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Metabolic Risk Factors and Associated Morbidities among Adult Urban People in Pyin Oo Lwin Township

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Metabolic syndrome is a cluster of risk factors for type 2 diabetes and cardiovascular disease, with insulin resistance proposed as a linking factor. It is common and is increasing in prevalence worldwide, largely attributed to increasing obesity and sedentary lifestyles, and now is both a public health and clinical problem. This community-based, cross-sectional descriptive study was conducted during 2015 to identify metabolic risk factors and associated morbidities among adult urban people in Pyin Oo Lwin Township. A total of 355 participants, 94 men (26.5%) and 261 women (73.5%) were enrolled. Age distribution was from 18 to 85 years with mean of 49.98 (SD:15.22) years. Metabolic risk factors were identified according to National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III) guideline. In this study, central obesity was the highest component with 145 subjects (40.8%) followed by elevated triglycerides 129(36. 3%), elevated blood pressure 104(29.3%), low HDL-cholesterols 85(23.9%), and elevated fasting glucose in only 48 individuals (13.5%). The total prevalence of metabolic syndrome was 35.2% with 26.6% in men and 38.3% in women, respectively. There were statistically significant associations above all five metabolic risk factors with metabolic syndrome (p value <0.001). Regarding its associated morbidities, ECG examinations showed normal 296 cases (83.4%) and abnormal in 59 cases (16.6%) but there was no significant difference between metabolic syndrome and abnormal ECG findings. In conclusion, this study recognizes the high prevalence rate of metabolic syndrome and can be depicted about the metabolic risks as the baseline data for implementation of further activities to reduce the incidence of non-communicable diseases.

Keywords: Metabolic risk factors, Urban people, NCEP ATP III

INTRODUCTION

There is an interest in health care and public health services to identify different risk factors related to disease or ill health in order to optimize prevention and early detection of health problems. Knowledge of risk factors as well as changes of attitude and life style in the population is supposed to prevent or reduce the burden of disease. There has been a focus on prevention and identification of disorders with high mortality, which misses the burden of common diseases and disorders. In order to early identify and reduce the impact on health-related problems, there is a need for identifying risk factors associated to a good outcome in health. This is of interest both when meeting the patient in the clinical situation and in the public health work aiming to promote the impact of good health in the population. Many factors are proposed to be associated with the development of health-related quality of life.[1]

A number of expert groups have developed clinical criteria for the metabolic syndrome. The most widely accepted of these have been produced by the WHO, the European Group for the Study of Insulin Resistance (EGIR), and National Cholesterol Education Program Adult

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Treatment Panel III (NCEP ATP III). All groups agree on the core components of the metabolic syndrome: obesity, insulin resistance, dyslipidaemia and hypertension. However, they apply the criteria differently to identify such a cluster.[2]

In order to make a diagnosis of the metabolic syndrome, according to ATP III clinical identification of the metabolic syndrome (2004), a patient must present with three or more of the following five risk factors: (1) central obesity (males: waist circumference >102 cm / >40 in; females: >88 cm / >35 in) (2) raised plasma triglycerides (≥1.7 mmol/l / 150 mg/dl) (3) low HDL (high density lipoprotein) cholesterol (<1.03 mmol/l / 40 mg/dl men; <1.29 mmol/l / 50 mg/dl women) (4) raised arterial pressure (≥130/85 mm Hg), and (5) fasting blood sugar (≥110 mg/dl / 6.1 mmol/l).[3]

Cardiovascular diseases (CVD) are the leading cause of death in the majority of developed and developing countries. A century ago, CVD were responsible for less than 10% of all deaths, whereas today, it accounts for approximately 30% of deaths worldwide, including nearly 40% in high-income countries and approximately 28% in low- and middle-income countries. The global trend in deaths from CVD predicts an estimated rate of 32% for the year 2020, with a greater contribution from middle- and low-income countries compared with high-income countries.[4]

The principal tests for detecting asymptomatic blockage of the coronary arteries or increased coronary heart disease risk include resting and exercise electrocardiograms, which can provide evidence of unrecognized previous myocardial infarction, silent or inducible myocardial ischemia, or other evidence of cardiac abnormalities. In this review, the researchers consider the role of ECG in the detection and prevention of coronary heart disease events.[5]

Therefore early diagnosis, effective treatment and prevention are important. Preventing non-communicable diseases is based on identifying individuals at risk through screening programs and providing adequate information such as life style to reduce that risk. To design such a preventive program and to assess the public health burden in the population, accurate population frequency data on metabolic risk factors in this urban people are required.

