Original Article

Prevalence of Metabolic Syndrome in a Suburban Community of Nepal

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Abstract

In context of rapidly rising prevalence of cardiovascular disease and risk factors in the developing world it has become important to study the scenario in its various aspects. This study conducted between March and July, 2007 in a suburban Nepali population deals with prevalence of metabolic syndrome according to the recently modified criteria for Asians. Altogether 150 subjects were randomly selected. The main component of the survey included administration of predetermined questionnaire, physical examination which included waist circumference measurement, height, weight, blood pressure measurement (twice), 12-lead ECG and fasting blood sample for lipid profile and glucose level. Prevalence of metabolic syndrome in our study according to the recent criteria developed by AHA/NHBLI is 12.4%. Significant Proportion of subjects diagnosed as having metabolic syndrome was not obese by traditional criteria but had increased waist circumference. Elevated triglyceride level was the most common component among subjects with metabolic syndrome was not obese by traditional criteria but had increased waist circumference. Elevated triglyceride level was the most common component among subjects with metabolic syndrome. Prevalence of metabolic syndrome syndrome in a suburban Nepali community seems to be significant. Thus, it is time for the developing countries to realize that the prevention of non-communicable diseases should also receive as much attention as that of nutritional and communicable diseases.

Keywords : Metabolic Syndrome, waist circumference, Blood pressure

INTRODUCTION

Metabolic syndrome which is characterized by atherogenic dyslipidemia, elevated blood pressure, elevated plasma glucose level and obesity appears to directloy promote the development of atherosclerotic cardiovascular disease.[1] Patient with metabolic syndrome are also at increased risk of developing type 2 diabetes mellitus.[2] Prevalence of cardiovascular diseases is increasing rapidly in the developing world. The predominant underlying risk factors for the syndrome appear to be abdominal obesity and insulin resistance is the essential cause of metabolic syndrome[3]. However people of South Asian origin who are not obese by traditional measures, nevertheless have insulin resistance and abnormal level of metabolic risk factors.[4,5] Although insulin resistant individuals need not be clinically obese, they nevertheless commonly have and abnormal fat distribution that is characterized by predominant upper body fat. Recently American Heart Association and National Heart, Lung and Blood Institute have published a scientific statement on diagnosis and management of metabolic syndrome.[2] This statement detrermines the different criteria for diagnosis of metabolic syndrome in Asian population. The availability of these criteria provides an opportunity to assess and compare prevalence of metabolic syndrome in our population.

METHODS

This study was carried out between March and July, 2007. Khadka Bhadrakali village, a suburban area in northern Kathmandu valley was chosen for the study as it was near to our institute. According to recently updated voters list, total adult population (18 years or above) was 3700. Systemic random sampling was done and altogether 150 subjects were selected. With extensive mobilization of local volunteers, village development committee and ward officials, each randomly selected individual was informed to attend OPD in our institute on the day of the appointment after 12 hrs of fasting. Among the 150 selected individuals, 145 attended the hospital OPD and the rest (n=5) were absentees.

The main component of the survey included administration of predetermined questionnaire, physical examination of each subject by physician and trained nursing staff which included waist circumference measurement, height, weight, blood pressure measurement (twice), and physical examination of cardiovascular system including auscultation. A 112-leadd ECG of each subject was also obtained and fasting blood sample for lipid profile and glucose level was also collected. The purpose of the study was explained to all the participants and verbal informed consent was obtained.

Sample size calculation

The prevalence of metabolic syndrome was estimated to be around 10%, desired 95% comfidence level was determined to be 5-15%. The standard error would be thus 2.5%. hence, the required sample size would be 144, As no response was expected from some individuals, sample size was kept at 150. Finally, altogether 145 subjects participated in our study.

Measurement of waist circumference

Waist circumference were measured according to the instruction provided in the recent statement of AHA/NHBLI regarding diagnosis and management of metabolic syndrome. To measure waist circumference, top of right iliac crest was located. A measuring tape in a horizontal plane around abdomen at level of iliac crest was placed. Before reading tape measure, it was made sure that tape does not compress the skin and that it was parallel to the floor. Measurement was done at the end of normal expiration.

