Full Length Research Paper

A study on the frequency of diabetes, elevated Body mass index (BMI) and metabolic syndrome among health-care workers in some hospitals and clinics in Douala, Cameroon

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There is evidence worldwide of the high prevalence of obesity, hyperglycemia and metabolic syndrome in health care providers, although very scanty data is available on this in sub Saharan Africa. The present study aims to determine the frequency of diabetes, elevated Body mass index (BMI) and metabolic syndrome among health-care workers in some hospitals and clinics in Douala, Cameroon. An observational and cross-sectional study was done for the diagnosis of metabolic syndrome. The 2005 definition of The International Diabetes Federation (IDF) was used for 147 health workers. Data were grouped and analyzed according to gender and age. 7.5% of the hospital workers had metabolic syndrome, 71.2% were at high risk of developing metabolic syndrome because of elevated abdominal obesity, 38.4% were obese (BMI ≥ 30) and 4.8% had elevated blood sugar levels. The prevalence rate increased with age: 2.9% (18 to 36 years), 9.5% (37 to 55 years) and 50% for more than 56 years. The definition gave the highest prevalence rate of 7.5% while the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) gave 0.7% with the World health organization (WHO) (1999) giving the lowest prevalence rate of 00%. There is a high prevalence of obesity and metabolic syndrome among health care personnel in the Littoral region of Cameroon. It is imperative to implement programs to screen these risk factors by means of routine medical exams and improving the lifestyles of Cameroonian health care workers. These study findings could be the basis for future research among hospital staff and the general population.

Key words: International Diabetes Federation (IDF), hyperglycemia, metabolic syndrome, body mass index.

INTRODUCTION

Metabolic syndrome is a cluster of disorders including raised blood pressure, cholesterol and blood sugar which increase the risk of cardiovascular disease and diabetes. Metabolic syndrome is a constellation of risk factors that predisposes the individual to coronary artery disease, stroke and diabetes. The metabolic syndrome has been intensely studied in many Western countries but relatively less in sub-Saharan Africa. The prevalence of the key determinants of metabolic syndrome (like hypertension, diabetes, elevated body mass index (BMI), dyslipidemias and central obesity are on a steady rise probably due to westernization of diets and adoption of more sedentary lifestyles, all favoured by an urban to rural migration (Rees et al., 2007). Currently, the most popular criteria for MS diagnosis is the International Diabetes Federation (IDF 2005) consensus definition (Phengtham, 2011). There is evidence worldwide of the high prevalence of these pathologies in health care providers (Garrido et al., 2009). The prevalence of metabolic syndrome (MS) among health employees has been reported to be above the figures for the general population (Padierna-Luna et al., 2007).

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Hospital work requires day and night shifts which, together with work stress, could lead to an increased incidence of MS (Vitaliano et al., 2002; Karlsson et al., 2001). Whichever definition is used, the presence of MS is associated with a doubled risk of cardiovascular disease (CVD) (Dekker et al., 2005; Isomaa et al., 2001) and especially stroke (Hsin-Jen et al., 2006) and type 2 diabetes mellitus (T2DM) (Wannamethee et al., 2005).

Health care workers have a high prevalence of MS. In South America, about a third of nurses had High blood pressure (HBP) and 16.6% were obese (Leão de Aquino et al., 2001) while 26% of all health workers had HBP (Mion et al., 2004). In Europe, there was a high prevalence among doctors of components of MS and a greater risk than the general population of developing any form of CVD (Nakládalová et al., 2005). In the USA, a large increase in the components that constitute MS was found in doctors, as part of the Physician's Health Study (PHS). Of the total of 22,046 doctors, 354 presented with >3 metabolic changes at the beginning of the study, reaching 2,050 at the end of the observation (Stürmer et al., 2006).

The global prevalence of chronic non communicable diseases (NCDs) is on the rise, with the majority of the growth occurring among populations in developing countries (Murray and Lopez, 1997). The quickening pace of change and adoption of western lifestyles by people in developing countries has led to a sharp rise in the incidence of systemic diseases such as diabetes, cancer, coronary artery diseases and hypertension. In sub-Saharan Africa, NCDs are projected to surpass infectious diseases by 2030 (Mathers and Loncar, 2006; Yach et al., 2004). Yet epidemiological studies of these conditions using validated methods are rare especially in Central Africa; besides, knowledge about this rampant clinical entity is meager not only among the general population but also among healthcare providers. Thus the world is currently going through a silently damaging epidemic. The aim of this study was to determine the prevalence rate of obesity, hyperglycemia and metabolic syndrome (MS) among health workers in Douala Cameroon.

