time [10]. Thus, safety at school is an important factor for public health.

Schelp [8] and colleagues have reported, two decades ago, that school accidents account for 10 to 30% of all accidents among school pupils. In 2003, in China, Li [11] and colleagues have found that injuries at school account for nearly a quarter of the places of injuries. In their paper, published in 2006, about the epidemiology of non-fatal injuries among the 11-, 13- and 15-year-old youth based on the data from 11 countries on 43 which participate to the "Health Behaviour in School-aged Children Study" (HBSC), Molcho [12] and colleagues have reported that 21.8% of the observed injuries occurred in the school context. For Belgium, Piette [13] and colleagues have reported, based on the data from the 2002 HBSC Study, that one third of young people interviewed had suffered from an injury during the twelve months before the study and that the school environment was involved in 24% for the girls and 20% for the boys. This means that school injuries are always a public health problem in the world, and also in Belgium.

At the best of our knowledge, in Belgium, there is not really information regarding the problem of school injuries. There is a little bit of information in terms of prevalence through the HBSC Study but there is no information on the associated factors, on the mechanisms involved or on the consequences (in terms of body parts injured and about the nature of the injuries). However, any school-related injury must be declared to an insurance company. Each insurance company has its standard accident form, but there is some similitude between the several forms.

As part of an Injury Prevention Community Plan [14], existing in the French speaking part of Belgium, a reflection is conducted on the potentially available data sources for injury surveillance, because surveillance provides important information for better understanding of the injury patterns and for better designing and evaluating injury interventions [15]. Therefore, having a routine access to the data contained in these forms could be an important source of information for an injury surveillance system in which the school injuries will be included. For having an idea of the potential of the available data, a well-established insurance company (it covers a large part of schools in the territory) has given to us access to old accident forms (it was closed cases).

Consequently, the first objective of this study was to describe the injury places, the mechanisms involved, the body parts injured and the nature of injuries; and, because head injuries are the single most common—and potentially most severe—type of injury sustained by children, the second objective was to study the factors associated to the head injuries [2] [7] [16] [17]. Linked with this second objective, we have also study the factors associated with the upper and lower limbs injuries because these type of injuries are not rare but also, and especially, because it is recognized that the musculoskeletal system of the child is particularly fragile, so an injury of this system can have adverse consequences and sometimes irreversible [7] [18].

2. Materials and Methods

2.1. Sampling

In this insurance company, the yearly number of school accident return forms was nearly equal to 35,000. Based on the forms from the year 2005, we have drawn a random sample of 1540 forms. The sample size was based on a precision of 1% around a proportion of 5%, corresponding to the lowest hypothesized proportion to estimate, and a confidence interval of 95%.

2.2. Variables

Regarding the children we have information related to the gender and to the age. The age was calculated as the difference between the injury date and the birth date. Four age groups were made based on the age limits usually reported for some schooling levels in Belgium. The first group gathers together the children under the age of 6 years, corresponding to the age for the kindergarten. Within the 6 - 12 years, corresponding to the age for the elementary school, two groups were done to show the difference between the younger, which could (may be) keep the kindergarten behaviors (it is the second group with the children between 6 and 9 years) and the older (it is the third group with the children between 10 and 12 years). Finally, the fourth group gathers together the children from 13 years or more, corresponding to the age for the secondary school. This link with the school levels were done because it is usually reported, in addition to the development change of the children across time, that the environmental characteristics, the framing norms, and the proposed activities were different and specific across these school levels [7].

Regarding the accident we have information related to the injury places, the mechanisms involved, the body parts injured and the nature of injuries. Except for the several categories of the injury places which were already originally present in the accident return form, the other variables categories were created according to the recommendations made by the World Health Organization [19] in its Injury Surveillance Guidelines.

Therefore, the seven mutually exclusive categories were in the playground, during physical education, in classes during theoretical lessons, in classes during practical lessons, on the way of school, outside school (but during the school time) and in another place that those listed before. Due to the low prevalence of some categories, we have made the choice of gathering some of them; therefore, in the end, we have 4 levels: 1) in the playground; 2) during physical education; 3) in classes (which was the merging of in classes during theoretical lessons and in classes during practical lessons) and 4) in another place (which was the merging of on the way of school, of the outside school and of the another place). Concerning the mechanisms involved, four categories were created based on the free text field available in the accident return form that they have called the “description of the accident”. These levels were 1) the falls; 2) the contacts with someone or something; 3) the movement and 4) another mechanism than those cited before. In the accident form, there were also free text fields which must be completed by the physician who has examined the child. It was explained at the top of the field that that “the natures of the injuries and the body parts must be indicated”. Based on these texts, the six categories created for the nature of injuries were: 1) the bruises; 2) the scratches and wounds; 3) the traumas of the joints, the muscles and the ligaments; 4) the fractures; 5) the dental traumas and 6) the others natures (e.g. a child who faints). The levels for the body part injured were: 1) the head and the neck; 2) the upper limbs; 3) the chest and the pelvis; 4) the lower limbs and 5) the general affliction or the multiple injuries.

2.3. Missing Values

Because all these variables cited below were not from required fields and because all the injuries did not lead to a consultation, some missing values were reported. In the sample (n = 1540), age and gender were not available for 188 and 208 cases respectively (corresponding to 12.2% and 13.5% of missing values). Regarding the injury places, the mechanisms involved, the body parts injured and the nature of injuries the proportions of unavailable data were 12.2%, 39.9%, 14.9% and 40.8% respectively.

2.4. Statistical Analyses

Proportions were used to describe the injury places, the mechanisms involved, the body parts injured and the nature of injuries. We have also described the proportions of these four variables according to the four age

groups, since it is known that injuries vary with the age. To answer at the second objective, which was to study the factors associated, on one hand, to the head injuries and on the other hand, to the upper and lower limbs injuries, the proportions of these three specific types of injuries were reported according to the gender, to the age groups, the place of injuries and to the mechanisms of the injuries. The Pearson's chi-square test was used to compare proportions and the Bonferroni's correction was applied for the multiple comparisons. When the proportions of injuries increased or decreased according to ordered categories of a factor, the Cochran-Armitage test for trend was used. We also calculated odds ratio (OR) with their 95% confidence intervals (95% CI) to estimate the strengths of the associations. To highlight the "at risk" categories of associated factors (OR > 1), we have chosen the category with the lowest prevalence of injuries as reference (OR = 1).

In a logistic regression model, interactions were tested for ensuring that the age or the gender had not a modifier effect on the association between each specific types of injury and the place or the mechanisms of these injuries. As the likelihood ratio (LR) tests of these interactions were not statistically significant, three models (one for the head injuries and two for both the limbs) containing the gender, the age, the place and the mechanisms were generated for taking into account the potential confounding effects of the associated factors among them. Therefore, adjusted odds ratios (OR_a), derived from these models, were presented with their 95% confidence intervals and the p-value of the Wald's test. To assess the fit of the models, we used the Hosmer and Lemeshow goodness-of-fit. The significance level for all tests was 0.05 and all statistical analyses were performed using Stata/SE 12.0 for Windows (TX: StataCorp LP).

3. Results

The gender ratio is equal to 1.6; with 61.3% of boys and 38.7% of girls. The four age groups were distributed with 25.9% of children under 6 years, 29.4% of children between 6 years to 9 years, 26.9% of children from 10 years to 12 years and 17.8% of children from 13 years or more; with an age range varying between 2 years and 20 years (data not shown).

3.1. Places of Injuries

Figure 1 shows that, the two major places of injuries were the playground (56.9%) and the physical education (19.7%). We can also observe that 2.7% injuries occurred on the way of school.

The proportions of the several injuries places varied statistically significantly ($p < 0.001$) according to the age groups. On one hand, the proportion of physical education injuries linearly increased with the increase of age ($p < 0.001$); and, on the other hand, the proportion of playground injuries decreased when the age increased ($p < 0.001$); with the nuance that this decrease exists only from the 6 to 9 years group to the oldest groups. For the youngest, the proportion is lower than the one observed for the 6 to 9 years group (**Table 1**).

3.2. Mechanisms of Injuries

Falls were observed in a little more than half case (52.1%) of injuries; and the proportions of these falls decreased linearly and statistically significantly ($p < 0.001$) with the increase of the age. Contacts with someone or something were reported in a little less than a quarter (24.3%) of the cases; and these contacts don't varied statistically significantly ($p = 1.000$) in the several age groups. Finally, the movements, which were reported generally in a little more than one situation on ten (13.9%), increased linearly and statistically significantly ($p < 0.001$) with the increase of the age (**Figure 2**) (**Table 2**).

3.3. Body Parts Injured and Nature of Injuries

Figure 3 shows that limbs were injured in one situation on two, with a little higher proportion for the upper limbs in comparison with the lower limbs (32.0% vs. 20.2% respectively). This figure also shows that for 40.6% of the situations, it was the head and the neck which were injured. Regarding the variations of the body parts injured between the age groups, the proportions of the head and neck injuries on one hand, and, of the lower limbs injuries on the other hand, varied linearly and statistically significantly with the age ($p < 0.001$ for both of them): the proportions of head and neck injuries decreased with the increase of age; while the proportions of lower limbs injuries increased when the age increased (**Table 3**).

Regarding the nature of the injuries, the bruises, on one hand, and the scratches and the wounds, on the other

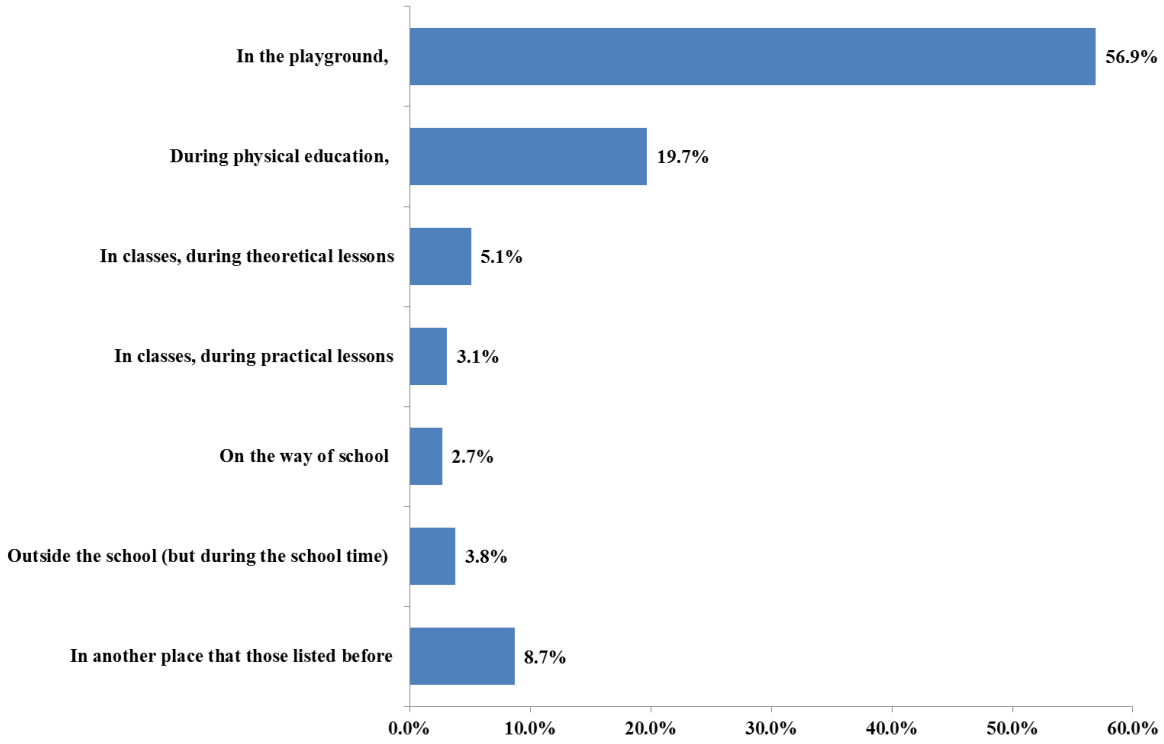

Figure 1. Place of injuries (proportions of each level reported, n = 1352).

Table 1. Variation of the injuries places according to the several age groups.

$p_g < 0.001$	Age groups				
	Under 6 years (n = 350)	6 - 9 years (n = 398)	10 - 12 years (n = 363)	13 years and more (n = 241)	p value
In the playground	61.7%	71.9%	62.5%	17.0%	$p < 0.001$
During physical education	7.4%	14.6%	22.9%	41.5%	$p_t < 0.001$
In classes	14.3%	4.5%	2.5%	14.1%	$p < 0.001$
Other places	16.6%	9.0%	12.1%	27.4%	$p < 0.001$

p_g is the p-value of the global test, p_t is a p-value from a linear trend test and the other values come from the comparison's tests of the proportions of each categories of injury versus the remainder, according to age.

hand were observed roughly in the same proportions (23.8% and 21.5% respectively). We have also observed that the injuries led to fractures in 16.1% of the situations (**Figure 4**).

The study of the variations of the injuries nature, according to the age groups, shows that the proportions of the scratches and wounds, but also the traumas of the joints, muscles and ligaments and the tooth traumas varied statistically significantly among the several age groups ($p < 0.001$ for the cited natures of injuries). The proportions of scratches and wounds were more important for the children under 6 years whereas the traumas of the joints, muscles and ligaments were more observed among the older ($p < 0.001$). Finally, the highest proportions of dental traumas were observed among the children under 10 years: 14.6% among the 6 - 9 years and 9.4% among the children under 6 years ($p < 0.001$) (**Table 4**).

3.4. Factors Associated with Head Injuries and with Limbs Injuries

As a reminder, without taking into account the age groups, 40.6% of head injuries were reported (**Figure 3**). The univariate analyses show that there were more head injuries among boys than among girls and that the proportions of head injuries decreased when the age increased. We have also observed that these head injuries resulted from falls or contact with someone or something. Finally, regarding the places of injuries, the highest propor-

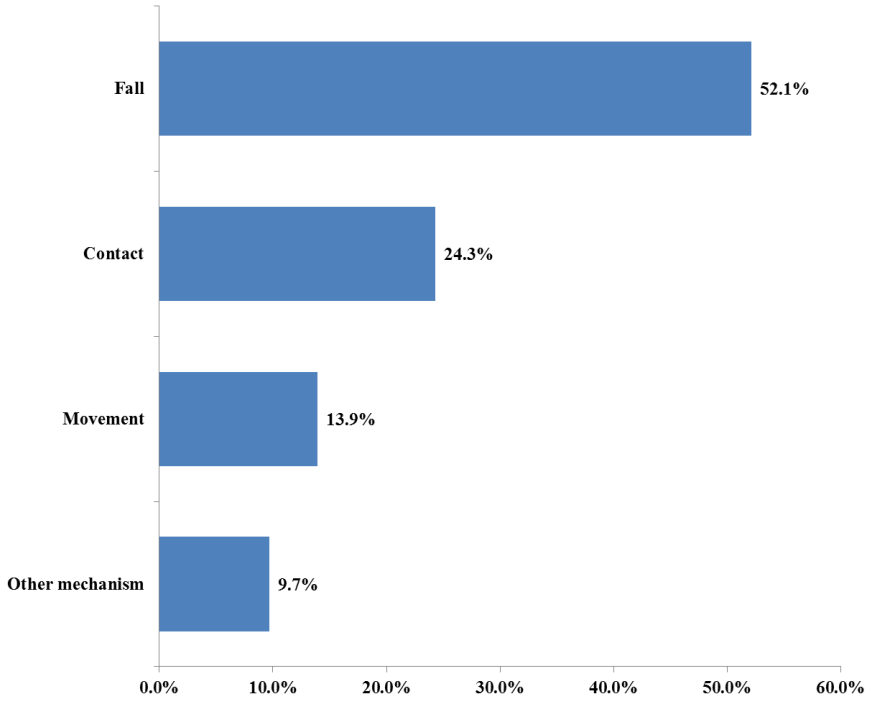

Figure 2. Mechanisms of injuries (proportions of each level reported, n = 926).

Table 2. Variation of the mechanisms of injuries according to the several age groups.

$p_g < 0.001$	Age groups				
	Under 6 years (n = 243)	6 - 9 years (n = 259)	10 - 12 years (n = 250)	13 years and more (n = 174)	p value
Fall	65.8%	52.9%	46.4%	39.7%	$p_t < 0.001$
Contact	21.8%	25.9%	26.8%	21.8%	$p = 1.000$
Movement	4.5%	13.5%	19.2%	20.1%	$p_t < 0.001$
Other mechanism	7.8%	7.7%	7.6%	18.4%	$p < 0.001$

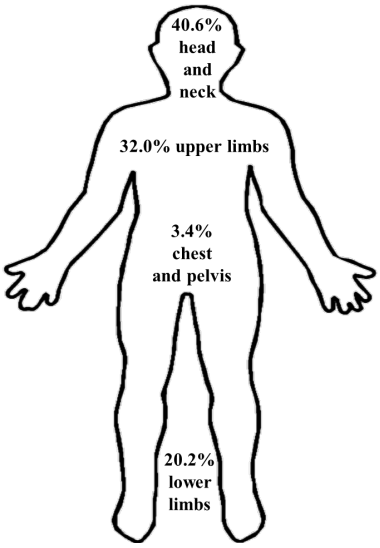

Figure 3. Proportions of the several body parts injured (n = 1310, whose 50 general affections not reported on the figure).

Table 3. Variation of the body parts injured according to the several age groups.

$p_g < 0.001$	Age groups				
	Under 6 years (n = 341)	6 - 9 years (n = 385)	10 - 12 years (n = 351)	13 years and more (n = 233)	p value
Head and neck	70.4%	48.6%	20.8%	13.7%	$p_t < 0.001$
Upper limbs	17.6%	27.8%	45.9%	39.1%	$p < 0.001$
Chest and pelvis	2.1%	3.1%	3.7%	5.6%	$p = 0.725$
Lower limbs	7.0%	17.7%	25.9%	34.8%	$p_t < 0.001$
General affection	2.9%	2.9%	3.7%	6.9%	$p = 0.550$

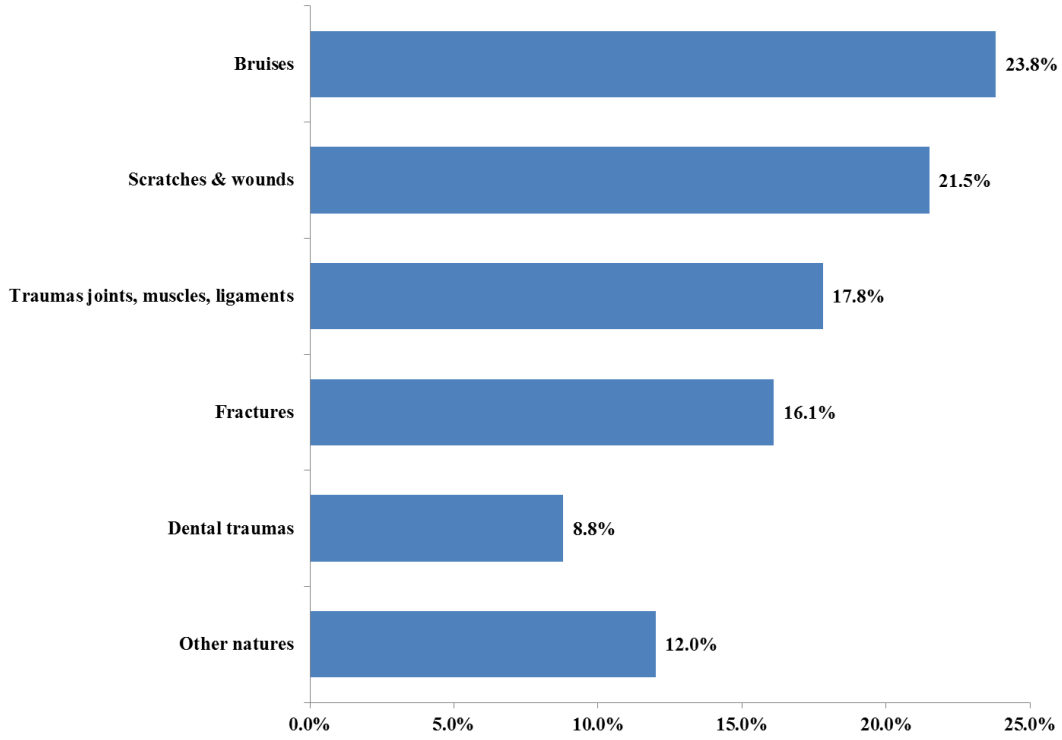

Figure 4. The nature of injuries (proportions of each level reported, n = 912).

Table 4. Variation of the natures of injuries according to age groups.

$p_g < 0.001$	Age groups				
	Under 6 years (n = 224)	6 - 9 years (n = 275)	10 - 12 years (n = 252)	13 years and more (n = 161)	p value
Bruises	21.4%	21.7%	27.8%	24.2%	$p = 1.000$
Scratches & wounds	40.6%	21.8%	8.7%	14.3%	$p < 0.001$
Traumas of JML	3.2%	13.1%	29.0%	28.6%	$p < 0.001$
Fractures	12.5%	18.2%	19.1%	13.0%	$p = 0.744$
Dental traumas	9.4%	14.6%	5.9%	2.5%	$p < 0.001$
Other natures	12.9%	10.6%	9.5%	17.4%	$p = 0.516$

tions of head injuries were observed when the injuries have taken place in the playground or in the classes. After adjustment by all the analyzed variables, the situation at risk for having a head injury was to be a boy, to be young, to have an injury in classes or in the playground (rather than during physical education) and to have a contact with someone or something or to fall (rather than to be in movement) (**Table 5**).

Table 5. Associations between head injuries and gender, age groups, places and mechanisms of injuries.

		Head injuries		
	n	% Head injuries (p-value)	OR_c (CI95%)	OR_a (CI95%) (n = 884 with 341 HI) ($p_{H\&L}$ = 0.983)
Gender		**p < 0.001**		
Boys	786	45.7%	1.67 (1.33 - 2.11)	1.90 (1.35 - 2.69)
Girls	505	33.5%	1	1
Age groups		**p_t < 0.001**		
Under 6 years	341	70.4%	14.93 (9.62 - 23.16)	17.78 (9.52 - 33.18)
6 - 9 years	385	48.6%	5.93 (3.88 - 9.06)	6.07 (3.28 - 11.22)
10 - 12 years	351	20.8%	1.65 (1.05 - 2.60)	1.54 (0.82 - 2.91)
13 years and more	233	13.7%	1	1
Place of injuries		**p < 0.001**		
In the playground	750	46.0%	3.49 (2.49 - 4.89)	1.98 (1.17 - 3.34)
During physical education	260	19.6%	1	1
In classes	106	59.4%	6.00 (3.66 - 9.84)	5.47 (2.48 - 12.05)
Other places	194	37.6%	2.47 (1.62 - 3.77)	2.47 (1.30 - 4.70)
Mechanisms of injuries		**p < 0.001**		
Fall	462	40.5%	4.1 (2.42 - 7.01)	2.28 (1.25 - 4.18)
Contact	219	58.0%	8.36 (4.74 - 14.73)	7.46 (3.92 - 14.20)
Movement	128	14.2%	1	1
Other mechanism	85	12.8%	0.89 (0.40 - 1.99)	0.54 (0.22 - 1.31)

A. ORc are crude odds ratios,p_t is a p-value from a linear trend test, ORa are odds ratios adjusted for all the variables reported in the table, HI is the abbreviation for head injuries, $p_{H\&L}$ is the p-value of the goodness-of-fit test of Hosmer and Lemeshow.