Moreover, there is insufficient of studies on apparently healthy people focusing on metabolic risk factors by doing routine medical examinations. The aim of this study was to identify metabolic risk factors and associated morbidities among community. This study will depict the metabolic risks as the baseline data for the implementation of further activities to reduce the incidence of non-communicable diseases.

MATERIALS AND METHODS

This community-based, cross-sectional descriptive study was conducted during the period September to December 2015 in urban area of Pyin Oo Lwin Township. A total of 355 people of both sexes within the age of 18-85 years were recruited from all ten wards situated in urban areas of Pyin Oo Lwin Township. From each ward, 35-37 households were selected randomly to obtain the required sample size (n=355). The sampling frame was prepared using the list of household numbers available at "Ward Administrative Office". Then, one person from the eligible household members of each household was selected using the Kish table. Each and every 3rd person was selected from the list of each household member. If 3rd person was absent at study day, 2nd or 4th person was selected.

After explaining the purpose, risks and benefits of the research, and getting informed consents from the participants, about 5 ml of blood were collected under aseptic precautions after overnight fasting. One milliliter of blood was collected in sodium fluoride tube for determination of blood glucose and 4 ml of blood were collected in plain tube for determination of biochemical parameters. Plasma and serum was obtained by centrifuging at 3000 rpm for 10 minutes and stored at -4°C until analysis. After collecting required samples, biochemical parameters were assessed by using biochemical analyzer (AE 600).

Then, history taking, physical examination, measurement of height, weight, waist and hip circumferences, blood pressure and ECG examination using a computerized device (Schiller® AT-10 EKG, Baar, Switzerland) with 12 leads were done and metabolic risk factors including gender according to NCEP ATP III Guideline, metabolic syndrome and its associated morbidities were identified.

Data entry and analysis was done by SPSS software 20.0 version during January 2016. Frequency charts were defined and continuous variables' averages and standard deviation were calculated. Metabolic risk factors were calculated and statistical significance tests were used when making comparisons, if necessary (Student's t, χ^2 or linear X^2), setting a $p < 0.05$ as statistically significant level.

Ethical consideration

The study received human subjects approval from Ethics Review Committee, Department of Medical Research (7.10.2015, 89/Ethics 2015). Participants provided written informed consent to participate.

RESULTS

A total of 355 people who were actively participated in this study were male participants 94 cases (26.5%) and female 261 cases (73.5%). Age distribution in these subjects was from 18 to 85 years and the mean age was 49.98 years (SD:15.22 years). Most people were Bamar 265 cases (74.6%) and others 90 cases (25.4%). Educational level of 96 cases (27.0%) was high school level, 173 cases (48.7%) had moderate income and their family numbers were not crowded (i.e. number of family numbers 5 and below).

Regarding physical examinations, height in those urban people ranged from 136.50 to 145.50 cm with the mean level 158.88 ±69.39 cm, weight from 33 to 104 kg with the mean 58.28±10.98 kg, body mass index (BMI) of all cases from 14.00 to 42.00 with the mean 24.21±4.26, waist circumference from 61.00 to 119.00 with the mean 88.86±10.32 cm, hip circumference from 29.00 to 122.00 cm with the mean 90.56±9.65 cm, waist to hip ratio from 0.01 to 1.6 with the mean 0.97±0.11, systolic blood pressure from 90 to 180 mmHg with the mean 122.70±18.91 mmHg and diastolic blood pressure from 60 to 120 with the mean 81.23±12.25 mmHg.

In this study, fasting blood glucose levels in urban people ranged from 61.44 to 315.1 mg/dl (mean of 104.95±31.89 mg/dl) in which high FBS level occurred in total 48 cases (age 18-24, male 0 and female 1, age 25-44, male 1 and female 5, and age ≥45, male 7 and female 34). For lipid profile, the results of the study showed total cholesterol level from 78.43 to 284.22 mg/dl with the mean level of 172.08 ±39.79 mg/dl, triglyceride level from 33.62 to 342.35 mg/dl with the mean level of 143.07±47.21 mg/dl and HDL from 27.00 to 387.00 mg/dl with the mean level of 51.61 ±20.75 mg/dl. Normal total cholesterol, triglyceride and HDL levels were 87.6% (311/355 cases), 32.1% (114/355 cases) and 62.8% (223/355 cases), respectively.