MATERIALS AND METHODS

Sampling technique

Sampling was purposive because the study targeted adult (age 18+) health workers of urban and peri-urban areas of the Littoral Region. Sampling was clustered because participants were sampled at the level of specific chosen locations, notably the district hospital or other health center found at the sampled health district. Sampling was randomized because it was by chance that a health worker could be working on the shift during which the research team was around. In summary, purposive-clustered-randomized sampling was used for this study.

Study area

The study area is the coastal area of Cameroon (Douala the

commercial capital and the districts in the peri-urban zone), where the main activity in the urban area is commerce and other sedentary occupations as opposed to the peri-urban area where the main activity is farming, with the inhabitants having a relatively more physically active lifestyle. The climate in both the urban and peri-urban areas is warm and humid. Hospital personnel were recruited from the district Hospitals of Deido, New Bell, Cite des Palmiers, Nylon, Bonassama and Polyclinic Bonanjo Annexe, all in the Douala municipality.

Participants and recruitment

A cross sectional survey was conducted using hospital personnel of the district hospitals in urban region of littoral region of Cameroon. Data were collected from all personnel who voluntarily attended the medical examination on the designated days. Participants with incomplete data were excluded. The exact recruitment criteria included: Age 26 to 56 years, overnight fast and sex. Both male and females were recruited for the study. Excluded from this study were pregnant women, personnel who are nonfasting or refused to participate in the study, or refused to sign the consent form. Those arriving the hospitals after 12.30 noon were advised to report the next morning after an overnight fast. A total of 147 healthcare workers of both sexes with ages between 26 to 56 years were recruited for this study between May 2010 and April 2011. A prior pilot study was conducted at the Douala Cardiovascular Center (a specialized center in the treatment of most of the determinants of MS) in order to ascertain the competence of the trained personnel and the validity of the instruments to be used.

Measurements

Trained certified medical personnel obtained blood pressure and anthropometric measurements (height, weight, waist and hip circumferences) and collected a venous blood sample for measurement of glucose. Waist circumference was measured with a spring-loaded measuring tape, midway between the inferior angle of the ribs and the superior iliac crest at the high point of the iliac crest at minimal respiration to the nearest 0.1 cm, whereas hip circumference was measured at the outer most points of the greater trochanters. Waist to Hip Ratio (WHR) was recorded to the nearest 2 decimal places. Fasting blood sugar concentration was measured using an enzymatic reaction (glucose oxidase method). Questionnaires on medical and medication history as well as lifestyle options (area of residence, dietary habits, sporting activities, occupation, alcohol consumption, sleep patterns and consumption of rapid sugars) were administered to all the subjects.

Metabolic syndrome designation

This was a three component metabolic syndrome study. Prevalence of the metabolic syndrome and its components were estimated using the 2005 definition of IDF which was the main definition used for the study. This prevalence rate was then compared with those of the other definitions (NCEP-ATP III (2002) and World Health Organization (WHO) (1999). The determinants or components of metabolic syndrome considered in this study were: Body mass index (BMI), Waist /Hip Ratio (WHR), elevated blood sugar, waist circumference (WC) and hypertension (HT).