As a reminder, without taking into account the age groups, 52.2% of limbs injuries were reported, with 32.0% of upper limbs injuries and 20.2% of lower limbs injuries (**Figure 3**).

There were more limbs injuries among girls, but the difference for the lower limbs injuries was not statistically significant. Both for the upper and the lower limbs injuries, the proportions were higher among the older. Regarding the place of injuries, there was no statistically significant difference among the proportions of upper limbs injuries, but for the lower limbs injuries, the lowest proportion was observed when the injuries occurred in the classes and the highest proportion was observed when the injuries occurred during physical education. Movements and falls were the major mechanisms involved both for the upper and the lower limbs injuries. After adjustment by all the analyzed variables, the situation at risk for having an upper limb injury was to be a girl, to be older and to have a fall or a movement rather that a contact as the mechanism of injury. For the lower limbs injury, the situation at risk was also to be older, and was to have an injury in the playground or during the physical education (rather than in classes) and to be in movement (rather than to have a contact with someone or something) (**Table 6**).

4. Discussion

To the best of our knowledge, this study is the first in Belgium which gives as much information about the school-related injuries in terms of injury places, mechanisms involved, body parts injured and nature of injuries.

The gender ratio boys/girls in this study is equal to 1.6, indicating that boys are more likely to suffer from school-related injuries than girls. From a general point of view, this excess of risk among the boys is a constant in nearly all the studies related to injuries whether based on school-related injuries or not. Hypotheses are that, in comparison with girls, the boys are more unruly, more mobile, impulsive and short-tempered whereas girls are slower, but maybe clumsier. Also, boys are more engaged in risky and sporting activities [4] [11] [17] [20]-[26].

Table 6. Associations between (upper/lower) limbs injuries and gender, age groups, places and mechanisms of injuries.

	Upper limbs				Lower limbs		
	n	% (p-value)	OR_c (CI95%)	OR_a (CI95%) (n = 884 with 299 ULI) ($p_{H\&L}$ = 0.353)	% (p-value)	OR_c (CI95%)	OR_a (CI95%) (n = 884 with 178 LLI) ($p_{H\&L}$ = 0.876)
Gender		**p < 0.001**			**p = 0.196**		
Boys	786	27.9%	1	1	19.2%	1	1
Girls	505	37.2%	1.54 (1.21 - 1.95)	1.54 (1.13 - 2.09)	22.2%	1.20 (0.91 - 1.58)	1.03 (0.72 - 1.48)
Age groups		**p < 0.001**			**p_t < 0.001**		
Under 6 years	341	17.6%	1	1	7.0%	1	1
6 - 9 years	385	27.8%	1.80 (1.26 - 2.58)	2.37 (1.49 - 3.77)	17.7%	2.83 (1.73 - 4.63)	2.67 (1.44 - 4.92)
10 - 12 years	351	45.9%	3.97 (2.80 - 5.63)	6.09 (3.85 - 9.62)	25.9%	4.62 (2.86 - 7.46)	3.60 (1.97 - 6.57)
13 years and more	233	39.1%	3.00 (2.05 - 4.40)	3.50 (2.06 - 5.19)	34.8%	7.04 (4.29 - 11.54)	6.30 (3.29 - 12.06)
Place of injuries		**p = 0.301**			**p < 0.001**		
In the playground	750	30.8%	0.98 (0.63 - 1.53)	0.89 (0.49 - 1.63)	16.7%	2.83 (1.28 - 6.23)	3.72 (1.26 - 11.05)
During physical education	260	36.9%	1.29 (0.80 - 2.10)	0.89 (0.46 - 1.72)	33.9%	7.24 (3.22 - 16.24)	5.47 (1.81 - 16.54)
In classes	106	31.1%	1	1	6.6%	1	1
Other places	194	30.4%	0.98 (0.58 - 1.61)	0.69 (0.35 - 1.36)	22.7%	4.15 (1.80 - 9.58)	4.62 (1.52 - 14.09)
Mechanisms of injuries		**p < 0.001**			**p < 0.001**		
Fall	462	37.8%	1.92 (1.31 - 2.80)	2.19 (1.32 - 3.64)	19.1%	1.24 (0.80 - 1.90)	1.40 (0.89 - 2.19)
Contact	219	21.0%	1	1	16.0%	1	1
Movement	128	40.9%	2.61 (1.61 - 4.22)	2.19 (1.32 - 3.64)	35.4%	2.89 (1.73 - 4.82)	2.20 (1.28 - 3.76)
Other mechanism	85	58.1%	5.22 (3.05 - 8.94)	6.26 (3.49 - 11.22)	12.8%	0.77 (0.37 - 1.60)	0.85 (0.40 - 1.83)

ORc are crude odds ratios, p_t is the p value of the linear trend test, ORa are odds ratios adjusted for all the variables reported in the table, ULI is the abbreviation for upper limbs injuries and LLI is the abbreviation for lower limbs injuries, $p_{H\&L}$ is the p-value of the goodness-of-fit test of Hosmer and Lemeshow.

Our results have shown that a large part of the injured children were from kindergarten (25.9% of children under 6 years) or elementary school (29.4% of children between 6 and 9 years, and 26.9% between 10 and 12 years) with a little less than a fifth (17.8%) of children in age of the secondary school. These observations are in agreement with the literature review paper of Laflamme, Menckel and Aldenberg [25] who reported that all injuries aggregated, injuries were generally found to be more frequent among elementary school children than among secondary school pupils. Based on a school injury-reporting system in British Columbia, in Canada, Sheps and Evans [7] also found the same tendency, but, it is not what it was observed by Maitra [23] in his British study. He had found a higher proportion of middle and secondary schools compared to primary school. Linakis [27] and colleagues, based on a sample of American hospitals, have also found a higher proportion of middle school children compared to a lower proportion of primary or secondary school. Finally, the Fotherrgill and Hashemi [26] results, based on data from an emergency department in England, have given the same tendency: a higher proportion from senior schools, followed by the junior schools and the nursery schools. These differences could be due to the fact that the injuries observed in these two studies were school injuries which required attendance at an emergency department, which suggests that injuries occurring for the oldest children could be more serious. The discussion here above, regarding the variations of injuries according to age, shows that studies were more focused on elementary or secondary school children than on preschool children. As men-

tioned at the beginning of this paragraph, our sample contained a little more than a quarter of children under the age of 6 years. This age group was then non-negligible. The work of Garzon [28], based on the contributing factors to preschool unintentional injury, had reported that children under the age of 5 years were more likely to sustain serious injury and have adverse outcomes than their older school aged peers, due to fact that preschool years are a dynamic period of cognitive, physical and emotional development. This group of children have, in our study, the highest proportion of falls (65.8%), the highest proportion of head injuries (70.4%) and the highest proportion of scratches and wounds (40.6%). Always, according to Garzon [28], preschoolers have better gross than fine motor development, so that children under the age of 5 years cannot combat inertia and right themselves once they begin to fall. Their larger and heavier heads increases also the risk of falls and head injuries.

The two major places of injuries observed were on one hand the playground (56.9%), with a lowest proportion for the older and the highest proportions for the children in age of elementary school; and, on the other hand, the physical education (19.7%) with a linear increase of the proportion according to the increase of age. These observations are in agreement with the literature which reports that the playground and the sport activities have been found to be more hazardous than others, with more playground injuries among the elementary school children and more sports accidents among the secondary school children. These distributions fit in with the normal activities of the children and the pupils. It is well know that the "simple games", in the playground, decrease when the children become older but also that children are less turbulent and have better locomotor skills when they become older. In the secondary school environment, sport activities are more common, especially among the first levels of the secondary. The pupils play more to basketball or to soccer during their breaks but they are also more exposed due to the physical education lessons [6]-[8] [17] [21] [25] [26] [29].

In our study, falls were the most common mechanism of injuries (52.1%). This observation is in agreement with the international literature [7] [11] [17] [22]-[25]. We have observed, on one hand, a linear decrease of the fall proportion with the increase of the age and on the other hand, a linear increase of the movement, as the mechanism of injuries, with the increase of the age. These observations were also made by Sheps and Evans [7] who have found a higher proportion of falls for the elementary school students in comparison with the secondary school students. In their literature review Laflamme, Menckel and Aldenberg [25] reported also that having a contact with someone or something was a frequent cause of injuries. In our study it was the second major mechanism of injuries (24.3%).

A British study, based on school injuries which required attendance at an emergency department, had shown, regarding the nature of injuries, a proportion of a little more than a fifth of sustained fractures or dislocations and a proportion of a little less than a fifth of lacerations or grazes [23]. Our results were almost in the same direction with a proportion of fractures equal to 16.1% and a proportion of scratches and wounds equal to 21.5%. We also have found a proportion of bruises equal to 23.8%, which combined to the proportion of scratches and wounds, confirms the fact, as stated by Haq and Haq [17] in their review of the literature that cuts, abrasions and contusions were the most frequently reported injuries. In the study of Fotherrgill and Hashemi [26], which was based on hospital data, bruises, abrasions and sprains accounted for over half of the total of the nature of injuries observed. In the Laflamme study [25], the authors reported that the type of injuries is difficult to be compared between studies because of differences between classifications used to describe the type of injury and part of the body parts injured but generally speaking, there is a tendency for the type of injury to vary with the school levels. Indeed, we have observed, on one hand, that the proportions of traumas of the joints, the muscles and the ligaments were higher for the two oldest age groups and, on the other hand, that the proportions of dental traumas were higher among the youngest age groups.

Regarding the part of the body injured, this study has shown that the head injuries were the most observed (40.6%) followed by the upper limbs injuries (32.0%) and the lower limbs injuries (20.2%). These observations were also found in others studies dedicated to school-related injuries despite the different geographical localization around the world [6] [10] [21] [22] [30]. Regarding the variation with age, the proportions of head injuries, on one hand, and the injuries of the lower limbs, on the other hand, varied with a linear increase according to age for the head injuries and a linear decrease according to age for the lower limbs. This tendency has been summarized in the literature review from Laflamme [25] and colleagues who reported that head injuries seem to be sustained more frequently in the playground (which concern more the youngest children), while injuries to the lower and upper extremities of the body are most frequently incurred during sports (which concern the older

children). The study of Willer [16] and colleagues, which was focused on the concussion, had reported that the head injury with concussion were higher for boys than girls and higher for younger children than older children; with the falls as common cause of head injury and head injury with concussive symptom, especially among the younger children.

Finally, we discuss the issue of the data availability. In their review, Haq and Haq [17] have proposed that a computerized reporting system must be helpful. Actually, in Belgium, the accident forms are now increasingly recorded through a computerized system, specific for each insurance company, but always based on forms which have kept similarities between companies. Therefore, having access to the databases of these insurance companies (in an anonymous form) could be an important step in the construction of an injury surveillance system. The take into account of the data provided by the schools for the documentation of the school-related injuries was already done, as examples, in the United States, in Canada, in France, in United Kingdom or in Germany [4] [7] [15] [21] [31]-[33]. Routine school reporting could underestimates the incidence of school injuries, but provides the simplest method of gathering information [21]. Thus, such a system, requires qualitative criteria, such as flexibility and acceptability for long term operation. It should also be and stay reliable and inexpensive [10]. A first step, in this case, could be to give a feedback to the insurance company about the relevance of the use of their data in a preventive perspective; because, as say by Stark [21] and colleagues: one of the barriers to action in schools is likely to be a lack of recognition of the importance of school accidents, and of the scope for prevention. Currently, since the text explaining how the accident happened is not compulsory, there is then a lot of missing data for some of the variables. Another step could be, therefore, to concentrate on the automatic and complete description of the injury in terms of place, mechanism but also in terms of body parts injured and nature of injuries. As it was done for the Utah Student Injury Reporting System, a systematic follow-up of discrepancies or missing values, for all reports received by the person in charge, could be done. Finally, a last question could be asked. Despite the fact that, in Belgium, each school-related accident must be declared to an insurance company, we have currently no idea about the practices of each school. In their paper about the staff concerned with the data collection and reporting procedures about accidents in the school environment, Williams, Latif and Cater [34] reported that some schools under-report accidents whereas others over-report in anticipation of complaints and litigation. In his work on preventing school injuries, Garnier [5] insists on the need to know about all accidental events, even those that don't lead to serious injury, since the factors responsible of these "little incidents" could have led to more serious injuries.

5. Conclusions

This study, which is the first in Belgium, gives interesting and rich information on epidemiology of the school-related injuries, according age and gender, in terms of injury places, mechanisms involved, body parts injured and nature of injuries. In summary, our results shown that 1) boys are more likely to suffer from school-related injuries than girls; 2) a large part of the injured children were from kindergarten or elementary school; 3) the major places of injuries were the playground, with a lowest proportion for the older, and the physical education with an increase of the proportion according to the increase of age; 4) falls were the most common mechanism of injuries with a decrease with the increase of the age; 5) bruises, scratches and wounds were observed roughly in the same proportions and fractures count for an non negligible part of the injuries; 6) the head injuries were the most observed followed by the upper limbs injuries and the lower limbs injuries; 7) the situation at risk for having a head injury was to be a boy, to be young, to have an injury in the playground and to fall; and 8) the situation at risk for having an upper limb injury was to be a girl, to be older and to be in movement; and for the lower limbs injury, the situation at risk was also to be older, and was to have an injury in the playground or during the physical education and to be in movement.

Finally, under the idea of "better to know to better prevent", having a routine access to the data from the insurance companies could be an important source of information for an injury surveillance system in which the school injuries will be included. But this taking into account will require an awareness of the field staff about the relevance of such a system and a harmonization of the accidental forms.

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The Characteristics of Breast Cancer Mortality in Inner Mongolia between 2008 and 2010

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Abstract

Background: The aim of this study was to explore the characteristics of breast cancer mortality in Inner Mongolia, and to provide evidence for the prevention of female breast cancer. Methods: Using data from the Death Registry System from 2008 to 2010. We classified female cancer deaths according to the International Classification of Disease-10th Revision. The mortality of different age groups and the potential years of life lost were calculated for female breast cancer in Inner Mongolia. Results: Breast cancer mortality for Inner Mongolian women was higher in older age groups. The potential years of life lost were also much higher in younger groups than in older groups. Marital status, education level and occupation may contribute to this increase in breast cancer mortality in younger groups. Conclusion: Preventive policies should be implemented to develop strategies aimed at reducing the breast cancer mortality, especially with regard to younger age groups in Inner Mongolia.

Keywords

Breast Cancer, Mortality, PYLL

1. Introduction

Breast cancer is the second most common cancer worldwide, and by far, the most common cancer in women, with an estimated 458,000 deaths (14% of all cancers) having occurred in 2008 [1]. At the end of the last cen-

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tury in Japan, several studies had predicted that breast cancer would become a leading cancer [2]. Generally speaking, mortality of breast cancer are higher in North America, Northern Europe, Australia/New Zealand and lower in sub-Saharan Africa and Asia [3].

The age groups trend was different for breast cancer mortality in different countries and regions. In North America, breast cancer mortality rose with age. In Asian countries, the breast cancer mortality curves are flatter in younger age groups than in North America. The peak of mortality for age group was in 55 - 64 years groups in Asian [4]. Some studies showed that a higher proportion of breast cancer patients in developing Asian countries are more in younger age groups than those in developed Asian and Western countries [5]. This characteristic has been explained in part by the fact that many Asian women with breast cancer continue to be diagnosed at a relatively late stage, and young age by itself is a known indicator of poor prognosis for breast cancer [5].

Inner Mongolia is 1 of 5 minority ethnic autonomous regions in China. Until now, only a few studies have evaluated breast cancer in this region. The aim of this study was to explore the characteristics of breast cancer mortality.

2. Materials and Methods

2.1. Data Source

Death data between January 2008 and December 2010 was collected for this study through the Death Registry System (DRS), which was established by the Ministry of Health of China and maintained by the Inner Mongolia Autonomous Region Centers for Disease Control and Prevention (CDC). Death data from DRS included information on primary cause of death, death date, sex, and age. DRS uses a multistage cluster probability sampling strategy with stratification according to population structures of the eastern, central, and western regions of Inner Mongolia, the local gross domestic product, the proportion of rural dwellers, and the total population of local areas. Monitoring points of DRS in Inner Mongolia included Kailu County, Bairin Youqi, Sonid Youqi, Muslims District, and Linhe District.

The death data were categorized on the basis of the Tenth Revision of the International Classification of Diseases (ICD-10) criteria. The ICD-10 codes for breast cancer and female cancer used in this study were as follows: C50, malignant neoplasm of the breast; C51, malignant neoplasm of the vulva; C52, malignant neoplasm of the vagina; C53, malignant neoplasm of the cervix uteri; C54, malignant neoplasm of the corpus uteri; C55, malignant neoplasm of the uterus, part unspecified; C56, malignant neoplasm of the ovary; and C57, malignant neoplasm of other and unspecified female genital organs.

The total population in 2008-2010 was obtained from the Inner Mongolia CDC to calculate breast cancer mortality per 100,000 women aged 20 years or older.

All hospitals in Inner Mongolia were divided into 4 levels: provincial, municipal, county, and township. Pathological diagnosis can be provided in all 4 hospital levels. All diagnostic methods in this study included pathological, clinical, surgical, and postmortem diagnoses. Clinical diagnosis included imaging, pathological anatomy diagnosis, and pathophysiology diagnoses. Surgical and postmortem diagnoses were also employed.

2.2. Statistical Analysis

The chi-square test was used for examining the 5 monitoring points and 3-year differences in female cancer and breast cancer mortality. The percentage of hospital-level diagnoses and diagnostic methods was calculated. Life expectancies were estimated from life tables. These life tables were constructed from total mortality and population data, each covering 1 calendar year. In order to analyze the characteristics of age, patients were categorized into the younger age groups (20 - 49 years old) and older age groups (≥50 years). We calculated the potential years of life lost (PYLL) for female cancer and breast cancer for the premature death analysis for all ages. To compare potential relevant factors between younger and older age groups, the mortality by region, ethnicity, marital status, occupation and education level for female cancer and breast cancer were calculated. The chi-square test was used to examine the differences of these rates.

Microsoft Excel and SPSS 13.0 statistical software were used for data management and analysis. A p-value of ≤0.05 was considered statistically significant throughout this study.

3. Results

The annual average population of the 5 monitoring points was 1.5 million, with 60% of the people living in rural

areas. Populations of the 5 monitoring points accounted for about 6% of the total population of Inner Mongolia. There were a total of 362 cancer deaths among women recorded in the DRS system during 2008 - 2010. The mortality was 22/100,000 (95% confidence interval [CI], 19.7 - 24.3) for female cancer and 10/100,000 (95% CI, 8.5 - 11.1) for breast cancer.

Table 1 shows the mortality for female cancer and breast cancer in the 5 monitoring points according to the calendar period. Breast cancer mortality accounted for nearly half of the female cancer deaths during those 3 years. A large variation in mortality for female cancer (16.0, 95% CI, 4.0 - 29.0) and breast cancer, (95% CI, 5.4 - 14.7) was observed during the 3 years. However, there were no statistically significant differences in the 3 years between the 5 monitoring points of female cancer ($\chi^2 = 13.6$, $p = 0.09$) and breast cancer ($\chi^2 = 11.2$, $p = 0.19$). Therefore, the data sets for the 3 years and 5 monitoring points were merged for analysis.

The percentage of hospital-level diagnoses and diagnostic methods for female cancer and breast cancer are shown in **Table 2**. More than 80% of women were diagnosed in the first 2 hospital levels. All cases of breast cancers and 99.7% of female cancers were diagnosed pathologically.

Table 1. Mortality rate of female cancer and breast cancer among the 5 monitoring points in Inner Mongolia (2008-2010).

	2008		2009		2010	
	n	rate ($1/10^5$)	n	rate ($1/10^5$)	n	rate ($1/10^5$)
Female cancer						
Kailu County	11	7.67	21	14.5	16	10. 9
Balinyouqi	7	10.6	14	20.9	13	19.1
Suniteyouqi	8	29.3	2	7.2	3	10.7
Muslims District	18	16.3	33	29. 7	22	19.7
Linhe District	70	35.9	66	33.4	58	29.0
Total	**114**	**21.0**	**136**	**24.8**	**112**	**20.2**
Breast cancer						
Kailu County	5	3.49	14	9.65	5	3.40
Balinyouqi	1	1.52	5	7.46	5	7.33
Suniteyouqi	3	11.0	2	7.24	2	7.16
Muslims District	12	10.9	17	10.8	11	9.83
Linhe District	36	18. 5	27	13.7	20	10.0
Total	**57**	**10.5**	**65**	**11.9**	**43**	**7.75**

Table 2. Percentage of the breast cancer and female cancer in the 5 monitoring points (2008-2010).

	Breast cancer		Female cancer	
	n	%	n	%
Highest diagnostic institutions				
Provincial hospital	75	45. 5	135	37.3
Municipal hospital	72	43.6	183	50.6
County level hospital	17	10.3	41	11.3
Township level hospital	1	0.61	3	0.83
Diagnostic method				
Clinical and Pathology	67	40.6	143	39.5
Pathology	49	29.7	90	24.9
Clinical	20	12.1	64	17.7
Surgery	28	17.0	63	17.4
Postmortem infer	1	0.61	1	0.28
Unknown	0	0.00	1	0.28

The PYLL and the mortality in the 5 monitoring points are presented in **Figure 1**. Points to the up of the column indicate causes that contribute to PYLL more than to mortality. Error bars represent the standard error of mortality. **Figure 1** shows that the PYLL value of breast cancer and female cancer was close to the standard error of corresponding mortality. It means that the PYLL had a similar effect as mortality. **Figure 2** shows the PYLLs of breast cancer and female cancer were significantly higher than the mortality in younger age groups. Conversely, the mortality was slightly higher in older groups. It is consistent with the rule of PYLL and mortality of cancer.

The demographic characteristics for female cancer and breast cancer are presented in **Table 3**. The rates of younger age groups were higher than older age groups in all categories. The chi-square test indicates that the rates of marital status and education level in younger age groups were higher than that in older age groups. This means that the risk of female cancer and breast cancer increased ($p < 0.05$). Although occupation was not a significant factor in female cancer ($p = 0.06$), it was close to the significance level and was significant in breast cancer ($p < 0.01$).

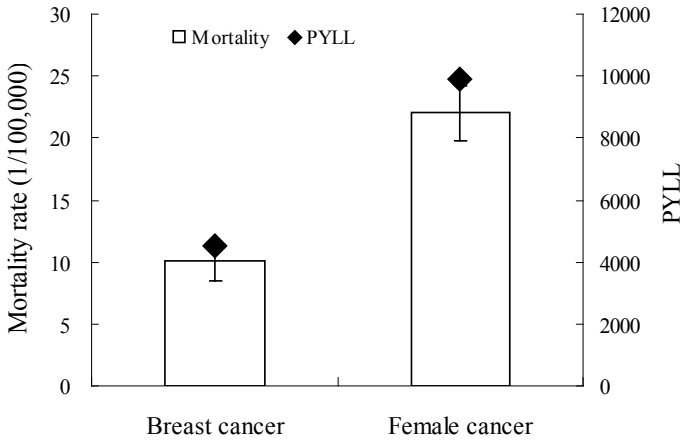

Figure 1. Comparison of mortality to PYLL in five monitoring points from 2008 to 2010.

Table 3. Results of the Chi-square test for characteristic variables and corresponding rates for female cancer and breast cancer in the 5 monitoring points (2008-2010).

