Prevalence of metabolic syndrome in individuals undergoing comprehensive cardiac and general medical check-up at Kathmandu Medical College Teaching Hospital

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Abstract

Background: Metabolic syndrome represents a constellation of metabolic derangements including insulin resistance, diabetes mellitus, obesity, dyslipidaemia and cardiovascular disease. Since it is associated with higher risk of coronary artery disease and diabetes mellitus, timely detection is important.

Objectives: The main objective of the study was to find out the prevalence of metabolic syndrome in individuals undergoing comprehensive cardiac and general medical check-up at Kathmandu Medical College Teaching Hospital. The other objectives were to find the gender and ethnic prevalence of this condition.

Methods: This is a hospital based cross-sectional study conducted at Kathmandu Medical College Teaching Hospital among 389 healthy participants of both gender and above 20 years of age who underwent comprehensive cardiac and general medical check-up. Metabolic Syndrome was diagnosed using US National Cholesterol Education Program Adult Treatment Panel III.

Results: Out of the 389 subjects, 56 persons were found to be having metabolic syndrome (14.40%). Metabolic syndrome was more common in female and obese people and the prevalence did not differ with ethnicity.

Conclusion: The prevalence of metabolic syndrome in the present study has been found to be 14.40 %. It is important to diagnose this condition in time so that subsequent complications can be prevented.

Key Words: Impaired fasting glucose, Metabolic Syndrome, Nepal, Waist circumference.

INTRODUCTION

The term Metabolic Syndrome dates back to late 1950s, but it came in common use in late 1970s to describe various associations of risk factors with diabetes that had been noted as early as 1920s[1,2]. In 1977, Haller used the term Metabolic Syndrome for associations of obesity, gout, diabetes mellitus, and hypertension with hyperlipoproteinaemia syndrome[3]. In 1988 in his Banting lecture, Gerald M Reaven proposed insulin resistance as the underlying factor and named the constellation of abnormalities Syndrome X[4]. Hormonal balance of the hypothalamic-pituitary-adrenal axis is upset in this condition. This produces cortisol that results in diabetes mellitus and insulin resistance[5].

Metabolic Syndrome is becoming an important medical problem of the modern society. The incidence of type 2 diabetes mellitus and coronary artery disease have been found to be high in Metabolic Syndrome by various authors all over the world[6-9]. In a meta-analysis of 16 multi-ethnic cohort studies, the relative risk of developing diabetes ranged from 3.53 to 5.17 depending upon the definition of metabolic syndrome and population studied[6]. Three meta-analysis have found the relative risk of developing cardiovascular disease to be 1.53 to 2.18 [7-9].

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There are very few studies about the prevalence of metabolic syndrome from Nepal. A population study from eastern Nepal using NCEP ATP III criteria has revealed 20.7% prevalence of metabolic syndrome[10]. We conducted this study to find out the prevalence of metabolic syndrome among individuals undergoing comprehensive and general medical check-up.

METHODS

This is a hospital based cross-sectional study conducted among 389 participants undergoing comprehensive cardiac and general medical check-up at Kathmandu Medical College Teaching Hospital (KMCTH) from December 2009 to September 2012. Comprehensive cardiac and general medical check-up is a general health check-up package at KMCTH offered to healthy participants coming for routine check-up as well as to those attending the medicine out-patient department (OPD) who are willing to undergo a general medical check-up. Criteria for inclusion in the study were: age 20 years or above, both genders, no known co-morbidity other than those under medication for hypertension and diabetes (exception for these two conditions was made because being under medication for diabetes or hypertension is among the criteria for metabolic syndrome). After approval from the Ethical Committee and verbal consent from participants, proforma was filled up and all the details of the anthropometric measurement, physical examination findings and investigations were recorded.

The US National Cholesterol Education Program-Adult Treatment Panel III 2001 (NCEP ATP-III) criteria[11] were followed in the diagnosis of Metabolic Syndrome. NCEP ATP III criteria required at least three of the following: Waist Circumference ≥ 102 cm or 40 inch (male), ≥ 88 cm or 36 inch (female); triglyceride (TG) ≥150 mg/dl or on treatment; High Density Lipoprotein (HDL) cholesterol <40 mg/dL in male and 50 mg/dL in female, Blood pressure ≥130/85 mm Hg or on treatment; Fasting glucose ≥100 mg/dL or under medication for diabetes. The distribution of demographic (age, sex, ethnicity) and other baseline variables (smoking, alcohol consumption, high total cholesterol [≥200 mg/dL], high waist circumference, high waist:hip ratio [>0.9 for females, >1 for males] and body mass index (BMI) in those with and without metabolic syndrome was compared. Those patients who were currently smoking or left smoking for less than four weeks prior were considered smokers. Similar criteria were used to define alcohol consumption.

The sample size was calculated based on prevalence data from a population based study from eastern Nepal[10]. Maintaining a level of significance of 5%, minimum sample size required is 253. Data analysis was done with Statistical Package for Social Sciences (SPSS)-16 and two-sample t test or chi-square test were applied as appropriate. A p-value <0.05 was taken as statistically significant.

RESULTS

Of the total 389 participants, metabolic syndrome was detected in 56 (21 males, 35 females), with a prevalence rate of 14.4% (20.71% in females and 9.55% in males).

The distribution of baseline variable is shown in table 1. Those with metabolic syndrome were of higher age and body mass index (BMI) than those without the syndrome. Similarly female gender, high waist circumference and high waist hip ratio were associated with metabolic syndrome.