Statistical methods

Data from the questionnaires and laboratory reports were entered into an electronic data base Epi-Info 6.04d (CDC, 2001). Range and
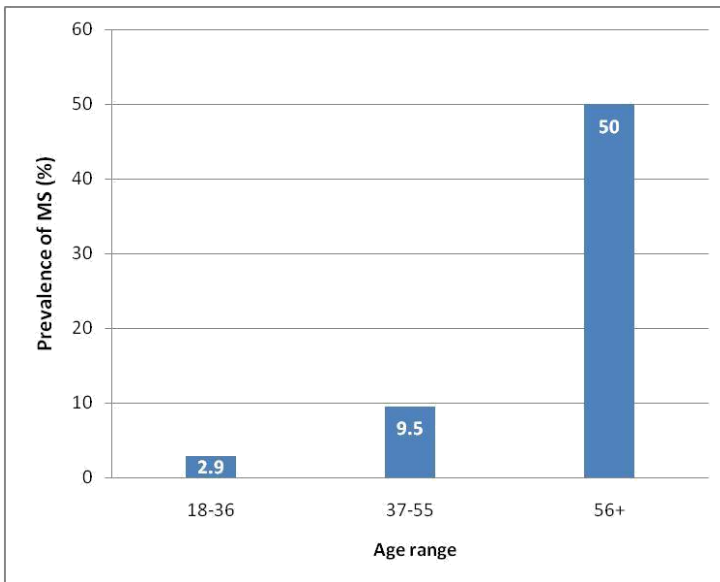
Figure 1. Prevalence of MS using IDF (2005) definition among hospital personnel stratified for age (years).
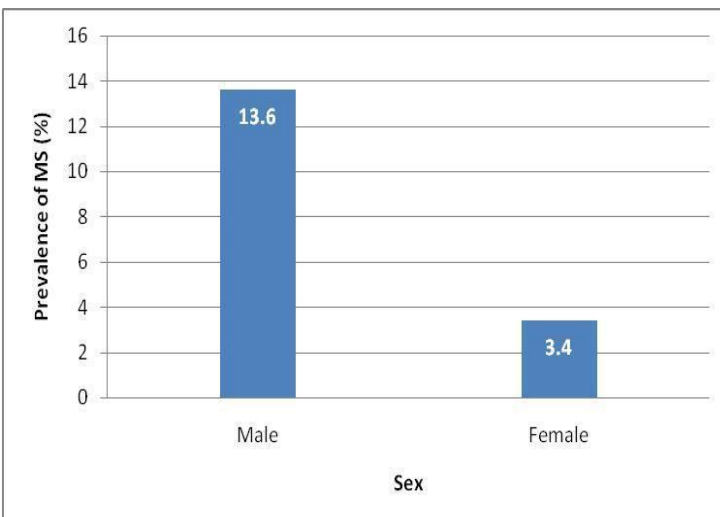
Figure 2. Prevalence of MS according to the gender.

consistency checks were used to minimize data entry errors. Data were merged and exported from Epi-Info to Statistical Package for the Social Sciences (SPSS).

Generating computed variables

To answer specific indicators, some variables were derived from „raw variables" using direct compute command or command syntax such as the generation of the BMI from height and weight of the patient.

Development of syntax journal

A syntax journal was developed for each major steps of the analysis. Syntax was also indispensable to solve specific problems

that could not be done using direct interactive-window analysis. For categorical variables, descriptive statistics was used to present the distribution of subjects between and within subsets using frequencies and proportions. Associations between lifestyle options and determinants of the metabolic syndrome was done using χ^2-test chi -square test for categorical variables with 95% confidence interval (p < 0.05). .

Ethical considerations

The study protocol was approved by the National Ethics Committee of the Ministry of Public Health, Cameroon as well as administrative clearance from the Authorities of the Littoral region. All subjects gave informed consent to participate and the authors followed the Declaration of Helsinki on biomedical research involving human subjects.

RESULTS

About 46.9% of these personnel were of the youthful range (26 to 36 years), 50.4% were aged between 37 and 55 years, with only 2.7% aged more than 56 years. This group had more females (59.9%) than males (40.1%). Elevated waist circumference was the most prevalent component while the diabetic condition was least prevalent. The highest prevalence rate for MS was amongst those medical personnel aged more than 56 years (Figure 1). Those aged between 26 to 36 years expectedly registered the lowest MS prevalence rate. The males recorded higher prevalence rate than the females (Figure 2). The IDF (2005) definition gave the highest prevalence estimate (7.5%) (Figure 3 and Table 1). No significant difference (Table 3) was found between the MS prevalence rate among the different health districts.