Category	<50		≥50		χ^2	*p*
	n	Rate (%)	n	Rate (%)		
Female cancer						
Urban	96	61.2	112	54.6	1.54	0.21
National minority	13	8.28	15	7.32	0.12	0.73
Cohabit	148	94.3	170	82.9	10.7	0.01*
Employment	115	73.3	131	63.9	3.57	0.06
Above middle school levels	114	72.6	64	31.2	68.5	0.00**
Breast cancer						
Urban	47	63.5	48	52.8	1.94	0.16
National minority	5	6.76	5	5.49	0.11	0.74
Cohabit	70	94.6	74	81.3	6.48	0.01*
Employment	71	96.0	54	59.3	29. 8	0.00**
Above middle school levels	55	74.3	23	25.3	39.4	0.00**

*$p < 0.05$

**$p < 0.01$

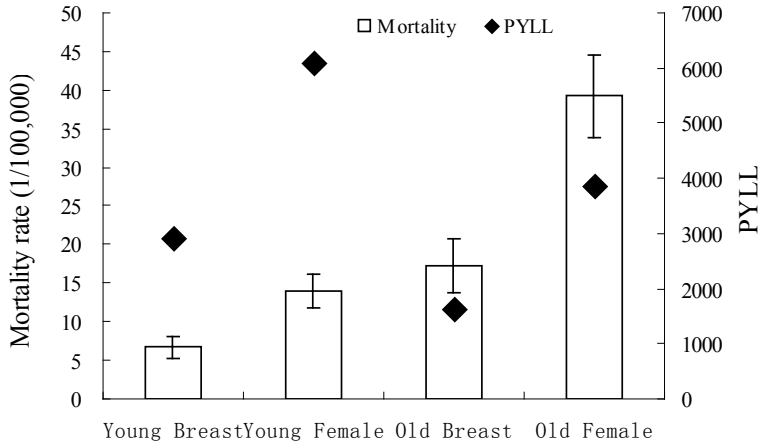

Figure 2. Comparison of mortality to PYLL by younger and older groups in five monitoring points from 2008 to 2010.

4. Discussion

Our results show that the breast cancer mortality were 10/100,000. It was lower compared to recently reported breast cancer mortality in Western countries; 22.7/100,000 in Serbia [6] and 21.8/100,000 in Ireland [1]. However, it was higher than that in neighbouring regions of Mongolia (2.80/100,000) [7]. The breast cancer mortality increased with age in Inner Mongolia.

Both the PYLL and mortality include some measure of the number of deaths and distribution of age at death, although they have different emphasis. The PYLL contribution of breast cancer was similar to mortality. The PYLL contribution of breast cancer greatly exceeds the mortality in younger age groups and was less than the mortality in older age groups. It was indicated that the impact of loss of life for breast cancer was more severe for younger age groups. In contrast, the impact of mortality was more severe for older age groups. It was consistent with the general rule in PYLL and mortality of cancer [8].

We selected some demographic characteristics to explore their effect for age of breast cancer. In our study, the mortality for living with a spouse was higher in younger age groups than in older age groups among the cases of breast cancer deaths. Women who lived together with a spouse were more likely to develop breast cancer than those who live alone owing to the widowed or divorced status. Consistent with our study, women who lived alone had lower breast cancer mortality in Norway [9] and Sweden [10].

In our study, the rates of higher education in young groups were almost 3 times higher than in older age groups with breast cancer. Some earlier studies in the West have shown the breast cancer mortality in women who had higher education were higher [11]. Early in the 1990s some studies have shown that higher education in itself being a risk factor for breast cancer was unlikely. The biologic factors hypothesized to mediate this relation, such as nulliparity or an older age at first birth among more highly educated women partially explained the excess risk among the most highly educated group [12]. The higher breast cancer risk seen among well-educated woman appears to be attributable to these women's greater exposure to breast cancer risk factors [12]. Older age at first birth increases the risk for breast cancers [13].

In our study, the rates of employment were more than 90% in younger groups and less than 60% in older groups. Some studies have shown the breast cancer mortality in women who were employed were higher than those who never work [14]. The retirement age for women was 50 years according to State Council on the workers retire or resign Interim Measures. Many retired women had less work stress. Some studies showed high levels of strain were associated with a slight increase in the risk of breast cancer [15].

5. Conclusion

The present study demonstrated that breast cancer mortality increased with age. Young women who lived together with a spouse, had a job and had higher education were more likely to die of breast cancer. Control policies should aim at reducing the breast cancer mortality for younger age groups. Additional research needs to be conducted to identify characteristics for different populations to better design strategies to minimize the impact on breast cancer death in younger age groups.

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Conflicts of Interest Statement

The authors declare that they have no competing interests.

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Epidemiology of Increasing Hemo-Parasite Burden in Ugandan Cattle

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Abstract

Hemo-parasites (HP) are one of the major constraints to the economic development of the livestock industry in Uganda. Generally, the occurrence and importance of HP is a reflection of complex interactions involving the causative organisms, tick vectors, the vertebrate hosts and the environment. We carried out a cross sectional study to identify and determine the prevalence of the major HPs in Central and Western Uganda, to form a baseline for appropriate interventions. A total of 295 bovine samples were analyzed from 15 districts of Uganda; 56.3% being from the Central and 43.7% from the Western region of the country for a period of six months, and a questionnaire was administered to the farmers. Thin peripheral blood smears stained with Giemsa were used during the laboratory identification of the parasites. The disease prevalence was established at 47.4%, 6.7%, 1.9% and 14.4% for *Theleria parva*, *Babesia spp.*, *Trypanasoma brucei*, *Anaplasma spp.* with a corresponding disease risk ratio (DRR) of 67.4%, 9.5%, 2.6%, 20.5% respectively in Uganda. The odds of having an infection from the Central region were 1.7 times greater ($P < 0.05$) than those from the Western region with a corresponding risk ratio of 1.2 (CI.1.1, 2.84, 95%), which showed that there exist marked differences between the two regions. Mean PCV was at 29.8%, and majority (59%) of infected animals had low PCV which varied across the months.

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These showed that generally, cattle in the West are more severely affected by HP than those from the Central region. The questionnaire revealed that 100% of the farmer treatments are based on clinical sign presentation, with occasional reliance on veterinarians. In conclusion, the burden of hemo-parasites is steadily increasing across the regions, and the current policies are not helping farmers who are hit the hardest by the development of antibiotic and acaricide resistance. These findings, along with previous studies, suggest that eradication HP is not feasible unless there are radical changes implemented, and that current practices are expensive and unsustainable. Further studies would be carried out to provide knowledge on the level of antibiotic resistance for the promotion of veterinary public health and trade.

Keywords

Hemo-Protozoan Parasites, Farming Practices, Uganda, Food Security

1. Introduction

Hemo-parasites (HP) are of great economic impact on livestock, affecting 80% of the world's cattle population [1] [2]. In East and Central Africa the major disease with the highest cases of mortality is East Coast fever (ECF) [1] [3] which is caused by *Theleria parva*, transmitted by *Rhipicephalus appendiculatus* [4]. Other minor tick-borne diseases in cattle include benign theileriosis babesiosis, anaplasma, cowdriosis caused by *Theileria mutans* [5], *Babesia bigemina*, *Anaplas mamarginale* and *Erlichia ruminantium* [5] respectively. HP cause economic losses due to high morbidity and mortality [6] [7], and losses incurred have hindered further advancement of the livestock sector in most developing countries including Uganda [3]. This has further made the attainment of the millennial developmental goals (MDGs), in particular the eradication of extreme poverty and hunger among developing countries elusive [8]. In small livestock, Erlichiosis is a great burden thus limiting productivity despite efforts by the international community in partnership with regional Governments to provide highly productive breeds through improved livestock technologies [9] [10]. The disease is endemic in various parts of Uganda [11] [12], and there is limited epidemiological data on the disease in this country. *Anaplasma marginale* and *Anaplasma centrale* have been detected among livestock in East Africa [1] [5] [13] in both small and large animal populations. These are transmitted by *Boophilus decoloratus* ticks, and mechanical transmission during herd vaccinations has been reported [14] [15] and *Babesia bigemina* vectored by *Boophilus decoloratus* has got a wide geographical distribution in the tropics [16]. Generally, tick-transmitted diseases such as Babesiosis and Theileriosis are of economic importance globally [17]-[19]. HP are a major threat to food security especially among the livestock dependent communities within the Sub Saharan Africa [6] [20]. Recent studies in Uganda [21]-[23] and South Africa [24] have shown that certain wild ungulates such as the Cape Buffalo, have continued to act as reservoirs for some of the HP. This challenge is highly magnified at the wildlife-livestock [21] interface within most rural communities which has further modified the epidemiology of the disease.

The characteristic low-coverage of diagnostic laboratories coupled with poor extension services has hindered development of the livestock industry, since farmers have limited knowledge on the occurrence of the HP. A study [11] in Northern Uganda (Gulu) showed that Theileria and Anaplasma were highly prevalent and mortality attributable to TBDs was evident. In a corresponding study, HP burden was shown to be due to ECF (79%), Anaplasmosis (11%), and Babesiosis (4.4%) [25]. In Eastern Uganda (Soroti), a study [26] indicated Sero prevalence up-to 100% HP burden in *Bos indicus* to East Coast Fever, Babesiosis and Anaplasmosis. In the *Bos indicus* (Nkedi Zebu), the prevalence of trypanosome infection was lower (7.9% v. 10.8%; $P > 0.05$) with the overall mean PCV higher (29.4% v. 28.7%; $P < 0.05$) than in the *Bos indicus* (Ankole) [26]. In the Kenya highlands, recent studies [4] [27] [28] demonstrated that prevalence of *T. parva* infections and the reported ECF mortality and case-fatality can vary significantly by zones and grazing system [29]. In Kenya, intensive/semi-intensive smallholder systems [30] were characterized by different management practices at the farm, agro-ecological level as well as grazing systems [4]. Consequently, they show varying ECF prevalence, incidence and ECF-specific morbidity and mortality rates and Kenya has recently approved ECF vaccination [17] in all production systems, thus farm management can improve on the outcomes of HP burden [31].

It's generally agreed that control of tick-borne diseases in Sub-Saharan Africa has failed because of lack of epizootiological information and control strategies [3] [32]. These would probably be due to the various social farming challenges at the community interface, controlled by a variety of factors ranging from Government policies, farming technologies, climate change, soil and vegetation to human activities including livestock production systems as well as measures taken to control ticks and treatment interventions done by the farmers. There is still a great lack of knowledge regarding the epidemiology of the increasing HP burden in the region despite the efforts from the regional Governments in the livestock sector to promote the MDGs [8]. In this study we carried out a survey to identify and determine the prevalence of the major HP in Central and Western Uganda. A questionnaire was administered and an on farm drug survey was conducted to determine any relationship between HP distribution and the seasons, farming practices in order to form a baseline for institution of relevant corrective measures within the study areas.

2. Materials and Methods

This was a cross sectional study carried out (along the cattle corridor of West and Central) from September 2013 to February 2014. A total of 143 farmers from 15 districts in Central (Kampala, Kiboga, Kyankwanzi, Luwero, Lyantonde, Masindi, Mukono, Wakiso) and Western (Fort-portal, Ibanda, Isingiiro, Kamwenge, Kibaale, Kiruhura, and Mbarara districts) were covered. Farms for inclusion were selected through veterinary records from the local Government, accessibility and history of tick borne infections following recent episodes of treatment and acaricide application and an open ended questionnaire along with a drug survey was structured and administered by an interviewer. Adult (≥1.5 years) and yearlings (<1.5 year) were considered, while the major breeds considered were *Bos indicus* (Ankole, Zebu), *Bos taurus* (Friesian, Boran, Guernsey, and Jersey). We included all cattle with and without clinical signs of HP infection (ill thrift, anemia, temperature of >40.5˚C) on the farms, those that had been treated within the last 14 days or had undergone acaricide application within the last 7 days, as well as those animals that had not received any chemotherapeutical intervention by the farmer. Thin peripheral blood smears stained with Giemsa were used during the laboratory identification of the parasites. Briefly, blood was collected from the coccygeal vein following effective restraint of the cattle under study using a field improvised crush, from which thin blood smears were prepared in the laboratory. The smears were fixed with methanol, stained with Giemsa and examined under ×1000 magnification with oil immersion. Heparinized blood was placed in micro-hematocrit tubes, and centrifuged at 10,000 rpm for 4 minutes; afterward the PCV was determined using the hematocrit reader. The identified parasites were hence recorded against the respective animal, along with their individual corresponding PCV readings. Data entry was done using Excel version 2010, and analysis by Excel and Epi-Info software. Logistic regression was used to examine the relationship between farmer treatment interventions and the other risk factors thought to be responsible for the observations made. Ethical Approval was got through The College of Veterinary Medicine and Animal resources and Biosecurity.

3. Results

A total of 295 bovine samples were analyzed; 56.3% from the Central and 43.7% from the Western region of the country over a period of six months (September 2013 to February 2014) at 95% confidence interval as shown in **Table 1**.

The mean PCV reading was 29.8%, while the regional readings were 30.5%, 28.8% (SD: 7.9, 8.2) for Central and Western regions respectively as shown in **Table 2**. The majority (59%) of the animals that were positive with hemo-parasites (HP) had a PCV below the mean, while 41% among the infected had a PCV above the mean (29.8). It was also discovered that 57.4% among the animals negative with HP, had a PCV > 29.8, while 42.6% had a PCV ≥ 29.8. Of the cattle samples obtained (295), those from the Central region had a higher burden of HP than those from the Western at 61.9% and 38.1% respectively. Infection with HP was highest (70.7%) among *Bos indicus* while in the *Bos taurus* it was established at 57.9% from the study area. The HP burden increased steadily across the months as shown in **Table 3**. Generally disease burden was higher in farmers that had not attempted any treatment than those that had tried to intervene. Majority (60%) of the farmers used antibiotics, while 30% used anti-protozoan agents, while the rest offered no treatment intervention. HP parasites were detected in cattle samples from farmers that had attempted treatment with anti-protozoan agents (70.7%), and those that had used antibiotics (50.7%), while in farmers that had not attempted any intervention; it was established at 63.9% as shown in **Table 3**.

Table 1. Showing Regional bovine sample distribution in the study area.

Region	Samples	95% Confidence Interval	
	Freq. (%)	Lower	Upper
Central	166 (56.3)	50.4	62.0
Western	129 (43.7)	38.0	49.6

Table 2. Showing PCV distribution across the Central and Western regions.

Parameters	Results		
	Total	Central	Western
Minimum	10.0	10.0	10.0
Maximum	68.0	68.0	60.0
Mean	29.8	30.5	28.8
Std. Dev.	8.1	7.9	8.2
Observations	295	166	129

Table 3. Showing descriptive statistics from bovine samples in the study area.

Parameter	Variable	Frequency Distribution (%)	
		Positive	Negative
PCV	< 29.8	36 (59)	139 (57.4)
	≥ 29.8	25 (41)	103 (42.6)
Regional Burden	Central	109 (61.9)	57 (47.9)
	Western	67 (38.1)	62 (52.1)
Breed	*Bos indicus*	29 (70.7)	12 (29.3)
	Bos taurus	147 (57.9)	107 (42.1)
Age	Adult	172 (60.4)	113 (39.4)
	Yearling	4 (40)	6 (60)
Month	September	16 (48.5)	17 (51.5)
	October	27 (81.8)	6 (18.2)
	November	35 (59.3)	24 (40.7)
	December	30 (69.8)	13 (30.2)
	January	55 (58.5)	39 (41.5)
	February	13 (39.4)	20 (60.6)
Treatment Groups	No treatment intervention	39 (63.9)	22 (36.1)
	Treatment intervention	137 (58.5)	97 (41.5)
Treatment Interventions	No treatment offered	39 (63.9)	22 (36.1)
	Anti-protozoan	65 (70.7)	27 (29.3)
	Antibiotic	72 (50.7)	70 (49.3)

In the present study, the disease prevalence was established at 47.4%, 6.7%, 1.9% and 14.4% for *T. parva*, *Babesia spp.*, *T. brucei*, *Anaplasma spp.* with a corresponding disease risk ratio (DRR) of 67.4%, 9.5%, 2.6%, 20.5% respectively for Central and Western regions of Uganda as shown in **Table 4**. The odds of having an infection from the Central region were 1.7 times greater than those from the Western region with a corresponding risk ratio of 1.2 (CI.1.10, 2.84, 95%), which showed that there exists marked differences between the two zones as shown in the **Table 5**.

There was a significant difference in the odds of exposure and risk of infection between the two regions in the study area (Chi-square p value < 0.01). Prevalence of Theileria and Anaplasma infection in Western region was

Table 4. Shows the hemo-protozoan isolates and their burden in from the selected districts of Uganda.

Variable	*T. parva*	*Babesia spp.*	*T. brucei*	*Anaplasma spp.*
Prevalence	47.4	6.7	1.9	14.4
DRR	67.4	9.5	2.6	20.5

Key: DRR = disease risk ratio.

Table 5. Showing odds and risk ratios for hemo-protozoan infection in bovine samples from the study area.

Parameters:		Point Estimate	95% Confidence Interval		
			Lower	Upper	
Odds Ratio	(cross product)	1.7696	1.1048	2.8344	(T)
			1.0749	2.9128	(F)
	Risk-based				
Risk Ratio	(DRR)	1.2643	1.036	1.5428	(T)
Risk Difference	(RD%)	13.7247	2.4767	24.9726	(T)

Key: T = Taylor Series; F = Fisher Exact.

56.2% and 24.8%, while that in the Central region was at 40.0%, 6.0% respectively. The Trypanosome prevalence infection was 80% in Western, while it was 20% in the Central region with a corresponding Babesiosis prevalence of 9.9% and 4.0% respectively as shown in **Table 6**.

The drug survey carried out showed that all the farmers in the respective districts had full access to the antibiotics and anti-protozoan agents as well as acaricides from the regional veterinary drug shops. The odds of having a HP positive cattle following treatment intervention were established at 1.2 times less likely to those from animals that didn't receive treatment by the farmer as shown in **Table 7**. Statistical analysis showed there is no significant association between animals that had been treated and those that had not been treated ($P = 0.23$) by the farmers in this study.

Factors that Would Probably Be Responsible for Differences in the HP Burden in the Two Regions

HP burden was significantly associated with season/month of the year ($P < 0.01$). In a stepwise logistic regression analysis using variables identified from the bivariate analysis only one variable-Month (Dec/Feb-Odds ratio 6.18; $P = 0.02$) was independently associated to HP burden. Further analysis of farmer treatment practices on the individual HP prevalence revealed a higher infection rate in treated compared to non-treated bovines as shown in **Table 8**. There was no significant difference in the presence of HP and treatment, thus treatment type was not significantly associated with the presence or absence of hemo-protozoan parasites as shown in **Table 9**.

Majority (60.4%) of the infected animals were adults, while only 40% of the yearlings were infected as shown in **Table 3** and further analysis showed there was no significant association between age and infection ($P > 0.05$) with HP.

The questionnaire revealed that 100% of the treatments done by farmers were based on their knowledge of the clinical signs without necessarily consulting veterinarians. Among those that relied on veterinarians, 84% were from the Central region while 16% from the Western region of Uganda. 65% of the farmers in the Central region attempted treatment without consulting veterinarians. Farmer treatment therapeutical failures of 50% from both regions were reported. Farmers continue to face a couple of limitations in the industry such as expensive drugs and limited laboratory coverage (100% Central) and limited Government support (83.3%, 16.7%) in the Central and Western regions respectively. The results are further summarized in **Table 10**.

4. Discussion

In this study, more samples (**Table 1**) were collected from the Central region probably due to convenience, and demand for laboratory veterinary diagnostic services within these communities. Prevalence of Theileria and Anaplasma infection was highest in Western region from this study, which showed a 50% increment from previous studies in both Northern and Eastern regions of Uganda [1] [11]. It was also shown that infection with

Table 6. Showing the regional burden in cattle from the individual hemo-parasites.

Region	Average Counts	*T. parva*	*Babesia spp.*	*T. brucei*	*Anaplasma spp.*	Negative
Central (%)	150 (28.9)	60 (40)	6 (4.0)	1 (0.7)	9 (6.0)	74 (49.3)
Western (%)	121 (28.9)	68 (56.2)	12 (9.9)	4 (3.3)	30 (24.8)	38 (31.4)

Table 7. Showing data output on effect of farmer treatments on HP and those that hadn't intervened.

Parameters		Point Estimate	95% Confidence Interval		
			Lower	Upper	
Odds-Based					
Odds Ratio	(cross product)	1.2551	0.7001	2.2502	(T)
Odds Ratio	(MLE)	1.2542	0.7014	2.2771	(M)
			0.6764	2.3706	(F)
Risk-Based					
Risk Ratio	(DRR)	1.092	0.8789	1.3569	(T)
Risk Difference	(RD%)	5.3874	- 8.2162	18.9919	(T)

Key: T = Taylor Series; C = Cornifield; M = Mid P; F = Fisher Exact.

Table 8. Showing HP burden in treated cattle populations by farmers in the study area.

Variable	Frequency (%)							
	T. parva		*Anaplasma spp.*		*Babesia spp.*		*T. brucei*	
	Post.	Neg.	Post.	Neg.	Post.	Neg.	Post.	Neg.
No Treatment	27 (18.8)	34 (22.7)	11 (28.2)	50 (19.5)	2 (10)	59 (21.5)	1 (16.7)	60 (20.8)
Antiprotozoan	56 (38.9)	36 (24)	18 (46.2)	74 (28.9)	9 (45)	83 (30.2)	3 (50)	89 (30.8)
Antibiotic	61 (42.4)	80 (53.3)	10 (25.6)	132 (51.6)	9 (45)	133 (48.4)	2 (33.3)	140 (48.4)

Key: Post = Positive; Neg = Negative.

Table 9. Showing relationship between presence of HP and farmer treatments.

Variable	Chi-square	Df	Probability	Comment
T. parva	7.5921	2	0.0225	$P < 0.05$
Anaplasma spp.	9.1840	2	0.0101	$P < 0.05$
Babesia spp.	2.5395	2	0.2809	$P > 0.05$
T. brucei	1.0215	2	0.6000	$P > 0.05$

hemo-parasites was highest (70.7%) among *Bos indicus* while in the *Bos taurus* it was established at 57.9% (**Table 3**), which is contrary to recent findings [1] [26] that indicated stability in *Bos indicus*. This would probably due to the farmer management practices in the rural communities which have led to the endemic instability of the parasites in the livestock populations. Generally, in both regions, farmers did offer medications without consultations from veterinarians due to the liberalization of the livestock industry [33], and they often wait until the condition has deteriorated thus accounting for the increased animal loses due to HP and the steady increase of the their prevalence within Uganda. Overall disease burden was lower in farmers that had not attempted any treatment than those that had tried to intervene.

Amongst farmers that attempted treatment, majority of them used antibiotics and anti-protozoa agents, while the rest offered no treatment intervention. HP were detected in cattle samples from farmers that had attempted treatment with anti-protozoan agents (70.7%), which was higher than in those that that claimed to have used antibiotics (50.7%) as shown in **Table 3**. The farm surveys also showed that the control of HP and vectors basically relied on the use of anti-protozoan agents as well as (**Table 3**) antibiotics which concurs with previous

Table 10. Showing Questionnaire responses from the study area.