Measurement of blood pressure

Blood pressure (BP) measurement was carried out on each participant using standard mercury sphygmomanometers with appropriate cuff sizes selected on the basis of arm; circumference of the participants. Before BP measurement, subjects were told to wait for at least ten minutes in the waiting room. BP was measured in the sitting position on the upper arm with the arm supported and sphygmomanometer at the level of the heart. Initially, BP was measured on both arms. Only the arm with higher BP was used for the second measurement. The first BP measurement was taken before the administration of the questionnaire and second BP measurement was obtained upon completion of the questionnaire.

Measurement of blood glucose level and lipid profile

Samples were collected at Shahid Gangalal National Heart Centre (SGNHC) clinical laboratory from all the subjects after 12 hours of fasting. Blood sugar was measured with glucose oxidase prerioxidase method (GOD-POD). Cholesterol level was measured by enzymatic end point method. HDL/LDL-Cholesterol were measured with direct homogenous assay. Triglyceride (TG) was measured with end point method. All parameters were measured by Randox (UK) (RX-Dayrona) autoanalyser.

Diagnostic criteria of metabolic syndrome

Metabolic syndrome was diagnosed according to the recent criteria defined by AHA for Asian population, that is, eleveated waist circumference (90cm for male and 80 cm for female), elevated triglyceride (150 mg/dl or 1.7 mmol/l, or on drug treatment for high TG, reduced HDL-C (0.9mmol/l in male 1.1mol/l in female), elevated blood pressure (130mm Hg systolic blood pressure or 85 mmHg diastolic blood pressure or on drug treatment for hypertension) and elevated fasting glucose 100 mg./dl(5.35 moll) or on treatment for DM. if a subject fulfills any three of the above criteria, he/she was diagnosed to have metabolic syndrome.

Statistical analysis

Data were analyzed using SPSS 11.5 software.

RESULTS

Altogether 145 subjects (male=65,female=80)participated in our study (table1).

Table 1: Demographic data

Sex	Number	Age (range) yrs	Mean(yrs)	(SD)
Male	65	22-81	47.8	13.8
Female	80	20-79	43.8	12.51
Total	145	20-81	45.5	13.2

Prevalence of metabnolic syndrome (MS) was 12.4% (18/145). Prevalence in male and female were 16.9% (11/65) and 8.75% (7/80) respectively (table2), P>0.05.

Table 2: Prevalence of Metabolic Syndrome

Sex	Number	MS	Percentage	P value
Male	65	11	16.9	13.8
Female	80	7	8.75	>0.05
	145	20-81	45.5	13.2

Among subjects with metabolic syndrome,the most common component was high Triglyceride level (17/18), followed by increased waist circumference (14/18),elevated blood pressure (14/18) or hypertension, decreased HDL-chol (11/18) and elevated blood sugar level or diabetes mellitus. Out of 18 subjects with metabolic syndrome, 61% (11/18) had increased BMI (>=25kg/sq. m). Mean BMI of subjects with metabolic syndrome was 26.9(SD 4.25) (range 20.44-36.64).

Table 3: Values of different parameters of sample population (n=145)

Parameters	Range	Mean(SD)
Waist circumference(cm)	57-108	80.7(11.45)
Fasting sugar (mmol/l)	3.7-23.3	5.16 (1.93)
HDL (mmol/l)	0.9-1.5	1.04 (0.155)
SBP (mm Hg)	90-170	122.48 (17.28)
DBP (mm Hg)	60-100	80.82 (9.6)
Triglyceride (mmol/l)	0.9-12.1	1.59 (1.18)
BMI (kg/m2)	15.55-40.0	23.89 (4.38)

Table 4: Values of different parameters of sample population (n=145)

Parameters	cut points
Elevated waist Circumference	>= 90 cm (35 inches) in men,e"80 cm (31.5 inches) in women
Elevated TG	>= 150 mg/dl (1.7 mmol/l) or on drug treatment for elevated TG
Reduced HDL Cholesterol	>= 40 mg/dl (0.9 mmol/l) in men,d"50 mg/dl(1.1 mmol/l) in women or on drug treatment for reduced HDL-C
Elevated BP	>= 130 mHg SBP or 85 mmHg DBP or on antihypertensive drug treatment
Elevated fasting glucose	>= 100 mmol/l (5.55 mmol/l) or on drugtreatment for elevated glucose

*any 3 of 5 constitute diagnosis of metabolic syndrome

Among other risk factors of cardiovascular diseases, prevalence of hypertension in our study was 20% (29/145), prevalence of diabetes mellitus was 4.1% (6/145) and prevalence of smoking was 35.2% (51/145).