DISCUSSION

This study revealed a prevalence rate of 7.5% for the metabolic syndrome amongst the hospital personnel in the Littoral Region of Cameroon. In another study in Celaya, Guanajuato, involving 142 women (71%) and 58 men (29%), with a mean age of 41 years (range 19 to 59), the overall MS prevalence was 29.5% (Padierna-Luna et al., 2007) which is much higher than the 7.5% prevalence rate reported in this study. Similar studies in Parkistan (Alam et al., 2011) and Lampang hospital (Phengtham, 2011) revealed higher rates of 14.95 and 9.5%, respectively. Our findings are also relatively much lower when compared to the staggering 34% metabolic syndrome prevalence rate reported for hospital workers in Botswana (Garrido et al., 2009). In another study conducted in Ethiopia (Tran et al., 2011), using the NCEP/ATP III and IDF definitions, the overall prevalence of MS was 12.5 and 17.9%, respectively (Tran). This is quite different from the results from this study which gave prevalence rates of 0.7 and 7.5%, respectively using the NCEP/ATPIII and the IDF (2005) definitions (Table 2).
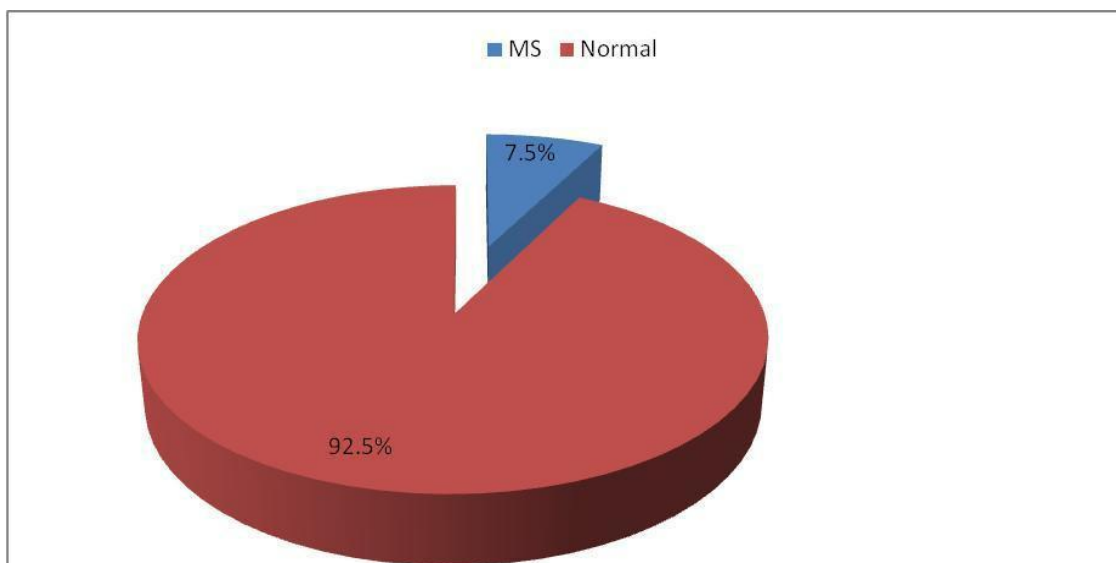
Figure 3. Prevalence of MS among hospital personnel using the IDF (2005) consensus definition.

Table 1. Prevalence of determinant of MS among the medical personnel.

Indicator of metabolic syndrome	Frequency	LB (95% CI)	Percent	UB (95% CI)	N
Elevated blood sugar	7	1.9	4.8	9.6	147
Hypertensive condition WHO	29	13.6	19.7	27.1	147
High BMI ≥30	56	30.4	38.4	46.8	146
Elevated WHR	54	29.2	37.0	45.4	146
Hypertensive condition (NCEP/ATP III)	48	25.2	32.7	40.9	147
Elevated Waist circumference (NCEP/ATP III)	67	37.6	45.9	54.3	146
Elevated waist circumference IDF (2005)	104	63.2	71.2	78.4	146

LB = lower bond [lower limit]; UB = upper bond [upper limit]; CI = confidence interval; N = sample size, BMI = body mass index; hypertensive condition (WHO) = hypertensive condition according to the WHO (1999) definition of MS; WHR = waist to hip ratio; NCEP/ATPIII = National Cholesterol Education Program-Adult Treatment Panel III, IDF (2005) = International Diabetes Federation, 2005 definition of metabolic syndrome; FBS = fasting blood sugar, MS = metabolic syndrome.

Table 2. Prevalence of metabolic syndrome using the different definitions.

Definitions used	Frequency	LB (95% CI)	Percent	UB (95% CI)	N
Metabolic syndrome with BMI and/or WHR WHO 1999	0	0.0	0.0	2.5	147
Metabolic syndrome with BMI only	0	0.0	0.0	2.5	147
Metabolic syndrome with WHR only	0	0.0	0.0	2.5	147
Metabolic syndrome using NCEP ATP III	1	0.0	0.7	3.7	147
Metabolic syndrome using IDF (FBS≥1.26 g/l)	2	0.2	1.4	4.8	147
Metabolic syndrome using Consensus IDF definition (FBS at 1.0 g/l)	11	3.8	7.5	13.0	147

The risk of developing MS is strongly associated with night-shift work in nurses. Medical counseling should be promptly instituted in night-shift workers with the syndrome and in case of persistence or progression, a change in work schedule should be considered (Pietroiusti et al., 2010). This study shows that MS increases with age, with the most affected age group being 35 to 56 years and those above 56 years showing