Qtn.	Variable	Response	Central (%)	Western (%)
1	Disease identification	Clinical signs	92 (64.3)	51 (35.7)
2	Treatment options	Treatment with pharmaceutical agents	78 (65)	42 (35)
		Didn't offer any treatment	22 (45.8)	26 (54.2)
3	Drug availability	Drug shops	82 (62.1)	50 (37.9)
		Hawkers	10 (90.9)	1 (9.1)
4	Human resource	Consulted veterinarian	21 (84)	4 (16)
		Seasonally relied on Veterinarian	71 (60.2)	47 (39.8)
5	Challenges faced	No improvement after treatment	20 (50)	20 (50)
		Unreliable veterinary services	22 (62.9)	13 (37.1)
		Acaricide resistance	74 (64.9)	40 (35.1)
		Drugs expensive	11 (100)	0 (0)
		Limited Vet laboratories	7 (100)	0 (0)
		Limited Government support	5 (83.3)	1 (16.7)
		NDA + Few Veterinarians	19 (67.9)	9 (32.1)
6	Complications to HP control	ECF vaccination	1 (100)	0 (0)
		Death of animals	18 (60)	12 (40)
		Fake vet drugs on the market	5 (55.6)	4 (44.4)
		Government policy and politics	11 (68.8)	5 (31.3)
		Climate change (droughts)	9 (81.8)	2 (18.2)
7	Production system (Observations)	Semi-intensive	84 (93)	6 (7)
		Extensive	60 (40)	90 (60)

Key: NDA = National Drug Authority.

findings [12] [34] while some farmers offered no chemotherapeutical treatment. It was also observed that the limited human resource at the regional local Governments was not being fully utilized, thus making disease diagnosis and control further more complicated under the prevailing Government policies, thus contributing to the slow development of the livestock industry through increased animal mortalities and poor farming practices that have culminated into the severe climatic changes in these farming communities as shown in **Table 10**. The Government's policy on liberalization [33], of the drug industry has been a great failure, because, the end point of the policy, was not to improve accessibility, but improve animal health and productivity and from our observations this is still elusive.

The findings **Table 2** and **Table 3** showed that generally, cattle in the Western region are more severely affected by HP than those from the Central region, and PCV alone wouldn't be used as measure of HP presence. Central region had a higher burden of HP than those from the Western (**Table 3**). This would probably be because the Central region lies more within the mixed rain-fed crop-livestock category in Uganda, which has a better climate favorable for farming [6] which would further indicate that the burden of HP. The absence of screening centers for inter-district animal movements against animal diseases in the regions has further escalated the situation [35]. Generally the occurrence and importance of HP is a reflection of complex interactions involving the causative organisms, tick vectors, the vertebrate hosts and the environment [3]. These interactions are driven and modified by a wide variety of factors ranging from the environment, host, and the vectors as well as community farming activities. Trypanosome prevalence infection was four times greater in Western region than in the Central region (**Table 6**), which concurs with the findings of Rubaire [12] in Eastern Uganda which showed that prevalence of HP in cattle vary with agro-ecological zones and management [4] [27] in the Kenyan highlands. The Western region is also bordered (Smith *et al.*, 2010) by a couple of National Game Parks (NGPs) which continue to act as reservoirs for maintenance [26] and carrier hosts [21] [22] in the regional farms as wildlife and cattle often intermingle during grazing. Human activities especially in the land use pattern of the

farming communities around the NGPs, as cattle grazers encroach on the game park pastures have resulted in an increased incidence of the HP [21]. This risk is higher in the Western region, and as communities continue to move long distances in search of water and pastures in the long dry seasons which have been worsened by the climatic changes in the region, probably accounting for the higher observed DRR over that in the Central region.

The current livestock policy [33] has yielded undesirable effects that have continued to undermine the development of the livestock industry (**Table 10**). This has led to the proliferation of the HP burden due to the maintenance of chronic carriers [11] within the communities. This would be due to the fact that most farmers find the services costly and would prefer not allowing the veterinarian to visit them [33] coupled with limited supervision of the veterinary drug industry by National Drug Authority (NDA), which has led to the development of antibiotic and acaricide resistance in the farming communities which has been induced by the farmers. The current dilemma facing the food animal drug use is probably due to the lack of appropriate guidance on proper drug usage, medication to use for a particular parasite, probably due to the poor Government policy in the livestock industry [34], as well as inadequate supervision of the drug industry (NDA) and ineffective extension service delivery as a result of shortage of professional human resource in these communities. This is further worsened by the poor attitude amongst farmers as they seldom rely on district veterinary laboratories [36] for a diagnosis, to gain a better knowledge on their individual herd challenges before treatment is instituted [11]. This would probably also be due to the few veterinary laboratories in the countryside or the shortage of human resource to operate them at the local Government level, thus leading to the development of this trend in farming practices which have continued to favor the proliferation of HPs within Uganda despite all the various policies in place.

The HP burden increased steadily from September and decreased through January. This would be due to the seasonal variations as the tick population increases exponentially during the rainy season (September to November) and logistic regression showed no significant association for the other months except for the Months of December/February (dry season)**.** This would probably have been due to the vector epidemiological dynamics as the tick (vector) challenge is highest in the rainy seasons, thus the observed increases in the HP challenge, and farmers are often vigilant to intervene and administer treatments. In the dry season, most of the severely challenged animals died due to increased stress levels from water shortage, limited pastures and severe mineral deficiencies in addition to the suppressed immune system as a result of the chronic infections due to HP. Cattle were observed to come down with infection as the dry season intensified (December to February) and more livestock losses were registered from several farms. Statistical analysis showed there was no significant association between cattle that had been treated and those that had not been treated by the farmers in this study. This would probably be due to the fact that farmer treatments are often ineffective due to their failure to seek professional assistance and adherence to dosage regiments, as well as poor diagnosis of HP conditions with other differential infections [11] within the community as they seldom rely on laboratory diagnosis. Cheap antibiotics that don't clear off infection are preferred to anti-HP agents which are relatively expensive. The current Government policy regarding veterinary drug usage has contributed to the development of drug resistance in the cattle in several farms, which has led to the proliferation of HP in the rural communities especially. Farmer treatment efficacy on the individual HP was further analyzed and it was discovered infection rate was higher in treated than non-treated groups as shown in **Table 8**. This observation was due to the fact that resistance had developed in the Ugandan cattle to the antibiotics that had overly been abused over the years [37]. There was no association between age and the infection of the cattle with HP despite of the fact that majority of infected animals were adults, which would be due to the fact that adult cattle move great distances in search of pastures and the yearlings are kept nearby the farm thus less exposed to the risk of HP.

The increasing HP burden is attributed to the farming practices, increased antibiotic and acaricide resistance [38] as well as failure by farmers to adhere to the therapeutical regiment for effective treatment, and epidemiological pattern of the dominant ticks in the region [12] as well as the current government policy. The findings, together with those of previous studies, suggest that eradication of hemo-parasites is not feasible unless there are radical changes implemented, and that current practices are expensive and given the indigenous nature of the breeds, also epidemiologically unsound [34] [39]. In addition, veterinary costs for animal health service delivery are apparently high especially following the liberalization [33] of the livestock industry. An ethno-veterinary approach combined with social service delivery to improve on behavioral change on farming practices, and drug usage, improved extension service delivery as well as efficient livestock industry management may be required for the sustainability of the livestock industry to control the increasing HP burden in the farming communities of Uganda and the neighboring East and Central African countries.

5. Conclusion and Recommendations

The burden of hemo-parasites is steadily increasing across the regions, and the current policies are not helping farmers who are hit the hardest by the development of antibiotic and acaricide resistance. There is an urgent need to design strategic control methods that are integrated in the production systems which would rely on renewable resources within our ecosystem especially for the respective regions along the cattle corridor of Uganda, through improved policy, research and extension service delivery in the livestock sector for the growth and development of the industry. Further research would be carried out to evaluate the Veterinary Public Health concerns that are raised by these threats especially for the promotion of both human and veterinary medical fields within the diaspora.

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Supplementary Information

Study Area Map

Annex 3. Map of Uganda showing the Cattle Corridor.

Questionnaire

I am a district veterinarian, currently working for the Animal Disease Control project in this region. I am currently working on a research project titled: "*Epidemiology of Increasing Hemo-Parasites in Ugandan Cattle*". You have been identified as a focal person in this district for the above research being a livestock farmer in cattle production. Kindly fill this questionnaire, which is meant to obtain data on disease burden, farmer treatment interventions, and common drugs that you use in this community. The findings from this research will help you to identify sources for the increasing hemo-parasitic challenge within the Central and Western regions of Uganda.

Farm ID: District

1. How do you know that your animal is sick?
2. Have you attempted any treatment, if so, what drug have you been using?
3. Where do you buy the drugs?
4. Have you consulted any professional and if any, did they visit to check on the farm of recent? If not, why?
5. What is the major challenge that you have faced in the management of this condition?
6. In your opinion, what do you think has further complicated the effectiveness of animal disease control and diagnosis delivery of recent within your community?

Drug Survey

This survey was carried out to identify the major drugs currently being used by farmers in the management of hemo-parasites on the farms visited.

Generally all farmers had identical challenges using penstrep® concurrently with OTC®, with a limited few using OTC® alone, only during the initial stages of the infection.

Few farmers relied on the use of anti-protozoal agents probably due to the high cost attached to them, despite of the fact that they are easily accessible from the drug shops in the communities.

Sn.	Antibiotics	Anti-protozoals agents
1	Penstreptomycin (Penstrep®)	Buparvaquone (Butalex®, Butakel®)
2	Oxytetracycline (OTC®)	Parvaquone (Parvexone®)
3		Imizol®
4		Diminazeneaceturate (Veridium®)
5		Isometamidiumchloride (Samorin®)

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Victimization and PTSD in Ugandan Youth

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Abstract

Background: Little is known about post-traumatic stress (PTSD) prevalence rates in community samples. This is especially true for the African continent where child-soldiers, HIV/AIDS affected and orphans have been the target for PTSD prevalence studies. Objectives: The aim of this study is to investigate the indirect and direct exposure to 20 potentially traumatic events and its relation with PTSD in a Ugandan sample of senior 3rd year students and to perform cross-cultural comparisons with previous studies examining this age group. Socio-economic status, coping styles, negative affect, and somatization are further examined. Method: A convenience sample of 408 senior secondary school students, from eight schools, across three major towns, Kampala, Mbarara, and Jinja, were selected. The Harvard Trauma Questionnaire (HTQ) was used to establish PTSD prevalence rates, The Coping Style Questionnaire (CSQ) was used to assess coping styles, and the Trauma Symptom Checklist (TSC) were used to measure negative affect and somatization. Results: The subjects had been exposed to a mean of 6.6 direct events and a mean of 7.2 indirect events. The estimated prevalence rate of PTSD was 37.7% and a further 28.2% reached a subclinical level, missing one symptom to have the full diagnosis. Variables related to a PTSD diagnosis were female gender, number of directly experienced events, emotional coping, negative affect, and somatization. Conclusions: Ugandan youth have been exposed to significantly more potentially traumatic events and negative life events than European youth, and subsequently PTSD prevalence rates are higher. In addition, fewer gender differences are found in the Ugandan sample compared to the European samples.

Keywords

Trauma Exposure, Post-Traumatic Stress Disorder, Coping, Gender, Somatization, Negative Affectivity

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1. Victimization and PTSD in Ugandan Youth

Despite the growing evidence that not only exposure to severe trauma (such as rape, violence, sexual abuse, and war) but also more common negative life events (such as bullying) are associated with PTSD, studies that examine a wide range of traumas and negative life events are rare. The DSM IV criteria of PTSD have hence been argued to be insufficient as also non-life threatening events or a series of "microtraumas" may precipitate PTSD [1]. Similarly, most studies on PTSD have been carried out in adult populations, despite the fact that also young children and adolescents suffer from trauma, and develop symptoms of PTSD as well as childhood trauma having lasting effects on both mental and physical health into adulthood [2].

Rather few studies have examined the prevalence of PTSD in African adolescents with the exception of studies examining the prevalence of PTSD in former child soldiers, HIV victims and orphans.

Seedat, *et al*. [3] examined the exposure to potentially traumatic events and PTSD in a sample of 2041 boys and girls from Grade 10 with a mean age of 15.8 in Cape Town and Nairobi. They found that 80% had been directly or indirectly exposed to severe trauma. The prevalence rate of PTSD using the Child PTSD Checklist was 22.5% in the South African sample and 5% in the Kenyan sample while the partial-symptom PTSD was 12% and 8% respectively. Partial-symptom PTSD was defined by the authors as having at least one symptom in each DSM-IV symptom criterion category (reexperiencing, avoidance, hyperarousal). In contradiction to the aforementioned studies, Seedat *et al*. [3] did not find that females were at higher risk for a PTSD diagnosis. This held true for both PTSD and partial-symptom PTSD. Mels *et al*. [4] also examined exposure to potentially traumatic events and PTSD prevalence rates in a sample of secondary school students in the Democratic Republic of Congo. In their study, 95% had been exposed to at least one potentially traumatic event and 52.2% met symptom criteria for PTSD. Cumulative trauma exposure was in this study strongly associated with PTSD.

Karsberg & Elklit [5] conducted a study in rural Kenya among 477 secondary school students with a mean age of 16.4 years. A total of 34.5% met diagnostic criteria for PTSD, with 30.5% of boys and 42.3% of girls meeting PTSD criteria. Another study, also from Kenya, examined PTSD prevalence rates among impoverished youth and found that 18% met criteria for PTSD after screening. However, after conducting clinical diagnostic interviews only 12% reached diagnostic criteria [6]. It hence appears that the overall exposure to potentially traumatic events and subsequent PTSD are significantly higher in the studied populations of African adolescents compared to European adolescents [7]-[10]. However, the substantial variations in prevalence rates within countries warrant for caution in making generalizations.

In Uganda, most studies on prevalence rates of PTSD have focused exclusively on former child soldiers and internally displaced people. One study of 169 former Ugandan and Congolese child soldiers with a mean age of 15.2 years found the prevalence rate of PTSD to be 34.9% as measured by the Child Post Traumatic Stress Disorder Reaction Index (CPTSD-RI; [11]). In one comparative study of abducted and non-abducted adolescents living in Gulu district, prevalence rates of PTSD were 26.8% for abductees and 12.6% for non-abducted adolescents [12].

The current study was designed to provide epidemiological information about exposure to traumatic events and negative life events (e.g. parental divorce or being bullied), and the prevalence of PTSD among Ugandan senior 3rd year students. The study replicates previous European studies of the same age groups [7]-[10], one Indian study [13], and one Kenyan Study [5].

There is an ongoing debate whether the PTSD diagnosis transcends cultures, but a growing number of research studies support the application of the DSM-IV criteria for PTSD to go beyond culture [14] [15]. Uganda is an East African country with borders to Kenya, Tanzania, Rwanda, Democratic Republic of Congo and Sudan. Most of the country has experienced a relative long period of stability after National Resistance Movement (NRM) took over power in 1986. Some areas of Uganda, have, however had armed conflicts since. The total population of Uganda is 34.1 million of which 56.1% are eighteen and below. The average life expectancy is 54 years. One quarter of the Ugandans are considered poor [16]. To our knowledge the current study is the only one examining the prevalence rate of PTSD in young Ugandans who have not been directly involved in armed conflict or lives in areas affected by armed conflict.

Lazarus and Folkman [17] describe coping as a product of the interaction between situation-specific characteristics and personal resources. Identifying correlates of coping in adolescence may be especially important because adolescents are confronted with many new life stressors for which they have not yet developed a repertoire of coping responses to draw from [18]. Associations between personality and coping appear to be stronger

for younger samples [19], suggesting that personality may be particularly important in predicting coping in adolescents. Research into coping styles has mostly focused on problem-focused and emotion-focused coping [17]. Problem-focused coping aimed at changing the stressor is generally considered adaptive. In contrast, emotion-focused coping aimed at changing one's own emotional responses to the stressor is viewed as maladaptive and has been linked to poor psychological health in adolescents [20]. Furthermore, problem-focused coping has been found to be either not associated with posttraumatic symptomatology or to serve as a protective factor following different types of traumatic exposure, whereas emotion-focused coping has been found to correlate with increased posttraumatic symptomatology [21].

Negative affectivity refers to a mood dimension and reflects a general tendency to react to and have a negative perspective on the surrounding world and oneself [22]. Negative affectivity can either be seen as a state or as a personality factor similar to neuroticism. Significant associations between PTSD and negative affectivity are found in relation to trauma exposed adolescents [23]. Somatization refers to the development of somatic symptoms for which no organic cause is found [24] [25]. The low prevalence of somatization in study samples has led researchers to use the less restrictive concept of somatization. Somatization is often considered to represent a continuum with few symptoms at one end and multiple symptoms relating to various body sites at the other [26]. Somatoform symptoms have consistently been linked to traumatic exposure. Trauma victims tend to score higher on self-reports of somatic complaints compared to controls [23].

It is expected that the Ugandan adolescents have experienced more potentially traumatic events and negative life events than what has been found in adolescent samples in European countries. Hence a higher prevalence rate of PTSD is expected among young Ugandans. It is expected that female gender, family poverty, low parental education level, and high degree of exposure to potential trauma and negative life events, will be associated with higher degree of PTSD severity. We also expect emotional coping, negative affectivity, and somatization to be positively associated with PTSD symptoms.

2. Method

2.1. Procedures

Before conducting the study, an application explaining the aim of the study, the procedures, the confidentiality principles, alongside with the questionnaire was sent to the Ugandan National Council for Science and Technology who approved the study. After the approval, a meeting with the headmasters of the selected schools was held where the aim of the study and the confidentiality principles was explained. Before commencing on the study, a pilot study was conducted were the students were given the questionnaires in the classroom and asked to independently fill it out. All the questionnaires were in English which is the official language of the country and the school system in Uganda. At this school level (senior three) we expected very few students asked for help to have a word explained. However, it quickly became apparent that the students had some language difficulties and because of these difficulties had questions to an extent that did not make it possible to answer each student individually. As a consequence the procedure in the study was changed, so that the whole class answered all questions simultaneously. This made it possible to answer questions without exceeding a reasonable time frame. Before handing out the questionnaires to the students, a short introduction was given, explaining the purpose of the study, the option of not participating, the confidentiality principles and the procedure of collecting the questionnaire in one envelope and sealing it in front of the students. It took approximately 1.5 hours for the students to fill in the questionnaires.

2.2. Measures

The first part of the questionnaire concerned age, gender, tribe, living arrangements (living with one or both parents or others such as an aunt or in an institution etc.) and socioeconomic status. As studies have shown that adolescents knowledge of their parents income and occupational status is not very reliable [27], the parents level of education, number of assets in the household (bicycle, running water, electricity, car, and TV), the number of people sleeping in the same room in the household, and the number of full meals per day was used as a crude measure of socioeconomic status.

The second part of the questionnaire contained a list of 20 potentially traumatizing events and negative life events. The students were asked to indicate whether they had had no exposure, direct exposure, or indirect ex-

posure (witnessing the event or having someone very close to them experience the event) to each of the listed events. The 20 potentially traumatic events were selected from scientific literature and clinical experience. The list covered possible life-threatening experiences and distressing family conditions including pregnancy/abortion, parents' divorce, severe childhood neglect and absence of a parent, as well as other negative events.

The Coping Style Questionnaire (CSQ) [28] [29] which consists of 37 questions was used to measure coping styles. The 37 items were scored on a 4 point Likert scale where the students were asked to indicate to what extent they reacted to stress in the described manner (1 = never, 2 = sometimes, 3 = often, 4 = always). The internal consistency of the scale was questionable with a Cronbach's alpha of 0.59 for rational coping and 0.61 for emotional coping.

The Harvard Trauma Questionnaire—Part IV (HTQ) was used to estimate the occurrence of PTSD in the time following the most distressing event as chosen by the student [30]. The HTQ consist of 31 items where 17 are directly associated with the diagnostic criteria of PTSD and measure the intensity of the three core symptoms of the PTSD diagnosis, re-experiencing, avoidance, and arousal (DSM IV-TR; [31]). The 31 items were scored on a 4 point Likert scale where the students were asked to indicate to which extend the symptoms had bothered them in the past (1 = not at all, 2 = a little, 3 = quite a bit, 4 = extremely). The internal consistency of the scale was good with Cronbach's alpha at 0.86 for the total scale HTQ.

The Trauma Symptom Checklist (TSC; [32]) were used to measure degrees of negative affect and somatization [33]. It consist of 32 questions and is measured on a 4 point Likert scale were the students was asked to indicate how often during the last month they had experienced the symptoms (1 = not at all, 2 = sometimes, 3 = often, 4 = always). The scale showed good internal consistency with a Cronbach's Alpha of 0.80 for the total scale and 0.72 for negative affect and 0.62 for somatization.

2.3. Participants

The data was collected among 408 senior three students aged 13 - 24 years (M = 15.95; SD = 1.377) in eight schools across three major towns, Kampala (the capital, located in central Uganda), Mbarara (Western Uganda) and Jinja (Eastern Uganda). The gender distribution was 49.8% males and 50.2% females.

3. Results

3.1. Socioeconomic Status

Of the total sample, 42.2% lived with both parents, 35.3% lived with a single parent, and 22.3% had other arrangements, and 0.2% did not state living arrangements. Of the total sample, 95.8% stated their father's education and 89.7% stated their mother's education. The fathers' versus the mother' educational level was respectively: no formal education 13.5% versus 14.7%, Primary school (7 years) 15.7 % versus 20.6%, Secondary school (13 years) 27.5% versus 29.4%, Diploma (2 years after finishing secondary) 16.7% versus 13.7%, Bachelor's degree (3 years after finishing secondary) 10.5% versus 6.1 %, Master's degree 12% versus 5.1%. With regards to how many people shared the same bedroom 6.1% had their own bedroom, 24.8% shared their bedroom with one person, 17.4% shared their bedroom with two other people, 16.4% shared their bedroom with three other people, 14% shared their bedroom with four other people, 11.5% shared their bedroom with 5 other people, 8.8% shared their room with 6 or more other people. One percent did not state with how many they shared their bedroom with.

Of the subjects, 14% reported living of one meal a day, 46.3% lived of two meals a day and 38.2% lived of three meals a day. One and a half percent did not state how many meals they had a day. With regards to assets 4.4% had no assets from the list, 14.5% had one asset, 15.2% had two assets, 29.9% had three assets, 19.6% had four assets and 16.4% had all five assets from the list.

3.2. Exposure to Potentially Traumatic Events and PTSD

Of the total sample of 408 senior three students, 97.8% reported having experienced at least one potentially traumatic event. The average number of directly experienced and indirectly experienced events per student was 6.6 and 7.2 respectively. No significant gender differences were found in respect to average number of events experienced. Of the total sample 61.3% of the students had experienced at least one potentially traumatic event within the last year.

The most commonly reported events were death of someone close (75.5%), serious illness (65.9%), bullying (52.9%), physical abuse (51%), and physical assault (48%). The least reported events were severe childhood neglect (25.7%), suicide attempt (17.6%), sexual abuse (15%), rape (6.9%), and pregnancy/abortion (6.4%). **Table 1** shows the gender differences between direct and indirect exposure to the 20 potentially traumatic events. More females than males had been raped ($X^2(1,407) = 12.44$; $p < 0.0005$), suffered childhood neglect ($X^2(1,407) = 7.27$; $p < 0.005$) and had experienced absence of a parent more frequent than males ($X^2(1,407) = 7.27$; $p < 0.005$). There were no gender differences with regard to indirect exposure.