Among 355 persons, normal ECG was observed in 296 cases (83.4%) and abnormal such as ischaemia, premature atrial complex, RBBB, WPW syndrome Type A, old inferior MI, and ventricular ectopics in 59 cases (16.6%).

Table 1. Prevalence of metabolic risk factors according to gender using NCEP ATP III

Risk factors	Men (n=94) (%)	Women (n=261) (%)	All (n=355) (%)
Waist circumference: (males: >02 cm, females:>88 cm)	4(4.3)	141(54.0)	145(40.8)
TG ≥150 mg/dl	37(39.4)	92(35.2)	129(36.3)
Low HDL-c (men;<40mg/dl, women:<50mg/dl)	8(8.5)	77(29.5)	85(23.9)
Raised arterial pressure (≥130/85 mm Hg)	30(31.9)	74(28.4)	104(29.3)
Fasting blood sugar (≥110 mg/dl)	8(8.5)	40(15.3)	48(13.5)

TG=Triglyceride, HDL=High density lipoprotein

Metabolic risk factors were identified according to NCEP ATP III guideline. There were waist circumference male >102 cm, female >88 cm, high triglycerides ≥150 mg/dl, low HDL-cholesterol male <40 mg/dl and female <50 g/dl, elevated blood pressure ≥130/85 mmHg, and elevated fasting glucose ≥110 mg/dl (Table 1).

Table 2. Prevalence of metabolic syndrome according to gender using NCEP ATP III

Risk factors	Men (%)	Women (%)	All N (%)
None	5(1.4)	15(4.2)	20(5.6)
One risk factor	29(8.2)	58(16.3)	87(24.5)
Two risk factors	35(9.9)	88(24.8)	123(34.7)
Three risk factors	20(5.6)	68(19.2)	88(24.8)
≥Four risk factors	5(1.4)	32(9.0)	37(10.4)
Total	94(26.5)	261(73.5)	355(100)

Metabolic syndrome was with ≥3 of the above categorical cut points. In this study, the prevalence of metabolic syndrome was 35.2% with prevalences in men and women are 26.6% and 38.3%, respectively (Table 2).

Table 3. Characteristics of demographic and metabolic risk factors among subjects with metabolic syndrome and those without metabolic syndrome

Variables	Subjects with metabolic syndrome (n=125)	Subjects without metabolic syndrome (n=230)	p value
Age (mean± SD)	58.19±10.18	48.03±15.57	0.000*
Sex			
Male	25(20.0%)	69(30.0%)	0.000
Female	100(80.0%)	161(70.0%)	
Increase blood pressure	74(71.2%)	30(28.8%)	0.000
Increase blood sugar	32(66.7%)	16(33.3%)	0.000
Overweight and obesity (BMI ≥25kg/m^2)	20(54.1%)	17(45.9%)	0.110
Central obesity	91(62.8%)	54(37.2%)	0.000
Low HDL level	22(25.9%)	63(74.1%)	0.039
High triglyceride level	82(65.6%)	47(20.4%)	0.000
High cholesterol level	4(50.0%)	4(50.3%)	0.376
Abnormal ECG examination	25(42.4%)	34(57.6%)	0.207

*****=T test, apart from age=Chi squared test

In this study, central obesity was the highest component with 145 subjects (40.8%) followed by elevated triglycerides 129(36, 3%), elevated blood pressure 104(29.3%), low HDL-cholesterols 85(23.9%), and elevated fasting blood glucose only 48 individuals (13.5%). There were statistically significant associations between all five metabolic risk factors with metabolic syndrome (p value <0.001) (Table 3).

DISCUSSION

In this study, mean values of waist circumference (89.63±10.64 *vs*. 86.71±9.09 cm), hip circumference (91.15±10.28 *vs*. 88.94±7.44 cm), and BMI (24.11±4.31 *vs.* 27.18±5.82 kg/m^2) were higher in the women (p<0.001). With regard to waist circumference, total 145 cases (40.8%) of the participants showed values above the recommended level, and women had a significantly higher (p<0.05) proportion of markedly high waist circum-ference, 141 cases (54.02%) and 14 cases (4.26%) compared with the values found in the men. Thus, abdominal obesity is more highly correlated with metabolic risk factors than elevated body mass index (BMI). Therefore, the simple measure of waist circumference is recommended to identify the body weight component of the metabolic syndrome.[8] The overall prevalence of hypertension was 29.3% (n=104), with higher proportion in men (31.91%, n=30) (Table 1). Higher prevalence of hypertension was found in the age ≥45 years in both sexes and unrelated to socioeconomic classes. The prevalence of hypertension in the current study was 29.3%, which is a lower value than those reported in other African countries, where the prevalence of hypertension varied from 13.7% in rural areas to 30.5% in urban areas.[4]