Table 3. Prevalence of MS (FBS at 1.0 g/l) in different Health districts.

| Health district | Metabolic syndrome IDF (FBS at 1.0) | | Total n (%) |
	Absent n (%)	Present n (%)	
Deido	21 (91.3)	2 (8.7)	23 (100.0)
New Bell	45 (91.8)	4 (8.2)	49 (100.0)
Nylon	7 (87.5)	1 (12.5)	8 (100.0)
Polyclinic Bonanjo	63 (94.0)	4 (6.0)	67 (100.0)
Total	136 (92.5)	11 (7.5)	147 (100)

$\chi 2$ -test: 0.594; DF = 3; P = 0.898.

the highest prevalence rate. This is consistent with the findings of other investigators (Phengtham 2011; Garrido et al., 2009). The males in this study showed a higher prevalence rate than the females and this is different from those reported in healthcare workers in Parkistan (Alam et al., 2011) and in Botswana where the female gender instead was strongly associated with obesity and metabolic syndrome. The very high pre-valence rate of obesity and metabolic syndrome may suggest that hospital staffs are quite complaisant when it comes to taking annual health check-ups. Such check-ups may show early stages of intermediate MS and remind staff to control their lifestyle (Patrakitkomjorn et al., 2011). Moreover a longitudinal study suggested that a three year period suffice for healthy healthcare workers to develop the components of the metabolic syndrome (Patrakitkomjorn et al., 2011). It has been suggested that at least one measurement from each of these components namely anthropometric, blood pressure, glycemia and dyslipidemia is adequate to diagnose MS (Khalil et al., 2011). This makes it much easier for the hospital personnel to have an indication of the metabolic syndrome components already being harbored by them.

As far as the components of the metabolic syndrome are concerned, using the IDF (2005) definition, hyper-glycemia gave the lowest prevalence rate while central obesity (elevated waist circumference) showed the highest prevalence. This is consistent with results obtained from other studies, although another recent study suggests that even neck circumference could also be included in the anthropometric measurements for the diagnosis of the metabolic syndrome (Khalil et al., 2011).

A sedentary work schedule and lifestyle with their lowering effect on the resting metabolism could easily be indicted as the principal cause of the high prevalence of MS amongst medical personnel in Cameroon. Also over-indulgence in alcohol and excessive consumption of starchy staples could easily predispose to abdominal obesity, more especially if these excesses are not

counter balanced by adequate and appropriate physical exercise regimen. Thus, result from this study show that there is a high risk of lifestyle-associated diseases within a group of people who are responsible for promoting health and healthy values and behaviours among the population.

That the NCEP/ATP III criteria (NCEP, 2002) and the IDF (2005) definition (Alberti et al., 2005) give different values for the MS prevalence rate is understandable, being mindful of different cut off values of the different components defining these two definitions. The WHO (1999) (Alberti and Zimmet, 1998) definition gave a pre-valence rate of 0.00%, suggesting it is the least sensitive of the three definitions used. Identifying the lifestyle changes among the youth that could determine the in-creased tendency to develop risk factors for the diseases such as rural to urban migration and adoption of western habits (Rees et al., 2007) is a very important aspect in the prevention of the metabolic syndrome. This is because the hospital personnel are also victims of this westernization of habits especially diets. Our study reveals that only a minority of medical community are aware of MS as a clinical entity. Nurses and other paramedics appear to be unaware of the problem and this has also been reported by other investigators (Alam et al., 2011). Moreover, future interventions by health policy makers and public health officials ought to focus on the individuals at risk who have one or two risk factors in order to control any potential burden of the syndrome. In hospital based prevalence study involving 1974 patients undertaken by our team, it was observed that the MS prevalence rate for the general public was 8.4% which is not very different from the 7.5% obtained for hospital personnel, and this suggests that successful prevention campaigns against this syndrome must include all sectors of society.

We therefore recommend that the detection of risk factors for CVD among health personnel in Cameroon be included as part of a routine medical review. Such

interventions would be more expeditious among health personnel who have the advantage of immediate access to medical care. Programmes that promote healthy lifestyles among government employees, particularly in the health sector, are also highly desirable and should form part of government policy.

Conclusion

The present study shows that only a minority of medical community are aware of MS as a separate clinical entity. These findings indicate the need for evidence-based health promotion and disease prevention programs and more robust efforts directed towards the screening, diagnosis and management of MS and its components among Cameroonian medical personnel and the population at large.

ACKNOWLEDGEMENTS

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