On the scale measures, there were very few missing values (0.2% to 4%); due to the large sample size no compensation for missing values was performed. Of the total sample 37.7% fulfilled the criteria for a PTSD diagnosis. The gender distribution was 44.4% of the females and 31% of the males that met the diagnostic criteria for PTSD. A further 28.2% of the total sample constituted a subclinical group. Of the children who lived with both parents, 31.4 percent met diagnostic criteria for PTSD, of the children living with one parent 37.5% met diagnostic criteria for PTSD, and finally the children who had other living arrangements almost half (49.5%) met diagnostic criteria for PTSD.

Table 1. Direct and indirect trauma exposure by gender.

	Direct exposure			Indirect exposure		
Event	Percent females (n = 205)	Percent males (n = 203)	Percent all (n = 408)	Percent females (n = 205)	Percent males (n = 203)	Percent all (n = 408)
Traffic accident	30.7	26.1	28.4	62.9	62.6	62.7
Other serious accident	32.2	32	32.1	50.7	52.7	51.7
Physical assault	50.2	45.8	48	35.1	38.9	37
Rape	11.2	2.5	6.9***	29.3	22.2	25.7
Witnessed other people being injured or killed	45.8	42	43.9	44.9	39.9	42.4
Being close to be injured or killed	45.9	46.3	46.1	37.6	37.9	37.7
Threats of violence	38.5	38.9	38.7	38.5	41.9	40.2
Near-drowning	30.7	32.5	31.6	28.8	36.9	32.8
Suicide attempt	20.5	14.8	17.6	23.4	25.6	24.5
Robbery/theft	44.9	41.9	43.4	44.9	42.4	43.6
Pregnancy/abortion	7.8	4.9	6.4	31.2	32	31.6
Serious illness	67.8	64	65.9	57.6	53.2	55.4
Death of someone close	78	72.9	75.5	54.1	51.7	52.9
Parents' divorce	29.8	23.6	26.7	28.8	35	31.9
Sexual abuse	18.5	11.3	15	29.3	27.6	28.4
Physical abuse	55.1	46.8	51	34.1	40.9	37.5
Severe childhood neglect	30.7	20.7	25.7*	39.5	41.9	40.7
Bullying	49.8	56.2	52.9	46.8	46.3	46.6
Absence of a parent	51.7	38.4	45.1**	40.5	42.9	41.7
Other	8.8	12.8	10.8	5.4	5.9	5.6

* = $p < 0.05$, ** = $p < 0.005$, *** = $p < 0.0005$.

3.3. Correlations between SES Measures and Measures of PTSD

The relationship between the measures for socioeconomic status was evaluated using the Pearson correlation coefficient (**Table 2**). There were significant correlations between most of the SES measures. Parental education was associated with fewer sleeping in the same bedroom, more daily meals, and more assets.

With regards to coping styles, no significant correlations between SES measures and rational coping were found. Emotional coping on the other hand was negatively correlated with number of meals, number of assets, parental educational level, and positively correlated with number of persons sharing the same bedroom. None of the SES measures correlated with number of indirect events experienced but the exposure to direct events correlated negatively with number of meals, and number of assets. With regard to total TSC score and the subscales (somatization and negative affect), no correlations with SES measures was found. Total HTQ was related to one SES measure, the number of persons sharing the same room.

3.4. Correlations between Exposure, Coping Styles, Negative Affect, Somatization, and PTSD Scores

The relationship between the measures for exposure, coping styles, negative affect, somatization and PTSD was evaluated using the Pearson correlation coefficient (**Table 2**). Positive correlations were found between indirect and direct exposure.

The number of *direct events* experienced was correlated with emotional coping, TSC total, negative affect, somatization, and total HTQ score. The number of indirect events experienced was positively correlated with emotional coping, total TSC, negative affect, somatization, and total HTQ.

Table 2. Correlations between SES, coping styles, exposure, negative affect, somatization and PTSD.

N = 408	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)[A]	12)[A]	13)
1) Age	1												
2) Meals	05 0.35	1											
3) Rooms	−0.14** 0.01	−0.11* 0.03	1										
4) Assets	−0.10 0.05	0.35** 0.00	−0.16** 0.00	1									
5) Fathers' education	−0.02 0.69	0.25** 0.00	−0.11* 0.03	0.31** 0.00	1								
6) Mothers' education	−0.08 0.12	0.18** 0.00	−0.14** 0.01	0.26** 0.00	0.48** 0.00	1							
7) Emotionel coping	−0.04 0.46	−0.16** 0.00	0.10* 0.04	−0.11* 0.03	−0.13* 0.01	−0.12* 0.01	1						
8) Rational coping	0.09 0.06	−0.03 0.61	0.02 0.68	−0.03 0.61	0.02 0.72	0.03 0.57	0.09 0.07	1					
9) Total indirect events	−0.09 0.07	−0.04 0.44	−0.07 0.13	−0.02 0.76	−0.02 0.65	−0.03 0.53	0.16* 0.00	0.05 0.27	1				
10) Total direct events	−0.00 0.99	−0.14** 0.00	0.08 0.09	−0.16** 0.00	−0.10 0.05	−0.03 0.49	0.22** 0.00	0.09 0.07	0.35** 0.00	1			
11) TSC total[A]	0.01 0.91	−0.02 0.75	0.05 0.32	−0.07 0.15	−0.06 0.21	−0.06 0.20	0.43** 0.00	0.13** 0.01	0.18** 0.00	0.31** 0.00	1		
12) TSC negative affect[A]	0.03 0.62	0.01 0.79	0.05 0.28	−0.08 0.11	−0.08 0.10	−0.10 0.05	0.43** 0.00	0.17** 0.00	0.16** 0.00	0.28** 0.00	0.93** 0.00	1	
13) TSC somatization	−0.02 0.67	−0.05 0.28	0.03 0.49	−0.04 0.38	−0.03 0.61	−0.00 0.94	0.34** 0.00	0.07 0.19	0.17** 0.00	0.27** 0.00	0.87** 0.00	0.64** 0.00	1
14) Total HTQ	−0.05 0.33	−0.09 0.06	0.13** 0.01	−0.09 0.08	−0.07 0.19	−0.09 0.08	0.41** 0.00	0.09 0.07	0.20** 0.00	0.31** 0.00	0.52** 0.00	0.49** 0.00	0.44** 0.00

Note: *Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed). [A]n = 407.

With regards to *coping styles* it was found that rational coping correlated positively with total TSC scores and negative affect. Emotional coping correlated positively with total TSC score, negative affect, somatization and total HTQ. The TSC scores all correlated positively with total HTQ score TSC total, negative affect, and somatization.

3.5. Gender Differences and Differences in Living Arrangements in Regards to TSC and HTQ Scores

To reduce the probability of making type 1 errors among the hypotheses, a Holm-Bonferroni correction of (0.05/3 = 0.0167) was made. Students who lived with none of their parents had experienced significantly more negative life events than children living with one or both parents ($F(2,404) = 14.2$; $p < 0.0005$). Similarly a significantly higher total HTQ score was found among students who did not live with either parent compared to students who live with one or both parents ($F(2,404) = 4.95$; $p < 0.008$). With regard to negative affect students who did not live with either parent experienced more negative affect compared to students who only lived with one or both parents ($F(2,403) = 3.79$; $p < 0.05$). Females had a significantly higher total HTQ and TSC score compared to males ($F(1,406) = 14.66$; $p < 0.0005$) ($F(1,405) = 6.52$; $p < 0.01$) respectively. Likewise females reported higher levels of negative affect and somatization compared to males ($F(1,405) = 5.23$; $p < 0.05$), $F(1,406) = 5.76$; $p < 0.02$) respectively.

3.6. Regression Analysis

Regression analysis was carried out to see which specific traumatic events were significantly related to PTSD symptomatology. Five *direct* events were significantly related to PTSD symptomatology (**Table 3**); traffic accident, threats of violence, sexual abuse, severe childhood neglect, and bullying. Traffic accidents have a negative relationship to PTSD severity, in contrast to the others which had a positive relationship to PTSD severity. Six *indirect* traumatic events was also related to PTSD symptomatology (**Table 4**); serious accident, near drowning, and physical abuse had a negative association, while rape, witnessing people injured or killed, severe childhood neglect, and bullying had a positive relationship to PTSD severity.

Table 3. Regression analysis for direct events with HTQ total as the dependent variable.

Model	Unstandardized coefficients		Standardized coefficients	t	sig
	B	Std. error	Beta		
(Constant)	60.56	1.93		31.37	0.00
Traffic accident	−4.18	1.66	−0.12	−2.52	0.01
Other serious accident	−1.51	1.65	−0.05	−0.92	0.36
Physical assault	0.80	1.58	0.03	0.51	0.61
Rape	0.56	2.98	0.01	0.19	0.85
Witnessed other people being injured or killed	1.67	1.57	0.05	1.06	0.29
Being close to be injured or killed	1.74	1.51	0.06	1.15	0.25
Threats of violence	4.13	1.62	0.13	2.55	0.01
Near-drowning	1.46	1.65	0.04	0.89	0.38
Suicide attempt	3.26	1.98	0.08	1.64	0.10
Robbery/theft	−0.96	1.52	−0.03	−0.63	0.53
Pregnancy/abortion	−1.22	3.26	−0.02	−0.37	0.71
Serious illness	2.21	1.66	0.07	1.33	0.18
Death of someone close	0.42	1.76	0.01	0.24	0.81
Parents' divorce	0.03	1.82	0.00	0.02	0.99
Sexual abuse	4.50	2.27	0.10	1.98	0.05
Physical abuse	0.75	1.63	0.02	0.46	0.65
Severe childhood neglect	5.34	1.89	0.15	2.83	0.01
Bullying	4.03	1.56	0.13	2.59	0.01
Absence of a parent	2.20	1.60	0.07	1.37	0.17

Table 4. Regression analysis for indirect events with HTQ total as the dependent variable.

Model	Unstandardized coefficients		Standardized coefficients	T	Sig
	B	Std. error	Beta		
(Constant)	66.24	1.49		44.58	0.00
Traffic accident	−0.18	1.69	−0.01	−0.11	0.92
Other serious accident	−3.58	1.62	−0.12	−2.21	0.03
Physical assault	1.88	1.71	0.06	1.10	0.27
Rape	4.73	1.87	0.13	2.54	0.01
Witnessed other people being injured or killed	4.68	1.77	0.15	2.64	0.01
Being close to be injured or killed	0.94	1.87	0.03	0.50	0.62
Threats of violence	0.24	1.76	0.01	0.14	0.89
Near-drowning	−3.88	1.82	−0.12	−2.14	0.03
Suicide attempt	2.45	1.97	0.07	1.24	0.22
Robbery/theft	−1.70	1.80	−0.05	−0.95	0.35
Pregnancy/abortion	1.12	1.87	0.03	0.60	0.55
Serious illness	−0.02	1.93	−0.00	−0.01	0.99
Death of someone close	−0.67	1.82	−0.02	−0.37	0.71
Parents' divorce	1.52	1.84	0.05	0.82	0.41
Sexual abuse	−1.24	2.05	−0.04	−0.61	0.55
Physical abuse	−4.76	1.90	−0.15	−2.51	0.01
Severe childhood neglect	4.10	1.81	0.13	2.27	0.02
Bullying	8.76	1.85	0.28	4.75	0.00
Absence of a parent	−2.33	1.78	−0.08	−1.31	0.19

3.7. Hierarchal Regression Analysis

In order to examine the effects of age, gender, SES measures, experienced events, coping styles and somatization and negative affect on PTSD symptomatology, a hierarchal regression analysis was carried out. Age, gender, and SES measures (parents educational level, living arrangements, number of meals, number of assets and number of people sharing bedroom) were entered at Step 1, explaining 7% of the variance in PTSD symptomatology. Step 2 included indirect and direct exposure to potentially traumatic events. After Step 2, 16.5% of the variance in PTSD symptomatology could be explained. After the entry of rational coping and emotional coping in Step 3, 23% of the variance in PTSD symptomatology could be explained. Last step included somatization and negative affect at which 34% of the variance in PTSD symptomatology could be explained.In the final model (**Table 5**), only gender, direct exposure, emotional coping, negative affect, and somatization were statistically significant.

4. Discussion

4.1. Gender Differences

There were relatively few gender differences with regards to type of exposure to potentially traumatic events, compared to Western studies where males more often than females are exposed to violent traumas [34]-[36]. This was not the case for Uganda with males and females experiencing violent trauma to the same extent. Not surprisingly, and in line with an array of research [34] more girls than boys had been raped. Interestingly, in the

Table 5. Hierarchal regression analysis with HTQ total as the dependent variable.

Model	Unstandardized coefficients		Standardized coefficients	T	Sig
	B	Std. error	Beta		
Constant	21.31	11.30		1.89	0.06
Age	−0.09	0.53	−0.01	−0.16	0.87
Gender	4.69	1.43	0.15	3.27	0.001
Number of assets	0.09	0.55	0.01	0.16	0.88
Living conditions	−0.34	0.93	−0.02	−0.37	0.71
Number of meals	−0.56	1.11	−0.03	−0.50	0.62
Sharing bedroom	0.58	0.40	0.07	1.44	0.15
Fathers' education	−0.00	0.64	0.00	−0.01	1.00
Mothers' education	−0.44	0.73	−0.04	−0.61	0.54
Direct events	0.69	0.24	0.15	2.90	0.005
Indirect events	0.23	0.16	0.07	1.50	0.13
Rational coping	0.07	0.13	0.03	0.56	0.58
Emotional coping	0.45	0.16	0.14	2.81	0.005
Negative affect	0.71	0.15	0.28	4.65	0.0005
Somatization	0.41	0.20	0.12	2.09	0.04

Note: Adjusted $R^2 = 0.34$.

current study, girls more often than boys experienced severe childhood neglect and the absence of a parent. One of the explanations for this could be the value that culturally is being put on having boys. It could be speculated that the father would be more likely to leave the family if a boy was not born.

An explanation for the few gender differences with regards to exposure might be accounted for by the level of exposure being so high that the risk behavior of males that normally accounts for the difference of exposure is not applicable in low income countries with high incident rates of violence. This would also explain why there was no gender differences found in indirect exposure. O'Donnell, *et al*. [37] examined the gender differences to exposure and PTSD in a Gambian senior school population (mean age of 17.8) and similarly found no gender differences with regards to level of exposure to traumatic events.

In line with previous findings it was found that females are at greater risk for developing a PTSD diagnosis than males: 44.4% females vs. 31% males. Likewise, females more often than males experienced negative affect and somatization. Interestingly and not in accordance with previous studies where women used more emotional and men more rational coping styles [38]-[40], there were no gender differences in regards to coping styles with males and females using emotional and rational coping styles equally.

4.2. Living Conditions, Exposure and Support

The adolescents in the current study, who was not living with either parent, had experienced significantly more potentially traumatic events than adolescents who lived with one or both parents, and subsequently, suffered from PTSD more often (49.5% vs. 37.5% vs. 31.4%) respectively. It is further well-documented that social support after a traumatic experience is crucial to whether or not PTSD is subsequently developed [41]-[43]. It is hence proposed that children living without either parent are at double risk in that it is expected that they will live in more deprived settings and engage more easily in behaviors leading to more exposure and it is expected that the social support after exposure will be less.

Similarly, children who lived with neither parent experienced more negative affect than children living with one or both parents. The correlations between negative affect and absence of a parent could be mediated by the

lack of or low perceived social support which research shows is a risk factor. Siedlecki, *et al*. [44] examined the role of perceived support and found that lack hereof correlated positively with negative affect. Similarly in a cross cultural study [45], it was found that in USA, Jordan, and Iran low perceived social support from family correlated with negative affect across all cultures. It was only in the US that there were correlations between low perceived social support from friends and negative affect, highlighting the importance of the family in more collectivistic cultures such as that of Uganda. Other studies have similarly established a connection between low social support and negative affect [46].

No differences were found with regards to coping styles and somatization in relation to living conditions. The current study is hence in line with previous studies emphasizing the importance of social support after a traumatic event as well as social support as a buffer against engaging in high risk behaviors.

4.3. Cross Cultural Comparison of Direct Exposure to Potentially Traumatic Events and Development of PTSD

The present study showed that 97.8% of the students in the Ugandan sample had been directly exposed to at least one potentially traumatic event. The students had experienced a mean of 6.6 potentially traumatic events compared to a mean of 1.9 - 3.1 potentially traumatic events in the similar European studies [7]-[10]. Thus, as expected, the percentage of senior 3rd year students' exposure to potentially traumatic events was more than twice as high in the Ugandan sample. In line with the significant higher exposure to traumatic events, in the Ugandan sample, a 2 - 3 times higher rate of PTSD was found compared to the European studies, where between 6% and 20% in the same age group meet criteria for PTSD whereas the number was 37.7% in the Ugandan sample. As in the European samples female gender, living with one or no parent and number of direct events were related to PTSD symptomatology.

Four trauma types were endorsed in high numbers: childhood neglect (25.7%), sexual abuse (15%), death of someone close (75.5%), and physical abuse (51%). The latter was among the least frequently reported events in the European samples but was among the highest reported in Uganda. In Uganda, physical abuse was not associated with higher risk of meeting criteria for PTSD when other trauma and negative life events were controlled for, in contrast to threats of violence.

Corporal punishment in Ugandan schools was banned by a government circular in 2006. However, it is still widely practiced. Previous studies conducted in Uganda, specifically focusing on different types of physical abuse within the school setting, found much higher frequency rates. The latest ANPPCAN report [47] finds that 81% of children have been beaten at their school. Similarly, a Save the Children report [48] found that 98.3 percent reported having experienced physical violence, such as caning, slapping, pinching, locking up, or burning. The report further reveals that parents and teachers are reluctant to use the terms violence or abuse, when it comes to corporal punishment of children, rather it is perceived as a natural child-rearing practice. Also, domestic violence is highly prevalent with nearly 60% of women having experienced physical abuse and in 87% of those cases it is a husband or partner that was the perpetrator [49]. Indeed, the Western conceptualization of what constitutes physical abuse may not be applicable in many other parts of the world. For instance, in the 2006 mental health survey Uganda [50] 70.2% of women was of the opinion that it can be justified that a husband uses violence against his wife in at least one of five presented instances (if she: burns the food, argues with him, goes out without telling him, neglects the children or refuses to have sexual intercourse with him).

It could be suggested that physical abuse would more likely be interpreted as threatening in a society, where it is uncommon compared to a society, where it is a common child rearing practice like Uganda. The understanding of what constitutes physical abuse in the various cultural contexts could hence explain both the relatively low reported frequency rates of physical abuse compared to other studies conducted in Uganda (simply because it is not viewed as abuse) but could also account for the difference between European samples and African samples in regards to subsequent development of PTSD. Of course, a more simple explanation could be that the severity of the maltreatment was less (starting later in life, lasting shorter, with few injuries). While logically reasonable, the abovementioned, well-documented reports give a picture of severe physical abuse (often combined with denial of food) as common means of upbringing children in Uganda.

Bullying has rarely been examined with regards to its relationship with PTSD. The few studies that have been conducted yield results that suggest that bullying although not in line with the DSM criteria for PTSD does significantly increase the risk of a PTSD diagnosis. In a Norwegian national sample of 8th and 9th graders it was found that 27.6% of boys and 40% of boys who had been bullied met criteria for PTSD [51]. Bullying could be

perceived as more threatening in Uganda than in Europe due to the emphasis placed on family and group for survival. Hence alienation from a peer group could pose a greater threat to a Ugandan child than it would to children in more pluralistic societies. In line with this, Cluver *et al*. [52], in a study of 1050 children in deprived neighborhoods in South Africa, found that children victimized at home or in the community were at higher risk for being bullied. In light of these findings it is assumed that bullying is more likely to be perceived as a threat, as the majority of the bullied are already victimized.

Traffic accidents are quite often reported both as direct and indirect event and they were surprisingly associated with less PTSD in the Ugandan adolescents. Indeed, previous research finds that traffic accidents are less likely to precipitate PTSD compared to interpersonal and volatile traumas [53] [54]. The reason that at traffic accidents had this relationship with the subsequent development of PTSD in the Ugandan sample is not known. Maybe traffic accidents are associated with having more material resources or eliciting more social support because of the visibility and acceptability of this type of trauma compared to interpersonal traumas. Another explanation could be the lack of severity statements indicating how many times it has happened or the seriousness of the accident.

Surprisingly, rape was not significantly related to a PTSD diagnosis in the Ugandan sample, but sexual abuse was and indirect exposure to rape was. As for physical abuse, it could be carefully argued that subjects from collectivistic and individualistic cultures will differ in their appraisal of events and this could account for some of the differences between the samples, also regarding rape. Physical abuse, however is a common occurring phenomenon that is believed to be a vital component in the upbringing of children, rape is of course not. Another explanation could be found in the gender roles. In the 2006 Mental Health Survey [50], 26.3% of women between 15 and 19 years of age indicated that husbands were justified in using physical violence if the wife refused to have sexual intercourse with him. If this belief, that men are entitled to sex within a marriage, also transcends to partners or even friends, and in addition is an expression of a societal belief in men's right to sexual intercourse with women; this could elicit different appraisals of rape, affecting the subsequent development of PTSD.

In a study of 172 female victims of rape, assault and robbery, peritraumatic responses and their relation with perceived threat was examined [55]. It was found that rape victims elicited more feelings of betrayal, fear, detachment, humiliation, numbness and dreamlike states, compared to victims of assault or robbery. In addition, rape victims, more often than robbery/assault victims, begged, pleaded or cried, tried to reason with the perpetrator, tried to struggle, keep quiet and do what they were told. It is likely that Ugandan women, if they indeed hold the belief that males has, at least to some extent a right to sex (and the right to resort to violence when denied sex), will experience some of these feelings to a lesser extent, and will be less likely to try to plead for the perpetrator to stop. The study concluded that peritraumatic emotions and responses accounted for more of the perception of threat than trauma type, and that especially the peritraumatic emotions and responses of rape victims were related to perceived threat [55]. The peritraumatic response to rape may hence explain some of the perceived threat and therefore lack of PTSD. It is likely that different perceptions of rape, rooted in cultural beliefs, could then account for some of the differences of trauma exposures predictive value on PTSD.

4.4. Psychological Factors and Coping

In accordance with our hypotheses emotional coping, negative affectivity, and somatization were contributing to predict the variability of PTSD severity. Rational coping was significantly associated with negative affectivity, but not with PTSD, somatization, or emotional coping. Emotional coping correlated strongly with all symptom measures, with total number of both direct and indirect events, with lower level of parental education and few daily meals. In the final regression analysis negative affectivity stands out as a very strong factor. Negative affectivity or neuroticism is related to coping efforts in general because it is associated with a heightened experience of distress and threat [56] and therefore am increased need for coping [57] However, because neurotic persons are easily overwhelmed by stress, they are very likely to seek to avoid stressors and decrease discomfort. Strong positive associations between negative affectivity/neuroticism and emotional coping and less strong but still significant to rational coping is found in other studies [58] [59].

Somatization is known to be a common state coexisting with PTSD. It is often consider a consequence of PTSD and to be associated with high levels of dissociation [60]. In a recent study [58], PTSD severity failed to predict somatization after negative affectivity was controlled for. The authors suggested that one possibility is that negative affectivity mediates the effect of PTSD on somatization. In the current study, however, that both somatization and negative affectivity independently contributed to PTSD severity.

4.5. Cross Cultural Comparisons of Exposure to Traumatic Events and Development of PTSD

Little attention has been given to the role culture plays with regards to appraisal in the PTSD research but this study lends support to understanding the conceptualization of what constitutes a trauma in a broader way. The appraisal of a given trauma will differ from individual to individual, but culture will play a part in that appraisal [61] [62] and hence subsequent development of PTSD. A major gap in the literature pertains to the difference between individualistic versus collectivistic cultures and their reactions to both direct and, not least, indirect trauma exposure.