The overall prevalence of hypertriglyceridemia was 129 cases (36.3%) and the proportions occurred in both genders (men, 39.36%; women, 35.24%). Prevalence of at risk level of HDL was observed to be high among both males and females in the present study of studied area. A similar pattern was observed among other study carried out in urban population.[9] Similar findings have also been reported in rural Nigerians whereas elevated blood pressure alone was the most frequent component in men in rural and urban Cameroon and semiurban Benin. Both these variables are known risk factors for CVD and these findings may suggest that if the current trend continues, this population is at increased risk for coronary artery disease.[10]

Regarding the biochemical data for the participants, gender differences were found with regard to low HDL and fasting blood glucose levels; the women had a higher average value than the men (men 8.51%, women 29.50%) (men 8.51%, women 15.32%). The overall prevalence of diabetes mellitus was 13.5% in this study. Nevertheless, the prevalence of diabetes in the present study was similar to that of Afro-Surinamese (14.2%).[11] The prevalence of low HDL was high, and more women were affected than men. This discrepancy is likely because the majority of women included in the study were premenopausal phase since the mean age of the women was 45.0±10.1 years.

A person who has metabolic syndrome is twice at the risk of developing heart disease and five times higher chance of developing diabetes as compared to someone who does not have it. Having even one risk factor raises the risk of heart disease.[12] Distribution of the number of metabolic risk factors between genders is shown in Table 1. It is important to note that only 20 cases (5.6%) of the participants were free from modifiable metabolic risk factors and around 94.4% of the sample showed one or more risk factors to metabolic syndrome. In this study, metabolic risk factors are observed in total 125 cases out of 355 participants in which 18-24 years age group 0 cases, 25-44 years

age group 25 cases and ≥45 years age group 100 cases, respectively. Thus, metabolic syndrome occurred in increasing age.

A statistically significant ($p < 0.05$) increase in the frequency of metabolic syndrome (86.90%) after the age of 50 years was observed in concordance with Jaspinder Kaur (2014).[13]

In this study, the most frequent individual risk factor was central obesity, the highest in 145 subjects (40.8%) followed by elevated triglycerides 129(36.3%), elevated blood pressure 104(29.3%), low HDL-cholesterols 85(23.9%), and elevated fasting glucose in only 48 individuals (13.5%). The prevalence of metabolic syndrome was 125 cases (35.2%) with prevalences in men and women are (n=25, 26.6% and n=100, 38.3%), respectively. However, the present findings are consistent with a previous study carried out in the rural population in 2004.[14] There were statistically significant ($p<0.001$) higher frequencies of dyslipidemia (74.61%), hypertension (60.26%), obesity (58.28%) and hyperglycemia (23.84%) among the subjects with metabolic syndrome than those without it. The higher frequency of metabolic syndrome in women according to all criteria is also consistent with other studies from South Asian countries.[15, 16]

Thus, the findings of this study are frequently increasing trend to compare with report on national survey of diabetes mellitus and risk factors for non-communicable diseases in Myanmar (2014) in which prevalence of hypertension was 26.4%, elevated triglycerides 31% and raised fasting glucose 5.9%.[17]

Therefore, this study suggests the existence of a high prevalence of metabolic risk factors in apparently healthy urban populations indicates the necessity to intensify efforts for the prevention, early identification, and control of risk factors, especially in ≥45 years age group of the population, which represents the priority group for intervention and the promotion of cardiovascular health and also baseline data for the implementation of further activities to reduce the incidence of non-communicable diseases.

Recommendation

These findings support the non-communicable disease control program to promote community health by giving proper health education such as changing lifestyle for monitoring the magnitude and temporal trends of these metabolic risk factors that are directed towards this population group, to use waist circumference as one of the diagnostic tools of the metabolic syndrome and also the findings of this study can be used as the baseline data for the implementation of further activities to reduce the incidence of non-communicable diseases.

Competing interests

The authors declare that they have no competing interests.

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