Abnormalities of individual component of metabolic syndrome are shown in Table 3. Four out of five participants had impaired fasting glucose or were under medication for diabetes. Obesity and high triglyceride level were also common among the participants. We also tried to evaluate the prevalence of individual components in those with metabolic syndrome (Table 4).

Table 1: Distribution of Baseline Characteristics among participants with and without metabolic syndrome.

Variables	Metabolic Syndrome Present (n=56)	Metabolic Syndrome absent (n=333)	p value
Age (years), Mean ± SD	51.41 ± 10.19	43.55 ± 14.53	< 0.001
Sex			
Male	21 (37.5%)	199 (59.76%)	0.002
Female	35 (62.5%)	134 (40.24%)	
Ethnicity			
Brahmin	23 (41.07%)	128 (38.43%)	
Chhetri	12 (21.43%)	61 (18.32%)	0.243
Newar	5 (8.93%)	67 (20.12%)	
Others	16 (28.57%)	77 (23.12%)	
Smokers	11 (19.64%)	71 (21.32%)	0.778
Alcohol consumers	21 (37.5%)	153 (45.95%)	0.240
High total cholesterol	27 (48.2%)	121 (36.34%)	0.090
High waist Circumference	48 (85.71%)	62 (18.62%)	<0.001
High waist: hip ratio	51 (91.07%)	221 (6.37%)	<0.001
BMI (kg/m^2) Mean±SD	28.93 ± 4.20	24.4±3.86	<0.001

p value for age and BMI calculated by t test. For other variables, p value calculated by chi-square test.

Table 2: Prevalence of Metabolic Syndrome according to age group

Age group (years)	Metabolic Syndrome present in
20- 39 (n=165)	5 (3.03%)
40-59 (n=157)	36 (22.93%)
60 and above (n=67)	15 (22.39%)

Table 3: Abnormalities of individual component of Metabolic Syndrome

Components	Number (%) of patients with the abnormality (n=389)
Waist circumference (>102 cm for males, >88 cm for females)	110 (28.28%)
Blood Pressure (≥130/85 mmHg)	58 (14.91%)
Impaired fasting glucose (>100 mg/dL) or under medication for diabetes	311 (79.95%)
Low HDL* – Cholesterol (<40 mg/dL for males and <50 mg/dl for females)	72 (18.51%)
High Triglyceride (≥ 150 mg/dL)	156 (40.10%)

*High density lipoprotein

Table 4: Abnormalities of individual components in those with metabolic syndrome.

Components	Number (%) of metabolic syndrome patients with the abnormality
Waist circumference	19 (33.93%)
HDL* cholesterol	34 (60.71%)
Triglyceride	43 (76.79%)
Fasting Blood Sugar	19 (33.93%)
Blood Pressure	28 (50.00%)

*High density lipoprotein

DISCUSSION

In this study, prevalence of metabolic syndrome was found to be 14.40% with higher prevalence in females (20.71%) than in males (9.55%). This figure is slightly less than that found in a population based study in eastern Nepal by Sharma SK et al[10], which showed a prevalence of 20.7% according to NCEP criteria. According to the same criteria, 34.5 % of the US adult population has been found to have metabolic syndrome[12]. The ICHR (Indian Council of Health Research) task force collaborative study has revealed the prevalence of metabolic syndrome in urban areas of Delhi to be 30% and 11% in rural Haryana using NCEP ATP III criteria.

Mishra et al have reported 30% prevalence among the urban population in Delhi [13]. Using modified NCEP ATP III criteria, Ramchandra et al [14] from Chennai have reported prevalence of 41% in urban areas among adults 20 to 75 years of age. Metabolic syndrome was more common in females (46.4% vs. 36.4%).

Among the baseline variables studied, occurrence of metabolic syndrome was associated with age (more common above 40 years), gender (more common in females), and obesity. Various studies have implicated obesity and sedentary lifestyle as risk factors for development of metabolic syndrome. In one study, individuals who watched television or played video games or worked in computer for more than four hours had two fold increase in risk of having metabolic syndrome than other individuals [15]. In the same study the approximate prevalence of metabolic syndrome in patients with coronary heart disease was found to be 50%[15].The prevalence of metabolic syndrome is high among obese children and adolescents, and it increases with worsening obesity[10].

We studied abnormalities in each component of metabolic syndrome and distribution of these components in those with metabolic syndrome. Single most common abnormality among the participants was impaired fasting glucose or under medication for diabetes (79.95%). But this component was present only in 33.93% of those with metabolic syndrome. High triglyceride on the other hand was present in more than three fourths of the metabolic syndrome patients. Next common abnormality was low HDL cholesterol. Thus, impaired lipid profile seems to be a common problem in those with metabolic syndrome. But individual components cannot singly predict metabolic syndrome. Hence one should actively look for all components as suggested in the guidelines.

All the components of metabolic syndrome can be controlled by dietary measures, regular exercise and medical treatment. Public should be made aware of this condition and they should be advised preventive measures.

CONCLUSION

The prevalence of metabolic syndrome in the present study has been found to be 14.40%. It is more common in females and obese people. The most common component of metabolic syndrome was impaired fasting glucose (79.92%). Presence of any one component should alert the physician to look for other components so that definitive diagnosis can be made and timely intervention can be commenced.

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