It appears that other variables pertaining to the etiology and maintenance of PTSD symptoms are at play in this sample. Uganda represents a collectivistic culture which differs greatly from the individualistic in that the self-construct, in collectivistic cultures, is an interdependent entity and in individualistic cultures is perceived as an independent entity [63]. The Independent self-construct is defined by reference to internal thoughts, feelings and actions which are seen as independent variables and unique to the self. In contrast the interdependent self-construct is defined in reference to the connectedness to other people and as such, feelings thoughts and actions are determined and organized in relation to others and to situations.

Hence, the self-construct, in a collectivistic culture, is defined as a part of the group and the obligations to and needs of the group will be greater than to the individual. It could hence be argued that upon witnessing or hearing about a family member or close friends being exposed to a potentially traumatic event, would elicit greater distress, than it would actually experiencing it as the self-construct is more a product of the group rather than the individual. It could also be argued that a greater sense of guilt and failure would be elicited by indirect trauma exposure for an individual belonging to a collectivistic culture as opposed to an individual from an individualistic culture.

Where the differences in mean number of directly experienced events did not differ significantly between the European samples there was a significant difference with regards to exposure to indirect events between the samples. It hence seems that there is an association between number of indirectly experienced events and PTSD in the European studies—an association not present in the Ugandan study, as the hierarchical regression analysis demonstrates no effect of number of indirectly experienced events on PTSD in the final model. It could be speculated that the extent of direct exposure is so high in the Ugandan sample that the effect of indirect cumulative exposure is diminished.

5. Conclusions

As expected the Ugandan adolescents have experienced far more potentially traumatic events and negative life events than what has been documented in the similar European studies, subsequently there are also more PTSD cases. From the sample of 408 young Ugandans, 97.8% had been exposed to at least one potentially traumatic event and 37.7% met diagnostic criteria for PTSD and an additional 28.2% met a subclinical level. There was a significant gender difference with 30.5% of boys and 42.3% of girls meeting criteria. Female gender was also associated with higher levels of negative affect and somatization. Living without a parent was likewise a risk factor for exposure to negative life events, potentially traumatic events, PTSD and negative affect.

In general, the findings from the current study support findings from previous studies in other cultures and highlight the importance of appropriate coping skills and social support. Female gender, number of traumatic events, living with only one or no parent, somatization, negative affect and emotional coping were found to be associated with PTSD. Findings that were not in line with previous studies are the very few gender differences with regards to type of exposure with only rape, childhood neglect, and absence of a parent being experienced more by females than males. No single trauma had been experienced more often by males than females and no gender differences with regards to coping styles were found. It was also found, that specific potentially traumatic events, that normally holds great predictive value on PTSD, such as rape and physical abuse, did not yield similar results in the Ugandan sample. One explanation for this could relate to cognitive appraisals of these events.

The findings from this current research would seem to validate the application of the PTSD diagnosis in non-western countries. It may, however, lack some cultural sensitivity in the conceptualization of life threatening

experiences and the list of traumatic events does not appear to be comprehensively enough to assess victimization in this Ugandan sample.

Among the implication of the study is that a high social priority should be given to children who are orphans or live with a single parent as their vulnerability stands out. It is also clear that Uganda is a country where many traumatic events and much violence have occurred and perhaps still is occurring resulting in high levels of trauma reactions. Pertaining community mental health, suicide prevention programs would be an investment as important as physical health. An important finding is the role of negative affectivity; in case a trauma focused intervention is not working well, one may consider focus on the negative affectivity itself to reduce post-trauma sequelae.

6. Limitations

The current study has number of limitations. The study is based on students self-reports, which could produce some response bias in regards to the students ability to be factual and honest and their willingness to remember painful events. Willis and Gonzales [64] have, however, shown that recognition in comparison with recall is less distressing when reporting a stressful event. The students were sitting very close to each other in the classrooms and this may have led to underreporting of events that represent some taboo in the Ugandan culture. It should also be noted that abortion as well as suicide are criminal offences in Uganda which could lead to underreport.

In order to facilitate a cross cultural comparison this study is a replica of studies carried out in European populations. Only 38.6% of males and 33.3% of females are enrolled in secondary education thus leaving out the vast majority of young Ugandans not enrolled in the school system. Because of language difficulties the data was gathered in three major cities, thus leaving out smaller cities and the large rural population. Despite the grade level, a compensatory, supportive data collection approach was applied. It would also be expected that cultural differences would make the list of 20 potentially traumatic events incomprehensive. There are widespread beliefs in witchcraft and possession by demonic powers in Uganda and exposure to these sorts of events could have been included in the list of potentially traumatic events. Indeed one of the subjects noted, in the comment section on the final page of the questionnaire that she believed to have been bewitched by her stepmother and as a consequence suffered from hallucinations at night.

Additionally, in the comment section on the final page, some of the children disclosed trauma exposure directly pertaining to lack of resources such as having to steal in order to eat or having to exchange sexual favors for school fees. This demonstrates that not only culture, but also living conditions necessitates a revision of Western produced trauma lists. These sorts of "self-inflicted" or "necessary" traumas are suspected to be almost exclusive to low-income countries and its associations with PTSD are, to our knowledge, not examined.

Another limitation of the study design is that it does not ask how many times a specific potentially traumatic event has happened. This would be relevant information in all the studies, but especially for the Ugandan sample where the frequency rates are so high, that it would be expected that the majority of the students have experienced the same potentially traumatic event more than once. In addition, it may have revealed gender differences to exposure. Finally, the measure of indirect exposure covers both witnessing, hearing of, or knowing someone who has been exposed. It is highly unlikely that the same response will be elicited upon witnessing versus hearing about a rape and makes it difficult to compare and analyze data with regards to the impact of indirect events on PTSD.

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Epidemiology and Pathophysiology of Acquired Heart Failures Amenable to Surgical Interventions in the Sub-Saharan Africa

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Abstract

Heart failure (HF) is an important cause of morbidity and mortality in sub-Saharan Africa and indeed worldwide. The management of this condition has largely been thought to be within the domain of the Physician with the Surgeon having little or no role to play. The commonest cause of HF that may require surgical intervention is rheumatic valvular heart disease especially in the young age group while ischaemic heart disease still remains at the low rung of the ladder and interestingly, hypertrophic cardiomyopathy is becoming common. Most of the literatures reviewed failed to identify pericardial diseases, though it ranked topmost in the face of tuberculosis and HIV infections in the sub-region, and the other non-cardiac structures as important causes of HF which is amenable to surgical intervention. Equally, what have not been clearly identified are the surgical aspects; indeed its sub-classifications into heart and non-heart causes have hitherto not been documented. Even though these lists from this review are not exhaustive of the numerous unidentified causes of surgical HF, this would act as stimulus for further and extensive documentation of guideline for the recognition of these sub-classifications of HF amenable to surgery.

Keywords

Epidemiology and Pathophysiology, Heart Failure, Surgical Intervention, Sub-Saharan Africa

1. Introduction

Heart failure (HF) is a clinical syndrome caused by any disorder involving the pericardium, the muscles, valves

or vessels which results in defective heart filling at diastole or impaired heart contraction or emptying with inability to pump adequate amount of blood to support tissue metabolism, or to be able to do so at an elevated filling pressure [1]. Also, some clinical conditions remotely removed from the heart may result in HF by various mechanisms.

The structures that could be affected and thus lead to HF can be succinctly classified into two: the heart and the non heart structures. The heart structures can furthermore be sub-classified into: the pericardium, the myocardium, the coronary arteries, the valves, the conductive tissues. The non-heart structures, outside the heart, that when affected may result in HF requiring surgical interventions, are the thyroid gland in thyroid diseases, peripheral vessels disorder like large arterio-venous fistulae, the pleural space and the lung diseases and off course postoperative low cardiac output.

There is no published literature on acquired HF requiring surgical intervention in SSA [2] and indeed those classifications and sub-classifications have not hitherto been done and thus, this is the first review.

2. Epidemiology

In pericardial diseases, tuberculosis accounts for a significant number of pericardial diseases recorded here [3]. Tuberculous infection of the pericardium may give rise to purulent pericardial collection [3] [4] and this in most cases will require surgical intervention alone or in conjunction with medical treatment [5]. A much earlier report in Nigeria showed that tuberculosis was histological diagnosed in 11.1% in patients with another form of pericardial disease known as constrictive pericarditis [6]. Interestingly, a subset of pericardial disease known as effusive-constrictive pericarditis was stated as deserving a closer attention as treatment was challenging [7]. Also, one of the important causes of pericardial diseases resulting in HF in HIV-AIDS patients, that is amenable to surgery, is pericardial effusion [8]. Thus the duo of tuberculosis and HIV infections which are common in the sub-region, have made the condition of pericardial diseases common [9] [10]. And the outcome of un-drained pericardial effusion associated with HIV infection is cardiac tamponade [11] and that requires urgent surgical intervention to avoid death.

Rheumatic heart disease (RHD) is considered to be relatively common in many parts of Africa, especially amongst young people [12] with valvular disease ranking high amongst the major causes of cardiovascular diseases (CVD) in Africa [13]. From the work done in Nigeria, the commonest causes of HF requiring surgical intervention, besides the three medical conditions listed, was RHD in 4.3% [14]. Though the prevalence of RHD was noted to be declining considerably as a result of improvements in the primary health care delivery system in the sub-region [15]; a previous study done in Cameroun, observed that the first aetiologic factor of HF in the young was RHD in about 14.6% [16]. In another study, 572 consecutive patients who were evaluated for HF; it was observed that the main cause of HF, apart from hypertension (21.3%) was RHD (20.1%) [17]. In Cape Town, South Africa, it was stated that the causes of HF in Africans remained largely non-ischaemic and that RHD was one of the main contributors to the aetiology of HF in sub-Saharan Africa [18]. A retrospective study in Cameroun of 312 adult patients with CVD, average age 44 years, revealed that RHD occurred in about 25.6%. [19]. In a survey of 1,115 children in Kenya, using echocardiographic method, it showed that the prevalence rate of RHD was 2.7 per 1,000 [20]. A 1993 study of patients admitted to Kenyatta National Hospital with HF revealed that almost 32% had RHD [21]. RHD remains a major cause of HF in Africa, especially in the young [22].

Cardiomyopathies, especially hypertrophic cardiomyopathy was considered to be more common than Ischaemic Heart Diseases (ISHD) and Hypertrophic cardiomyopathy which was thought to be rare in SSA was becoming common [23]. In earlier prospective review in the northern part of Nigeria, it was observed that cardiomyopathies were the commonest cause of HF in about 47% of cases reviewed [24]. In a consecutive review of patients coming for HF in a tertiary institution in Ghana showed that cardiomyopathies again, was noted as an important cause of HF [25]. The limitation in the latter two studies was that the cardiomyopathies were summed up without recourse to the ones that are amenable to surgeries like hypertrophic cardiomyopathy.

In the INTERHEART Africa study, ISHD ranked 8th amongst the leading causes of death in men and women in the region [26]. Another review a year afterwards showed that Coronary artery disease (CAD) and its complications were still uncommon in Africa [27]. It was on this strength that the age-standardised mortality rates for ISHD was projected to rise by 27% in African men and 25% in women by 2015, and by 70% and 74%, respectively by 2030 following a recent systematic review in Botswana [28]. Surprisingly, a 5-year retrospective

study in North-Eastern, Nigerian stated that the prevalence of ISHD was 3.4% of all CVD [29]. In Cameroun, a study done between 1992 and 1997 ranked CAD eighth among the CVDs registered with a prevalence of 1.53 percent [30]. Myocardial infarction in black Africans under age 40 years shows characteristics similar to those seen in patients under age 40 in the Western countries [31].

The prevalence of complete heart block in the SSA was high especially amongst the elderly and at sharp apparent contrast to the previous thinking that it was rare and will not merit surgical intervention [32] [33]. However, the aetiology of this condition was not roundly known [33]. Intra-ventricular mal-conductions in African Population seemed to exhibit a prevalence rate that was similar to that in other parts of the world [34].

Thyroid diseases, mainly hyperthyroidism and autoimmune thyroid disorder are associated with CVD leading to HF [35]-[37]. Thyroid disorders are the second most common endocrine disorders in Nigeria and Thyroid disorders in Nigerians are a significant cause of cardiovascular morbidity with complications such as atrial fibrillation and HF [37]. A coexistence of mitral valve prolapsed with autoimmune thyroid disease could explain the cardiovascular importance of thyroid disorder in this setting [36].

Arterio-venous (AV) fistulae is considered common in the sub-region especially with chronic renal failure that will necessitate the creation of AV fistulae using the peripheral vein as the patients wait long on this procedure for dialysis before possibly getting kidney transplant [38] [39].

Pleural and lung Diseases are on the rise in the sub-region, as the incidence of tuberculosis and HIV have made the occurrence of pleural fluid collection and destroyed lungs common [40].

Post cardiac surgery-pericardiectomies for constrictive pericarditis can be problematic [7] as it can lead to low cardiac output, also, after heart surgeries, especially after surgeries for ischaemic heart diseases [41]. The post operative period may be characterized by low cardiac output which may not be amenable to inotrope use, making the surgical intervention by insertion of intra-aortic balloon pump desirable [41].

3. Pathophysiology

Pericardial Diseases: Fluid collection in the pericardial space can lead to cardiac tamponade is defined as haemodynamically significant heart compression from excessive or sudden or accumulating pericardial contents that may lead to and possibly defeat compensatory mechanisms [42] [43]. In effusive pericardial disease, the rise in intra-pericardial pressure results in reduced myocardial transmural pressure and filling [43]. The sudden pericardial or excessive fluid accumulation without adequate accommodation by the pericardium leads to increased intra-pericardial pressure resulting in the initial compression of the right atrium and the right ventricle causing a decrease in their diastolic compliances with decreased right ventricular filling decreasing stroke volume and thus cardiac output [43] [44].

Constrictive pericarditis impairs cardiac filling only in late diastole. Thus early diastolic filling of the right ventricle occurs briefly in constrictive pericarditis until the ventricle suddenly reaches the rigid constraint of the pericardium [44]. In constrictive pericarditis, the pericardium looses elasticity as a result of progress fibrosis or dystrophic calcification occasioned by pericardial inflammation [43] and basically, in this condition, the cardiac compression ultimately leads to heart failure from impaired diastolic filling. Effusive-constrictive pericarditis has both components, which is characterized by constriction of visceral pericardium with a coexisting tense pericardial effusion [45]. The hallmark of effusive-constrictive pericarditis is the persistence of elevated right atrial pressure after intrapericardial pressure has been reduced to normal levels by removal of pericardial fluid [46].

The main impact of RHD is on the cardiac valves; with regurgitation of the mitral valve being the commonest disorder in the sub-region [29]. Mitral insufficiency results in retrograde regurgitation of blood from the left ventricle to the left atrium during systole. This regurgitant volume creates a volume overload in the left chambers. The effect of this volume overload on left ventricular performance depends on the severity and the duration of the regurgitation. The two most important compensatory mechanisms are left ventricular dilatation and left ventricular hypertrophy caused by increased wall stress. Left atrial enlargement is another consequence of chronic mitral regurgitation with this enlargement can lead to atrial fibrillation, which in turn decreases ventricular filling [44] [47]. Mitral stenosis is considered when there is reduction in mitral valve area and this leads to an increase in gradient across the atrio-ventricular area. This elevation in left-sided pressures secondarily leads to pulmonary hypertension; when the pulmonary artery systolic pressures increase, there is subsequent gradual rise in both right ventricular end-diastolic pressure and volume [44]. Coronary artery narrowing as a result of atheroma, when significant enough, can lead to myocardial infarctions and myocardial scarring resulting in ab-

normalities of left ventricular diastolic and systolic dysfunctions [48] [49]. Death can result from acute or sub acute heart failure or sudden ventricular fibrillation [50].

Hypertrophic cardiomyopathy entails an enlargement of the heart muscle, usually that of the left ventricle, but sometimes the right cardiac chamber is also involved. In one form of hypertrophic disease, the septum becomes enlarged and obstructs the flow of blood from the left ventricle into the aorta. The mitral valve also may be rendered incompetent by the thickened septum, resulting to mitral insufficiency [51].

With large AV fistula which is fed by large artery, there will be commensurately increase in venous return in other to maintain the increased cardiac output which is required to sustain the flow of the fistula. The falling peripheral resistance occasioned by the fistula leads to an increase in cardiac output and this can eventually lead to HF [52] [53].

Tension pleural fluid collection will eventually cause the collapse of the pliable vena cavae and impair diastolic filling of the heart [54].

In conduction disorders, atrial fibrillation decreases in ventricular filling by 15% - 30% especially in the elderly. In complete heart block, remembering that cardiac output is a direct product of stroke volume and the heart rate and thus the cardiac output decreases in cases of decreased heart rate [55] [56].

In thyroid diseases especially with hyperthyroidism, the impact of the hormones on cardiovascular system are both directly and indirectly [57]-[59] and resulting in increased cardiac contractility, increased cardiac output, and reduced systemic vascular resistance. The cardiac manifestations of thyrotoxicosis are those of HF and atrial fibrillation [35] [37]. Also, in some autoimmune diseases it has been noted to be associated with mitral valve prolapsed [59].

4. Conclusions

This is the first review of this kind, albeit, some clinicians may not agree with all of the above enumerated causes of surgical HF. Simply put, surgical HF is any clinical condition that prevents the proper pumping out of blood from the heart chambers or the heart does it at the expense of increased venous return and of which surgery may deservedly effect a cure.

The commonest cause of HF requiring surgical intervention from this review is rheumatic valvular heart disease especially in the young age group while ISHD still remains at the low rung of the ladder, and interestingly, hypertrophic cardiomyopathy is becoming common.

Most of the literatures reviewed failed to identify pericardial diseases and the other non-cardiac structures, when diseased, as the important causes of heart failure which is amenable to surgical intervention.

There has not been any documented account of the sub-classification of HF amenable to surgery in the sub-Saharan African region and indeed the whole world. However, what is needed is a regional approach to accurately document all the HF that may require surgical intervention.

Conflict of Interests

No conflicts of interest in this work.

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Residual Risk of Transmission of HIV and Hepatitis B and C by Blood Transfusion in Bukavu in the Democratic Republic of Congo

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Abstract

The aim of this study was to determine the incidence rates of HIV1/2 antibodies, HBV and HCV antibodies among voluntary blood donors and to estimate the residual risk of HIV, HBV and HCV infection among blood donors in Bukavu. We conducted a follow-up cohort study of volunteer blood donors who have made at least two blood donations in Bukavu (DRC) between January 2010 and December 2012. We recorded 2986 volunteer blood donors during the study period. The residual risk of viral transmission associated with the serological window was considered as equals to the incidence rate multiplied by the duration of the serological window period divided by 365. Seroprevalence in volunteer blood donors in Bukavu was 1.1% for HIV 1/2 antibodies, 4.0% for HBs Ag and 2.1% for hepatitis C antibody. The number of conversion between two blood donations (incident cases) were observed is 8, 12 and 37 donors respectively for HIV 1/2, HCV and hepatitis B between 2010 and 2012. Incidence rates reported for 1000 person-years were 11.0 for HIV, 51.7 for HBV and 17.1 for HCV. The residual risk as estimated from the window was 0.6 per 1000 donations or 1/1.515 donations for HIV, 3.1 per 1000 donations or 1/329 for HCV and 7.9 per 1000 donations or 1/126 donations for hepatitis B. The residual risk is high. The screening tests are not

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enough to ensure safe blood. The reduction of residual risk would be achieved through the effectiveness of preventive measures taken for transfusion chain, before and after the biological qualification of blood donation.

Keywords

Residual Risk, Hepatitis, HIV, Blood Donation

1. Introduction

In sub-Saharan Africa, given the large number of HIV and hepatitis B and C infected subjects, one in 20 adults is living with HIV [1], an adult in 13 is living with hepatitis B and one in 10 adults with hepatitis C [2]-[8]. Hepatitis viruses are responsible for hepatitis acute, chronic and hepatocellular carcinomas while HIV causes millions of deaths from a variety of opportunistic diseases (tuberculosis, Kaposi, diarrhea various germs and other infections). All its manifestations affect the age of people who are active in all areas of life group. This then threatens development of countries [1] [8]. The risk of transmission of these three virus from infected blood collected from donors during window period is not negligible. It is important to take appropriate precautions to reduce it. Several measures, including the qualification and selection of blood donors have been developed to ensure blood safety. Despite an evolution and improvement of all these measures, the residual risk is still too high. This is a risk of transmission of viruses whose markers (antibodies) are detected during the period preceding their appearance to be detected in the laboratory [9]-[12]. The strategy of the qualification and selection of blood donors has shown good results with the reduction of the residual risk of viral markers in industrialized countries [11] [13]. The estimation of residual viral risk in blood products is an indicator to evaluate the quality and the management of the provision process of these products [14]. A direct estimation of the transfusion risk would be recipient's follow-up to study the seroconversion; and indirect estimation is proposed by Schreiber [15] method, based on the incidence of each viral infection in the population of blood donors and the duration of the window period. These residual risk assessments have shown that in industrialized countries the risk is mastered in France without genomic screening, the risk was estimated to 1/1,400,000 donations for HIV 1/1,000,000 for HCV and 1/400,000 for HBV [11] while in Africa it is high in the order of 1/5780 donations for HIV, 1/406 donations for HCV and 1/383 donations for HBV in Ivory Coast [16] and 1/28,571 donations for HIV and 1/976 donations for the HBV Senegal [9]. This study aims to determine the incidence rate of HIV, HBV and HCV and to estimate the residual risk of HIV, HBV and HCV among voluntary blood donors in Bukavu RDC.

2. Methodology

This is a follow-up study of a cohort of volunteer blood donors. It focused on blood donors who attended the hospital blood banks of the General Provincial Referral Hospital in Bukavu, General Referral Hospital of Panzi and Provincial Blood Transfusion Center (CPTS) between 1st January 2010 and December 31st, 2012. The provincial hospital and the hospital of Panzi are academic hospitals that are in the health district of Bukavu, the capital of the province of South Kivu. The study focused on regular volunteer blood donors meaning donors who donated blood at least twice during the study period and whose first blood donation was negative. Time between the two donations should not have exceeded one year. The donors who made only one donation during the period of our study were not considered for the analysis of residual risk.

2.1. Data Collection

A pre-donation interview using a questionnaire was carried out before each donation to detect contra-indications to donate blood. This interview was conducted either by a doctor or by a nurse responsible for transfusion in the institution, trained for this purpose. Information to know the date of donation, sex, age, occupation, class of donors (new or old, volunteer or family) were collected from the blood donors. All this information was recorded on a single paper sheet and a code was assigned to each blood donor. The code was used for the laboratory tests The anonymity of the donor was respected. All laboratory results were kept confidential.

2.2. Serology

For each blood donor, after filling the pre-donation standard questionnaire, a blood sample was collected in a coded tube without anticoagulant and kept at room temperature. After complete coagulation, it was centrifuged to settle the serum. The rapid test Determine^{R} HIV for screening anti-HIV1/2 antibodies, Determine^{R} HBV for detecting the surface antigen of hepatitis B (AgHbs) virus and Determine^{R} HCV for the detection of hepatitis C virus antibodies were made. All the sera have been tested by a second analysis in a ELISA test.