DISCUSSION

Prevalence of metabolic syndrome in our study according to the recent criteria developed by AHA/NHBLI was 12.4%. prevalence rates in male and female were 16.9% and 8.7% respectively, which were not statistically significant (P>0.05). This was mainly due to the design of the study. This study was mainly designed to estimate the overall prevalence of metabolic syndrome in suburban Nepali population. More sample size would be needed to evaluate the prevalence of metabolic syndrome in male and female population separately. This was a relatively small pilot study. Larger study regarding cardiovascular risk factors in Nepali population is being planned.

Prevalence of metabolic syndrome in a suburban Nepali community seems to be slightly lower than other Asian and western countries. In a study carried out in urban population of Oman in 2003, the crude prevalence of metabolic syndrome was 17%. 6 Likewise, using the modified Asian criteria, prevalence of metabolic syndrome in a study carried out in Singapore was 17.9%. 7 The prevalence rate was higher in men than women in that study (20.9% vs. 15.5%, p<0.001). Among three different ethnic groups, the prevalence of metabolic syndrome was 23% by conventional ATP III definition. In out stuedy, high TG level was the most common component among subjects with metabolic syndrome (17/18), fllowed by increased waist circumference and elevated BP(14/18) and low HDL level (11/18). In a study carried out by Linda et al, the most common component of metabolic syndrome among Arab Americans was low HDL level. Mean value of TG level in out study also seemed to be on higher side (1.59 mmol/I). The cause of relatively high TG value of the representative sample of suburban Nepali population and its significance need to be investigated in future research projects. One of the causes of high TG value in out population may be typical Nepali diet which is high in carbohydrate and low in fat and protein. It has been reported that low fat diet may exacerbate atherogenic dyslopidemia (high TG, low HDL).[8]

Inn our study, more than one third (39%) of subjects with metabolic syndrome were not obese/overweight by traditional criteria (BMI 25kg/sq.cm). However, more than two thirds of them (78%) (14/18) did have abnormal level of fat distribution, that is, increased waist circumference, which is a feature of insulin resistance. This is a typical finding in Asian population, which has been described in other studies as well.

There are no national data in Nepal reagarding the prevalence of coronary artery disease (CAD). However; hospital admission records clearly support the increasing prevalence of CAD in Nepal. From 1960 to 1968, only 150 cases of acute myocardial infarction (AMI) were admitted in the hospitals of Kathmandu Valley. 9 According to the Annual report of National Heart Centre, Kathmandu, altogerher 319 cases of AMI were admitted in that hospital alone in 2006. 10 In 2001/2001, rheumatic heart disease (RHD) was the most common cause of admission in National Heart Centre followed by CAD (30% vs. 25%). 11 In 2006, CAD admission rate exceeds RHD significantly (42.57% vs. 23.38%). 12 Increased prevalence of CAD is related with increased prevalence of risk factors including use of tobacco, hypertension, diabetes mellitus, sedentary life style, changing dietary pattern and increased prevalence of metabolic syndrome and obesity. Development of transportation and communication facilities in Kathmandu in recent years is responsible for decreased physical activity. This may be one of the reasons for increased prevalence of metabolic syndrome.

CONCLUSION

Prevalence of metabolic syndrome in a suburban population of Kathmandu valley is 12.4% according to the recently modified criteria for diagnosis for metabolic syndrome In Asian population. Elevated triglyceride level was the most common component among subjects with metabolic syndrome. Significant proportion of subjects diagnosed ass having metabolic syndrome was not obese by traditional criteria but had increased waist circumference.

Our study has shown that the prevalence of metabolic syndrome and cardiovascular risk factors is quite significant in general population in Nepal. It is time to realize that the prevention of non communicable disease should also receive as much attention as that of nutritional and communicable diseases.

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