The following reagents were used for HIV: Vironostika^{R} VIH Uni-FormII Ag/Ab 4th generation laboratory Biomérieux; for HBV: Hepanostika^{R} AgHbs System Microelisa Laboratory Biomérieux; for HCV: Monolisa^{R} Anti-VHC Ab de BIO-RAD.

2.3. Statistical Analysis

After data collection, entry thereof was performed using the Epi Info software, Version 3.5.1. Analyses were performed by STATA Version 12 and OpenEpi. For sociodemographic variables of blood donors descriptive analysis consisted of obtaining proportions for variables into categories and median accompanied by the minimum and maximum for age. Chi square test of Pearson was used to compare proportions of socio-demographic variables; the significance level used was 0.05.

Seroprevalence of virus markers was calculated on entire population of donor during the period (new and former donors with positive serology). Was considered positive donations that was one of the two tests used (rapid test and ELISA).

The incidence rate was calculated by dividing the number of incident cases by the number of person-years. The number of incident cases for each marker corresponds to the number of donors with a negative result followed by a positive donation confirmed for the marker, 95% Confidence interval of was calculated.

The number of person-years is the amount of time tracking of each donor cohort, between the first and last donation, between the first donation and any positive donation. The time has been expressed in years and the incidence rate was obtained for 1000 person-years.

The residual risk per 1000 donations was calculated by multiplying the incidence by the duration of the window in days rate divided by 365.

The window period (in days) or serological window is the period between infection with the virus and the onset of plasma antibodies produced by the body. Serological windows were obtained from literature data: 22 days for HIV, 56 days for HBV and 66 for HCV [9] [11].

3. Results

During the study period, we recorded 5071 voluntary donations among which 1182 (39.5 %) were from new blood donors and 1804 came from regular donors with an average of three donations. Our blood donors were male in 73.2% of cases, single in 71% of cases in total. Concerning the profession 41.7% of blood donors were pupils or students and 28.4% without occupation. The median age of blood donors stood at 23 years with a minimum of 18 and a maximum of 65 years. A majority of blood donors were in the age group under 30 years (74%).

The number of blood donors has remained stable between 2010 and 2011 but decreased in 2012 mainly in new donors. The number of blood donations has increased since 2010. The overall prevalence in those three years was 4% (187 positive/4726 donations) to the surface antigen of hepatitis B, 2.1% (105 positive/5016 donations) for antibodies against hepatitis C and 1.1% (57 positive/5068 donations) for anti HIV (**Table 1**). During the study period we observed discordances between negative donations by rapid tests but positives by Elisa tests: three donations for HIV or 6 per 10,000 donations, 1 case for HBV or 2 per 10,000 donations and 2 cases for HCV or 4 per 10,000 donations. One blood donation was HIV positive with rapid test but negative to Elisa, two blood donations had a HBV positive result in the rapid test but a donation was negative and the other was indeterminate to ELISA and one donation of blood was hepatitis C positive with in fast test but negative in ELISA test. A statistically significant difference in the prevalence of HBV was observed between new donors and regular donors (5.0% vs 3.3%, $p = 0.003$), between men and women (4.4% vs 2.8%, $p = 0.01$) and between age groups (4.4% for those under 30 years, 3.4% for donors between 31 and 40 years and 2.4% for those aged 41 years and older, $p = 0.04$). The prevalence of antibodies against hepatitis C was significantly different by cate-

Table 1. Seroprevalence of HIV, HBsAg and HCV in blood donors in Bukavu.

Year	2010	2011	2012	Total
Number of volunteer blood donors	1079	1014	893	2986
New donors	491	384	307	1182
Regular donors	588	630	586	1804
Number of blood donations	1570	1715	1786	5071
Hepatitis B Prevalence (%)	4.2	5.2	3.7	4.0
Hepatitis C Prevalence (%)	3.8	2.8	1.5	2.1
HIV Prevalence (%)	0.8	1.2	1.3	1.1

gory of blood donors (new 2.8% against 1.6% in regular; p = 0.004). We did not observe any significant difference in HIV prevalence according to different socio-demographic characteristics of blood donors. In addition, we observed 6 donations in 4697 or 0.1% coinfection with hepatitis B and hepatitis C, 4 donations in 4723 or 0.1% coinfection with HIV and hepatitis B, 2 in 5015 gifts or 0.04% with an HIV and hepatitis C coinfection and 12 donations in 4696 (0.2%) with the three viruses.

The seroconversion between 2010 and 2012 were 37 cases for HBV, 12 for hepatitis C and HIV 8. Incidence rates reported in 1000 person-years were, respectively, for HBV, HCV and HIV 51.7, 17.1 and 11.0. The residual risk of transmission of infectious agents by blood transfusion of labile blood products found during the three years of follow-up cohort of blood donors was: one for 1515 blood donations for HIV, one for 126 donations for HBV and one for 329 for hepatitis C (**Table 2**).

4. Discussion

Our study on the estimation of the risk of transmission of HIV, HBV and HCV by blood transfusion has focused on voluntary donors who donated blood at least twice during the period between 2010 and 2012. It does not take into account donations from occasional donors (family or paid) or from new donors. Given the high proportion of these three viruses in the category of occasional donors and new donors [2] [6], the risk of transmission by blood units from this group of donors should be more important. Incident cases positive results in screening tests for three viruses have not been confirmed, it may cause misclassification and an overestimation of the residual risk. The calculation of residual risk based on duration of serological window was fixed with a genomic screening [10], whereas we used the ELISA tests. Despite these limitations, the residual infectious risk is representative of our endemic context and reliable given the respect of the duration of the 3-year study and consideration of seroconversion.

The number of blood donations was 5071 for three years with an average of 1600 per year for donations Bukavu which is inhabited by nearly one million people. We are very far to meeting the standards of the World Health Organization that wants the number of donors is 1% to 2% of the population of a country. This observation is the same for the rest of the country. The DRC has a national blood transfusion center in the capital, with 11 provincial centers, one in each province is still far to collect donations of blood meets the needs as is the case in other African countries Saharan [9] [17] [18]. In 2011 for a population of nearly 70 millions, 372,258 blood bags were collected.

The blood donors are young, pupils or students. Africa's population is young and this characteristic is found in most studies on African blood donors [2]-[6]. Our blood mobile collections take place often in universities and schools in collaboration with non-profit civil society gathered in platform friendly volunteer blood donors associations.

HIV prevalence in our study is 1 %; it is comparable to that found in the same city by Namululi [19] between 2001 and 2005. This shows the stability of this viral infection in this population group. This prevalence is higher than that observed in Dakar (0.8%) in 2009, but lower than that found among voluntary blood donors in Burkina Faso 2.3% [20]. The reason is that Senegal is a country with very low HIV prevalence unlike in Burkina Faso. The seroprevalence of HBV in our study (4%) is similar to that found by Namululi (3.7%) [19]. Indeed the proportion of HBV (4% between 2010 and 2012 in our study and 3.7% between 2001 and 2005 in the study of Na-

Table 2. Incidence rate of HIV, HBV and HCV and residual risk estimate from 2010 to 2012 in Bukavu.

	Person-years	Incident cases	Incidence rate per 1000 person-years (95% CI)	Serological window (day)	Residual Risk per 1000 donations
HBV	715	37	51.7 (36.9 - 70.6)	56	7.93 (1/126)
HCV	704	12	17.1 (9.2 - 28.9)	66	3.09 (1/329)
HIV	727	8	11.0 (5.1 - 20.9)	22	0.66 (1/1515)

mululi) shows stability of chronically in our population, although we observed a decrease in 2012 (**Table 1**). Prevalence of hepatitis B mainly affects new blood donors, men donor and less than 30 years. The explanation is that in this group of the population (blood donors and men less than 30 years), certain practices such as scarification and tattooing for various reasons may be the cause of the infections [21]. The organization of awareness-raising about the modes of transmission of this virus could probably play a role in reducing the incidence rate [9].

All blood donations with a positive infectious marker were discarded. Transmissions to recipients have been reduced by strategies put in place for the safety of blood products such as biological systematic qualification of any unit of blood. Despite these different mechanisms of blood safety (quality assurance, selection of blood donors), the risk of transmission of HIV and hepatitis B and C still exists [9] [22]. This risk can be attributed to factors such as handling errors, a variant not recognized by certain reagents such as HIV-1 group O and HIV-negative infectious donation in a chronic carrier or in a recently infected individual (window period) [9] [10] [14]. The risk due to the error handling is very low. With a high estimate of 0.25% errors and given the prevalence of the marker in blood donations, the probability of an error has been estimated in France, for a million donations, 0.009 for HIV, HCV and HBV 0.13 to 0.11 [13]. Unrecognized variants by some test kits are extremely rare. The highest risk is due to donors who have been collected early after infection, before the advent of serological markers. This last factor of residual risk has been the subject of our study. We found an incidence rate per 1000 person-years of 51.7, 17.1 and 11.0 respectively for HBV, Hepatitis C and HIV. These rates expose the risk of transmission of these three viruses by transfusion because the probability that a receiver becomes infected after exposure to the virus is 100% [23]. The residual risk of HIV found in our study 1/1515 donations is very high compared to that observed in the South Africa [24] between 1/10,909 donations and 1/25,641 donations, Côte d'Ivoire 1/5780 donations [16] and Senegal 1/28571 donations [9] but it is lower than that found in Ghana (1/290 donations) [5]. The difference is explained by the fact that the prevalence of HIV among blood donors in Bukavu is higher than that of HIV among blood donors in South Africa 0.8% [25] and Senegal (0.8%). But the residual risk in our study is lower than that observed in Ivory Coast because HIV prevalence in the general population is high as 10%. One explanation may be that the study of Ivory Coast has received confirmation tests for all the positive cases, whereas in our study the rapid Elisa tests were used. The residual risk of transmission of hepatitis B and C found here is similar to that found in other studies 1/121 donations in Guinea for HBV and 1/406 donations in Ivory Coast to the risk of hepatitis C [16] [23].

In our study, the residual risk is different for the three markers. The risk of residual HBV is 12 times higher than that of HIV, and 3 times that of HCV while the residual risk of HCV is 5 times higher than HIV. This can be explained in part by the length of the window relative to that of HIV and the other by the higher rate of incidence of HBV compared to HIV and HCV rate associated with a higher prevalence in the general population associated with greater efficiency of sexual transmission of HCV and HBV as HIV [23].

5. Conclusion

The residual risk of HIV, hepatitis B and C in our study is very high and joined the trends of African Studies. Despite the limitations of the study, the numbers found are in line with the epidemiological context of the country. Among blood donors, it is imperative to increase sensitization in order to change behavior and cause them to be loyal donors to reduce the risk of these viruses. The improvement over the last two decades of serological screening tests and even the introduction of genomic screening allows hope for reducing this risk of infection. However, the level of blood safety depends also and above all the effectiveness of prevention measures taken at each stage of the transfusion chain. These strategies can be temporary or definitive, taken upstream and/or

downstream of the biological qualification of blood donations. These measures are: the limitation of transfusion indications at provider level, the selection of donors with information and medical interviews pre-donation screening for viral markers by serological tests. It will make available these tests in all structures even in the most remote areas, before thinking to develop genomic screening and inactivation of labile blood products in our context.

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Stroke Epidemiology in Douala: Three Years Prospective Study in a Teaching Hospital in Cameroon

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Abstract

Background and Objectives: Cerebro-vascular accident or stroke constitutes a major challenge in sub-Saharan Africa. In Cameroon, basic epidemiologic data are not routinely available. Aims: The aim of this study was to determine the type, the associated risk factors, time to admission, the clinical presentation and the case fatality of stroke at the Douala General Hospital (DGH) in Cameroon. Methods: A cross-sectional study was performed from January 1, 2010 to December 31, 2012 at the neurology and intensive care units of the DGH. All patients above 15 years of age with a diagnosis of established stroke were enrolled. For each patient, socio-demographic, clinical and paraclinical data were recorded as well as the duration of hospitalization and the case fatality. Results: In all, 325 patients were enrolled with males constituting 68.1% and general mean age of 58.66 ± 13.6 years. The mean initial consultation delay was 47.36 ± 18.48 hours. The majors cerebro-vascular risk factors were hypertension (81.15%), chronic alcohol consumption (28.3%), diabetes mellitus (20.61%), obesity (18.15%), cigarette smoking (16%), dyslipidemia (8.9%) and atrial fibrillation (3.07%). Ischemic stroke accounted for 52% of cases while 48% were hemorrhagic. The mean duration of hospitalization was 8.58 ± 6.35 days with a case fatality rate of 26.8%. Septic conditions appeared to be the leading cause of death accounting for 35.6% of cases.

Conclusion: Stroke in the DGH is associated with a high case fatality rate and hypertension remains the number one risk factor. There is a clear and urgent need for public health authorities to reinforce measures for the control of modifiable stroke risk factors.

Keywords

Stroke, Epidemiology, Risk Factors, Case Fatality, Douala, Cameroon

1. Introduction

Stroke is the second leading cause of death worldwide [1]. Over the last 20 years, modifications of the disease epidemiology have been observed in Sub-Saharan Africa with emergence of non-communicable chronic diseases like hypertension, diabetes mellitus, dyslipidemia and the obesity [2] [3]. On the other hand, substantial modifications of lifestyle are also observed with increasing sedentary tendencies, alcohol consumption and tobacco smoking. All these conditions are prone to increase the incidence of stroke in this part of the world. Data on stroke in Cameroon are scarce and are generally related to specific conditions [4]-[10].

2. Objective

The objective of this study was to determine the type, the associated risk factors, time to admission, the clinical presentation and the case fatality of stroke at a reference hospital in Cameroon: the Douala General Hospital (DGH).

3. Materials and Methods

3.1. Study Setting

Douala, the economic capital of Cameroon has a population of 3 million inhabitants, an equatorial climate and is situated in the Gulf of Guinea. The DGH is a state-owned teaching hospital with 320 beds for the following departments: paediatrics, surgery, gynaecology and obstetrics, cobaltotherapy, nephrology and haemodialysis, intensive care, emergency, and internal medicine. The imaging department operates an 8-barettes CT scan allowing for 24 hours daily service. Magnetic resonance imaging is available in Douala only in the private sector (the cost of a brain MRI was 381.38 € at time of study). Stroke patients were hospitalized in the neurology unit (NU) of the internal medicine department and those with severe conditions at admission were hospitalized in the intensive care unit (ICU).

3.2. Study Design and Patient Management

A prospective cross-sectional study was performed from January 1st 2010 to December 31st 2012. All consenting patients more than 15 years of age with clinical diagnosis of stroke and CT scan confirmation were enrolled. Patients with severe clinical state (Glasgow Coma Scale < 8/15 or septic shock) were admitted directly into ICU while other cases were hospitalized in the NU. For each patient, socio-demographic, past medical history and clinical data were recorded. Initial consultation delay for initial consultation was also accessed as difference in time of onset of symptoms to time of consultation. The definitions of vascular risk factors are found in **Table 1**. Upon admission, vital signs included blood pressure, pulse, respiratory rate, oxygen saturation, temperature, capillary glycaemia and dipstick urine analysis were recorded. Neurological assessment was done by a neurologist or intensive care specialist or both. Interpretation of CT scans was done by both radiologists and neurologists. Electro-cardiography was systematically done for patient with ischemic strokes and for hypertensive patients with hemorrhagic strokes. For patients with ischemic stroke, transthoracic and supra-aortic Doppler ultrasound studies were done; except for critically ill patients. Blood samples were collected for standard assessments including: a full blood count with platelet counts, urea and creatinine, electrolytes, fasting glucose, lipid profile, prothrombin time, cephaline-kaoline time, uric acid, C-reactive protein, erythrocyte sedimentation rate and HIV serology. Other tests were prescribed if required by the patients' conditions: chest X-ray, urine culture, haemoculture, thick blood film to check for *Plasmodium falciparum*. Patient follow-up was done daily for clini-

Table 1. Definition of vascular risk factors.

Vascular Risk Factors	Definition
Hypertension	-Patient with medical history of hypertension, treated or not. Or -Patient with persistent high blood pressure > 140/90 mmHg after stroke
Diabetes Mellitus	-Patient with medical history of diabetes, treated or not. Or -Random serum glucose > or = 2 g/l. Or venous fasting glucose test > 1.26 g/l
Dyslipidemia	One of these conditions -Patient with medical history of dyslipidemia or -Total cholesterol > 2 g/l or -Low density lipoprotein > 1 g/l or -High density lipoprotein < 0.40 g/l or
Sleep Apnoea Disease	Suspected in patient with 3 of these conditions: -Snoring when sleeping -Apnea during sleeping -Excessive diurnal sleepiness -Can be associated with obesity
Alcohol Consumption	Daily alcohol intake > 40 g/l
Obesity	2 methods were used -the body mass index > 30: obesity -and when it's impossible to have the BMI, we used the abdominal circumference: >102 cm in male and >88 cm in female

cal evaluation and any complications were recorded. In case of death, a staff meeting was held to ascertain the cause of death. Oxygen was administrated if ambient oxygen saturation was less than 94%. Paracetamol was administered to patients who developed a fever (body temperature superior to 37.5˚C) at a dose of 1g six-hourly. Prevention of deep venous thrombosis and stress ulcers was done using prophylactic dose of enoxaparine (40 mg) and omeprazole (20 mg) respectively. An insulin protocol was set up when capillary glycaemia was above 1.4 g/l. Concerning blood pressure management, nicardipine was given intraveniously with an electric syringe in case of high blood pressure with a target of 140 to 160 mmHg for systolic blood pressure in hemorrhagic stroke. In ischemic stroke, early elevated blood pressure was not tempered with excepted when it was above 220 mmHg. Aspirin (100 - 250 mg per day) was given in ischemic stroke while a curative dose of low molecular weight heparin was used in case of atrial fibrillation with CHADS > 3, presence of intraluminal thrombus in a cerebral artery or presence of blood clot in the heart. Antibiotics and arthemeter were administered in case of bacterial infection and malaria respectively. Thrombolysis treatment is not yet practiced in Cameroon.

3.3. Statistical Analysis

We used the SPSS software version 20 to analyse data. Khi-square and Fisher tests were used to compare qualitative variables while the Student's T test was performed for quantitative variables. P values < 0.05 were considered statistically significant.

3.4. Ethical Issues

We obtained clearance from the National Ethic Committee. The objective of the study and other relevant information was explained to each patient or their relative and their (oral or written) consent was obtained.

4. Results

A total of 325 patients were enrolled with 258 (79.39%) from the NU and 67 (20.61%) from the ICU. There were 201 males representing 68.1% of cases with a M/F sex ratio of 1.62. **Figure 1** shows the distribution of patients according to age and sex while **Table 2** presents the characteristics of the study population. The mean age of male was 58.66 ± 13.06 years and the mean age of female at 61.56 years (P = 0.002). Some 127 patients (39.1%) were admitted directly from their homes while 198 (61.1%) were referred from public health care centres (109 cases) and private clinic (89 cases).

Table 3 gives the known cerebro-vascular risk factors (CVRF) before stroke considering the nature of stroke.

Table 2. Sociodemographic characteristics of patients.

	Number (n)	Percentage
Instruction Level		
Illiterate	35	7.7
Primary	73	16.3
Secondary	99	23.7
University	118	28.6
Total	**325**	**100.0**
Profession		
No	156	48.0
Yes	169	52.0
Total	**325**	**100.0**
Care's Payment		
Insurance	53	16.3
Individual	11	3.4
Individual and Family	29	8.9
Family Alone	232	71.4
Total	**325**	**100.0**
Patient's Residence		
Douala	207	63.7
Littoral	42	12.9
Other Region	71	21.8
Abroad	5	1.5
Total	**325**	**100.0**

Table 3. Known cerebro-vascular risk factors in patients.

Stroke Risk Factors	Ischaemic N (%)*	Haemorrhagic N (%)**	Total N (%)***	P
High Blood Pressure	127 (74.71%)	100 (64.52%)	227 (69.84%)	0.46
Alcohol	50 (29.42%)	42 (27.10%)	92 (28.30%)	0.64
Diabetes	49 (28.83%)	18 (11.62%)	67 (20.61%)	0.00
Overweigh/Obesity	42 (24.705)	17 (10.96%)	59 (18.15%)	0.02
Tobacco	28 (16.47%)	24 (15.49%)	52 (16%)	0.80
Past History of Stroke	24 (14.12%)	14 (9.04%)	38 (11.69%)	0.15
Dyslipidemia	21 (12.36%)	08 (5.17%)	29 (8.9%)	0.02
Other Emboligenic Cardiopathy	21 (12.36%)	05 (3.23%)	26 (8%)	0.02
Sleep Apnoea Syndrome	06 (3.53%)	05 (3.23%)	11 (3.38%)	0.88
Atrial Fibrillation	09 (5.30%)	01 (0.65%)	10 (3.07%)	0.01
HIV Seropositivity	05 (2.95%)	05 (3.23%)	10 (3.07%)	0.56

* = Percentage relative to ischemic stroke (N = 170); ** = Percentage relative to hemorrhagic stroke (N = 155); *** = Percentage relative to the total study population (N = 325); P = 0.05: Level of significance comparing ischaemic and haemorrhagic strokes.

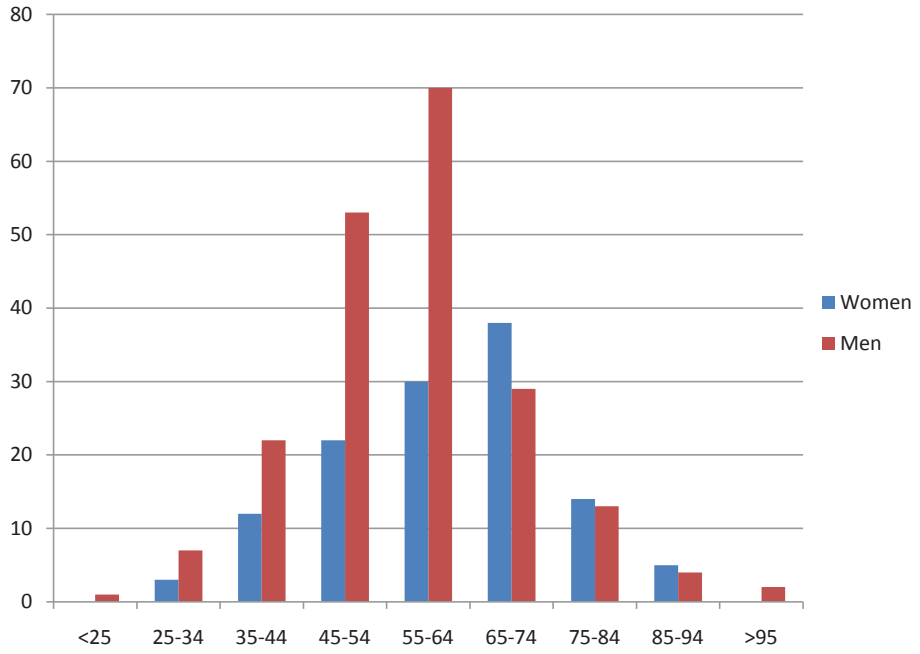

Figure 1. Distribution of patients according to age group and sex.

The prevalence of hypertension was 81.53% (265 cases out of which 38 cases were de novo new cases of high blood pressure). The situation was similar for diabetes mellitus and dyslipidemia where 10 and 16 new cases were diagnosed giving a prevalence of 23.69% and 14.15% respectively. Fourteen new cases of atrial fibrillation were diagnosed giving a prevalence of 13.53% during ischemic stroke.

The mean delay from the onset of symptoms suggestive of stroke and the initial consultation was 47.36 ± 18.48 hours (1 to 441.75 hours). The mean delay for consultation at the DGH was 96.37 ± 64.99 hours (range: 1 to 720 hours). Only 84 patients (25.84%) consulted in the DGH before 4.5 hours from the beginning of symptoms.

Table 4 shows the clinical characteristics on admission. Up to 167 patients (51.3%) had a capillary glycaemia above to 1.4 g/l and the temperature was above or equal to 38.5˚C for 29 (8.9%) patients. The Glasgow coma score was inferior or equal to 8/15 for 58 (17.8%) patients. Urine analysis showed a suspicion of urinary tract infection based on the presence of both nitrite and leucocytes in 31 patients (9.53%). Glucosuria, proteinuria and cetonuria were positive in respectively 85 (26.25%), 34 (10.46%) and 31 (9.53%). **Figure 2** shows the different types and subtypes of stroke. Ischemic and haemorrhagic strokes represented respectively 52% and 48% of cases. Strokes were associated with one or more comorbid conditions as shown on **Table 5**. The global (NU and ICU) mean duration of hospitalization was 8.56 ± 6.35 days. The case fatality rate was 26.8%. Septic conditions appeared to be the leading cause of death in 35.6%.

5. Discussion

Although stroke is the second cause of death and the first cause of acquired handicap worldwide, its incidence in the general population remains poorly studied in sub-Saharan Africa [11]. In Cameroon, some studies have been carried on patients in the intensive care units [7] [8], sickle cell children [4] [6] and on risk factors of stroke [5] [10]. The only study that employed modern imaging technique (CT or MRI) is that of Chiasseu and Mbahe [9] although it looked mainly at less severe stroke in a small sample and very little information was reported on stroke subtypes. The study we report in this paper included cases in the intensive care and neurology units allowing a better sample size to study epidemiological features of stroke.

The mean age of the patients was 58.66 ± 13.06 years and was higher in women than in men. Sagui *et al.* in Dakar, Senegal found a mean age of 61.9 ± 12.4 in 2008 in Dakar [12], a result similar to that of other developing countries [13] [14]. The mean age in the current study is 8 to 15 years lower than that observed in developed countries [15] [16]. Situation is same with life expectancy between developing and developed countries. But we

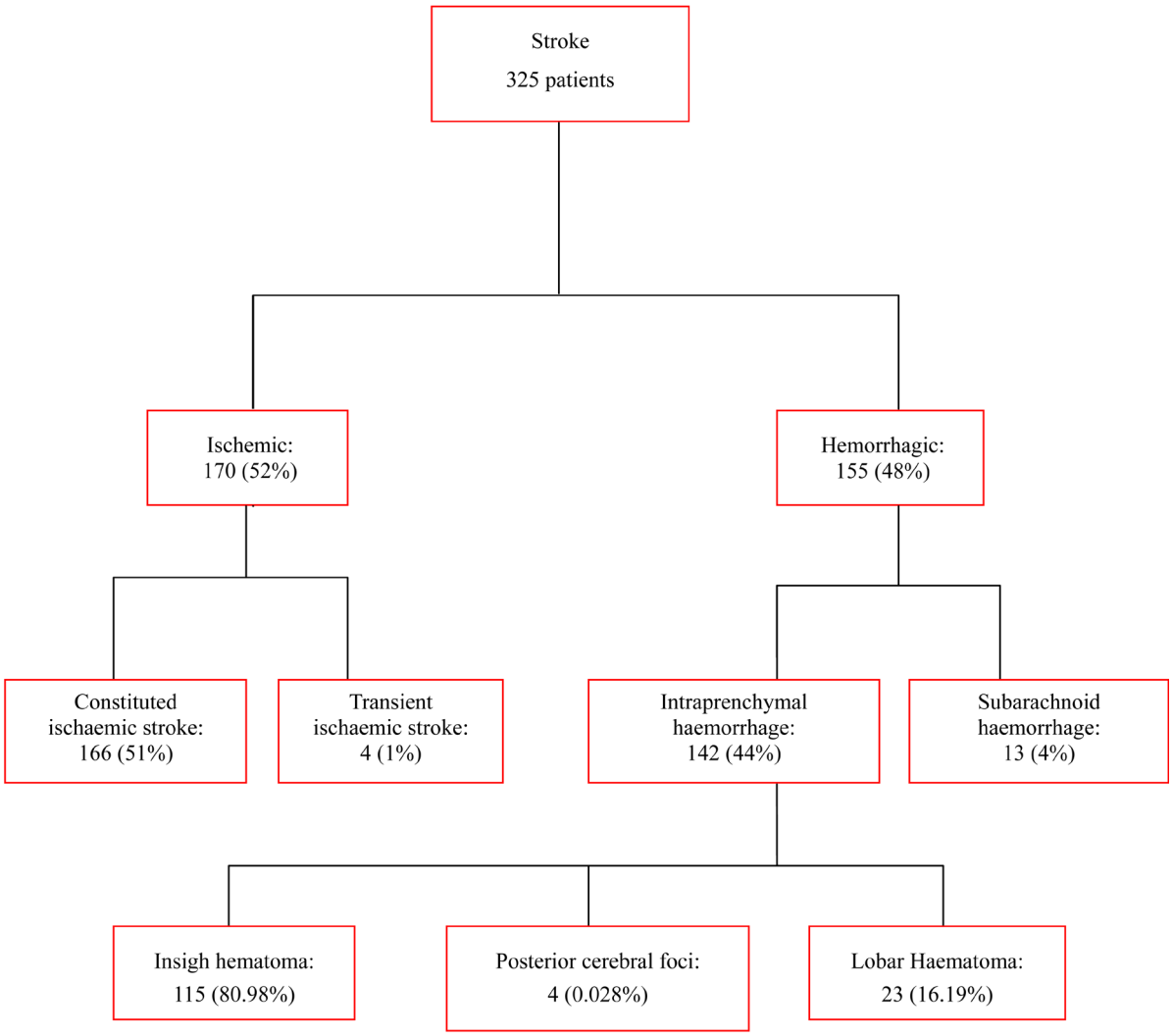

Figure 2. Types and subtypes of stroke.

Table 4. Clinical characteristics of patients at entrance.

	Mean	Standard Deviation	Minimum	Maximum
Systolic BP (mmHg)	168.38	33.60	88	255
Diastolique BP (mmHg)	100.88	20.50	50	171
Pulse Rate (/min)	84.41	19.32	26	169
Respiratory Rate (/min)	23.75	9.24	12	99
Temperature (°C)	37.29	0.76	35.8	40.30
Capillary Glycaemia (g/l)	1.47	0.77	0.23	5.99
Glasgow Coma Score	12.25	3.35	3	15

BP = Blood pressure.

cannot give an exact explanation relative to this difference of age at stroke onset in the two situations, may be easily access to healthcare for CVRF screening. In Cameroon, patients generally seek medical care only when they have symptoms.

Table 5. Associated cerebrovascular risk factors in stroke patient.

Associated Condition	Number	Percentage (%)
HBP	166	51.1
HBP/Diabetes	56	17.2
Atrial Fibrillation	18	5.5
HBP/Dyslipidaemia	19	5.3
HBP/Diabetes/Renal Failure	8	2.5
HBP/Dyslipidaemia/Diabetes	6	1.8
HBP/Atrial Fibrillation	6	1.8
Diabetes	4	1.2
HBP/Diabetes/Dyslipidaemia/Renal Failure	2	0.6
HBP/Dyslipidaemia/Renal Failure	2	0.6
Dyslipidaemia	16	4.7
Diabetes/Dyslipidaemia	1	0.3

HBP = High blood pressure.

There were more men in this study making up 68.1% of the cases. Apart from the study by Kouna *et al.* in Gabon [17], the masculin predominance of stroke is reported in other studies carried out in sub-Saharan Africa and elsewhere [12]-[14] [18]. This masculine predominance may be partly explained by the hormonal differences and lifestyle of men who tend to consume alcohol and tobacco more than women in our setting.

The majority of enrolled patients were living in Douala and its environs, while 21.8% were referred from other regions of Cameroon. The absence of basic stroke infrastructure, inadequacy and specialized personnel in other regions of the country apart Yaoundé and Douala can explain the referral of patients to the Douala General hospital which is better equipped to handle cerebrovascular diseases. There is need for population studies to access the incidence and risk factors of stroke in the country as this information will constitute the basis of a nation-wide stroke management and risk factors control programme.

Concerning the stroke risk factors known before the occurrence of stroke, 69.84% of the patients were hypertensive, and with newly diagnosed patients, this prevalence rose to 81.53%. The prevalence hypertension in stroke victims appears to be lower in developed countries [15] [16] and is situated around 55%. The review of Sagui [19] on stroke in sub Saharan Africa estimated the prevalence of hypertension between 32.3% and 68% among stroke victims. In Cameroon, there has been significant progression of the prevalence of hypertension both in rural and urban area [20]. At discharge from hospitalization, 23.69% of the patients were confirmed with diabetes mellitus whereas only 20.61% of them were known to be diabetic before the onset of stroke. Amu *et al.* [21] screened 26.25% of diabetics among stroke victims in 2002 in Nigeria. Apetse *et al.* found 30.7 % of diabetic patients in a sample of 307 patients in Togo in 2007 [22]. These results however differ from those of Touré *et al.* [23] who report a 9.2% prevalence of diabetes in stroke patients in Senegal. Nigerian and Cameroonian population share several similarities in terms of biological and cultural characteristics. On the other hand, the low rate of diabetes in Senegalese may be due to their Sahelien style of life and the possible existence of environmental factors which may influence the risk of diabetes cannot be totally excluded. The prevalence rate of diabetes in stroke patients is similar to ours in Europe [15] but lower than 45% reported in Saudi Arabia [14]. We found regular consumption of alcohol to be an important vascular risk factor in this study, present in 28.30% of cases. Kouna *et al.* had a similar result with 27.1% of cases in Gabon, a country located along the southern border of Cameroon. There is no strict control of alcohol consumption in Cameroon and there is a significant among of an indigenous production of alcohol that is consumed mainly by poor people. Many studies do not report this risk factor may be for religious reasons [12]-[14]. Tobacco consumption was present in 16% of the patients and especially in men, in our study. Napon *et al.* in Burkina Faso found similar results: 17.1% in a sample of 70 cases of stroke [24] while Kouna *et al.* [17] reported 9.5% tobacco consumption in a sample of 105 pa-

tients. These findings suggest the high level of tobacco consumption as a modifiable risk factor on which the sensitization of the population should be focused. Before stroke, 8.9% of the patients were known for dyslipidaemia and in the course of stroke, this prevalence rose to 13.83% in our sample. Apetse *et al.* in Togo in 2007 (22) reported a prevalence of 32.12% cases of dyslipidemia in a sample of 301 patients with stroke. Before the onset of ischemic stroke 5.3% of the patients had a past medical history of atrial fibrillation. Among the 24 cases of patients we received in atrial fibrillation, 23 (13.53%) were recognised as being the cause of the ischaemic stroke. Amu *et al.* in Nigéria [21] screened 6.25% cases of atrial fibrillation. Other studies did not mention their ECG results [9] [12] [17] [18]. In developed countries, the prevalence of atrial fibrillation in the course of constituted ischaemic stroke is estimated between 15% and 20% [15] [16].

In the current study, ischaemic stroke is slightly more frequent (52%) than for haemorrhagic stroke (48%). Similar results have been found by Komolafe *et al.* in Nigeria [18] with 51.1% ischaemic stroke. Kouna *et al.* in 2005 in Gabon [17] reported 61.9% cases of ischaemic stroke in a population of patients hospitalized the neurology department. In Europe, 80% of strokes are ischemic in nature [15]; similar to what obtains in Middle East [13] [14] [16]. Are there any existences of genetic or environmental factors which may explain this high prevalence of ischaemic stroke? Are there any biaises for example: are the haemorrhagic strokes so severe that the patients die in the communities (given the high prevalence of HBP) and are therefore not seen in the health facilities? Verbal autopsies could be helpful to attempt an answer to this question.

In-hospital mortality in this study was 26.8% for a mean duration of hospitalisation of 8.56 ± 6.35 days. Touré *et al.* [23] reported a similar mortality in a sample of 314 patients including patients admitted in intensive neurology care. Komolafe *et al.* [18] and Kouna *et al.* [17] estimated the mortality rate at 15.6% and 9.5% respectively. The difference between these mortality rates compared to that in the current study as well as that in Touré report is probably due to the fact that these studies did not include severe cases of patients hospitalized in intensive care unit. This hospital mortality rate is significantly lower in developed countries and is estimated to be around 13% to 14% [15] [16], and is relatively lower in developing countries around 19% [13].

6. Conclusion

The epidemiologic study of stroke in the Douala General Hospital suggests that cerebral haemorrhage and ischaemia have similar prevalence rates. The risk factors are similar to those described in the global literature. Hospital mortality is high and justifies that more action should be geared towards primary prevention in order to reduce the impact of stroke in our environment.

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Prevalence and Genotype Distribution of Oncogenic-Risk Human Papilloma Virus in the Cervix of Climacteric Women with Normal Pap Smears

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Abstract

Objective: To find out the incidence of high-risk HPV infections on climacteric women within our area of influence; and to typify HPV genotypes on women with normal cytology that come to our hospitalary unit of menopausia. Material and Method: Cross-sectional study; with a random sample of 140 cases of climacteric women of ≥50 years of age, with normal Pap smears for the last 12 months. HPV determination was carried out by PCR for screening, and by hybrid capture for genotype typification. Results: The percentage of climacteric women who are carriers of oncogenic HPV and a normal Pap smear was of 11.43% (16/140 cases). The genotype found most frequently was HPV-16, followed by HPV-58, 51 and 18. Conclusions: We found a high prevalence of women who were carriers of oncogenic HPV in climacteric women with normal Pap smears (latent infections) in our health region. We consider that cervical cancer screening, either by PCR or conventional Pap smear, should not be minimized or ignored from 50 years of age onwards.

Keywords

Prevalence, Oncogenic Human Papilloma Virus, Climacteric

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1. Introduction

Human papilloma virus (HPV) infection is presently very frequent and contagious, it being considered a very prevalent and multi-focal STD. In Europe, this prevalence is of around 30% in young women and 18% in adults [1]. In the USA, the mean prevalence, from 14 to 59 years of age is of around 26.8% [2].

Nowadays, it is widely accepted that this infectious (viral) disease, with a transmission that is mainly due to sexual practices, is an inducer or participant in the genesis of certain types of anal-genital cancers [3]. Currently, over 120 types of HPV have been described (40 have tropism for the lower genital tract), for 12 of which there is scientific evidence that they are of high oncogenic risk (HR) [4]. In 6 more HPV types, the evidence is still inconclusive (of a probable high risk) [5].

Most of these infections affect young women, and fortunately, they are transient and cause no lesions (sub-clinical infection), 70% resolving spontaneously by one year and 90% by two years; but they still have great repercussions in Public Health [6].

The oncogenic risk appears in women over 30 years of age (with HPV 16 - 18, and with normal Pap smears), with a possibility of 15% - 30% of developing high-grade intraepithelial lesions (CIN II+) in the next 5 - 10 years [7].

The prevalence of HPV-DNA (+) HR in patients with normal Pap smears varies greatly worldwide, in the USA it is of 7.8% - 8.4% (mean of 8.2%). Conversely, in South America, it ranges from 12.4% to 13.5% (mean of 30%); in Africa, it reaches up to a mean of 22.1% and on the other hand, in Asia, it appears in between 7.5% - 8.5% (mean of 7.9%) [8].

Summarizing data from the WHO, the rate in the developed world is of 10.0%, and in developing and under-developed countries it is of 15.5%. This difference is possibly due to the precocity in marriage in these countries, usually being comprised of older males with more than one previous partner, but above all, it is associated with their poor hygienic conditions [9].

A recently-published meta-analysis [1] shows a prevalence of HPV with oncogenic risk (with normal Pap smears) of 10.4%, increasing significantly with climacteric (45 - 55 years).

As we were unaware of the HPV infection incidence rates in our female population ≥ 50 years of age, with normal Pap smear results and asymptomatic (from the oncological standpoint), we designed this study in collaboration with the menopause unit at the hospital.

For this, we set out to find out the results of applying the molecular biology techniques for the determination and typification of the human papilloma virus (HPV), together with colposcopic (with 5% acetic acid) and cytologic (conventional exfoliative Pap smear) studies, by means of a sample that is representative of our reference menopause consult for the central district of Malaga, Western Costa del Sol and Guadalhorce Valley.

2. Material and Methods

A cross-sectional study was carried out, by means of a sample that was random (for this, the first and last user where included who, fulfilling the required specifications, had an appointment at our Unit every Monday and Wednesday during the 12 consecutive months that the enrolment period lasted) and significant (n = 140 cases).

The inclusion criteria were: Climacteric women (≥50 years of age) with normal cervical-vaginal Pap smear results (in the last 6 months) who were also asymptomatic. Hysterectomized patients were excluded, as were those having a history of diagnosis and/or treatment of Cervical Intraepithelial Neoplasm (CIN) or cervical carcinoma.

Informed consent was requested from the patients. As it was an epidemiological, non-interventionist study, the approval of a hospital committee was not necessary, although it was informed thereof.

The enrolment period lasted from 01.02.2012 until 01.02.2013. All the women summoned to our Unit came from our health region of the Andalusian Health Service (Servicio Andaluz de Salud, SAS), which is comprised of the central district of Malaga, Western Costa del Sol and Guadalhorce Valley (Spain). This would be comprised of a population of approximately 750,000 inhabitants, of which 51.09% are women, according to the last census by the National Statistics Institute (Instituto Nacional de Estadística, INE) for 2005.

HPV-DNA determination was carried out by our hospital's Anatomic Pathology Department, by means of the polymerase-chain-reaction technique (PCR) for screening and by means of hybrid capture for viral genotype typification. In clinical practice, the probe that we use is called VPH-AR "Hibrid Capture II®" (HC2) [10].

The statistical sample was obtained by applying the mean prevalence of the series published worldwide on the

female population that is registered in the census for our province, having an age of ≥50 years, with a 95% confidence interval.

To carry out the statistical analysis, we used the program SPSS® (SPSS® for Windows, version 18.1) of the University of Malaga (Spain). For the analysis of the frequency tables of the analyzed variables, we used the Chi-Square test. We applied the statistical significance for *p*-values < 0.05.

3. Results

The age mean of the sample was 53.1 years (RR: 50 - 71 years of age).

Regarding their source, the majority (non-significant) was comprised of an urban population (Malaga, central district), with 9 cases (55%); 7 cases (45%) came from the rural area, divided into 25.7% from Western Costa del Sol, and 19.3% from Guadalhorce Valley. This confirms that there are practically no differences between some communities if they are within a same region or country, and they possess the same cultural, geographical and economical development [11].

Most (60%) were married, healthy and the reasons for which they attended the menopause unit were: Hormone replacement therapy revisions, neoplasm prevention, screening for osteoporosis, etc. Of the 140 patients of the sample: 97 (69.28%) were Spanish; 22 (15.72%) were Central-South American, 10 cases (7.14%) were British; 9 cases (6.43%) Central European and 2 cases (1.43%) came from elsewhere.

The percentage of climacteric women (≥50 years) who were carriers of high-oncogenic risk HPV DNA and who had normal Pap smear results was **11.43%** (16/140 cases); where as the percentage of those with negative results was 88.57% (124/140 cases).

The most frequently found genotype was HPV-16 in 7 of the cases (43.75%), followed at a great distance by HPV 58, 51 and 18, with 12.5% (2 cases, respectively). After that, HPV-45, 31 and 39 appeared, with a 6.25% (1 case each) (**Figure 1**).

Seventy-five percent of these (12 cases) were Spanish, 18.75% (3 cases) came from South America and 6.25% (1 case) were from Central Europe. Most cases (6 cases) with HPV-16 were Spanish and 1 case was from Argentina. Cases with HPV-58 corresponded to 1 case from Colombia and 1 from Argentina. All the recorded cases of HPV 51-18-39-45 were of Spanish women. The only case of HPV-31 came from Romania.

4. Discussion

These data on the prevalence of subclinical HPV infection (11.43%), at these ages and carrying normal Pap smear results, are greater than what is expected for a Spanish population, as we are not a leading country in terms of cervical cancer (which has a global mean of around 6.8%), and the European mean is around 8.2% [1], although they are well above the data published in Holland, with 4% [12], and those from the Soviet Union, of around 2.4% [13].

In order to explain this high incidence of asymptomatic carriers of high-oncogenic-risk human papilloma virus in climacteric women with normal Pap smear results, several scientific hypotheses have been proposed, seeing that it could be due to multiple factors: Reactivation of infections that were latent until this time, or rather due to hormonal changes that happen in this age cluster (atrophic colpitis, hypoestrogenism, etc.), or also due to ageing of the immune system, which would allow for the expression of infections that were latent until then, and that are practically undetectable by methods such as the conventional triple-sampling Pap smear.

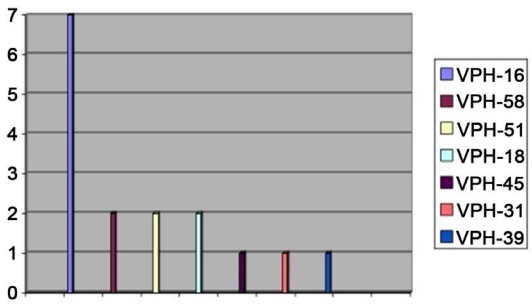

Figure 1. High-oncogenic risk HPV genotypes distribution and frequency.

There are authors that point at causes for the increase in oncogenic HPV carriers at these ages, the simple increase in the acquisition of "de novo" infections, regarding the changes in the climacteric women's sexual behavior [14]: High divorce rate in our country, new partners (according to the recently-published Afrodita© study about the Spanish woman's sexual profile [15], 77.9% of Spanish women between 45 and 55 years of age only have one sexual partner, 17.3% between 2% and 4%, and 4.8% of these women have ≥5 sexual partners), practices of unprotected sex (according to data from the same published study [15] 15.1% of women between 45 - 55 years do not use any contraceptive method, and in those who do use it, the most frequent one is oral contraceptives, followed by condoms). For these reasons an easier transmission of HPV is acquired at these ages. These Spanish data could justify the 11.43% of HPV subclinical infections that we have found in our study.

Although we concur with Fusté [16] in that the genotypes found in climacteric women with normal Pap smears are similar to those found when Pap smears are pathological, we believe that the percentages of HPV-16 and 18 are somewhat lower, and hence, we disagree with him regarding the other five more common HPV genotypes found in our hospital menopause unit.

We provide, as an epidemiologic curiosity, the finding of a greater proportion of HPV-58 in these users mainly coming from countries in Western Africa (such as Nigeria or Senegal), as well as from South America.

On the contrary, we are seeing a lesser proportion of HPV-31, coming from Central America and Eastern Europe.

Our results, although congruent with the worldwide meta-analysis, confirm that although the HPV infection is more frequent in young women of around 25 years of age, there is a second peak of HPV prevalence from 45 - 55 years onwards in all the regions of the planet, except for Asia [1]. This prevalence peak is seen at 54 years of age in Africa and Europe, and after 44 years in America [1].

Cervical cancer screening, either by conventional Pap smear or by HPV-DNA PCR, in light of these findings, cannot be minimized or ignored in this age group of climacteric women. This is why we point out the need to present clinical studies or trials that support the convenience of broadening the indication of preventive vaccines for oncogenic-risk HPV, even in ages closed to menopause.

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