Original Article

Metabolic Syndrome and its Components Among Patients Attending MOPD of A Tertiary Care Centre

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Abstract

This was a hospital based study done on 334 patients attending in medicine OPD BSMMU. According to modified NCEP ATP III criteria 27.2% of subjects aged $\geq$ 20 years had the metabolic syndrome and was more commonly seen in women than in men (32.4% vs 21.7%, P < 0.05). The metabolic syndrome increased with age in both sexes (40-49 years age groups 24.2% to 50-59 years age groups 35.2%). Majority of the patients (59.3%) were in the age group 40-60 years. Overall frequencies of components of the metabolic syndrome were in the order of abdominal obesity (97.8%) > low high density lipoprotein (83.5%) > hypertension (71.4%) > triglycerides (67%) > fasting plasma glucose (44%). Abdominal obesity appeared to be the highest frequent components of the metabolic syndrome in both sexes (men 100% and women 96.4%). However, among male patients, high serum triglycerides (77.1%) appeared to be the second frequent components. Where as among female patients low high density lipoprotein cholesterol (96.4%) appeared to be the second frequent component and was found to be high compared to the male patients (62.9%). Most of those with metabolic syndrome had three components of the syndrome (48.3%), 38.4% had four, and 13% had five components. The percentage of clusters of components increased with age of the patients and in female sex.

Introduction

Metabolic syndrome is a global health problem. It is an under appreciated, under recognized, and under diagnosed condition responsible for more illhealth than other condition. It is also under treated. But metabolic syndrome can be avoided and reversed in most case. Studies showed that the prevalence rate is approximately 22% of US adult (Ford ES, Giles WH, 2002)[1]. In Bangladesh there is minimum work in metabolic syndrome. There is no population based study in our country. A clinical practice based study showed that 9.3% cases labeled as metabolic syndrome according to NCEP- ATPIII criteria (Islam QT et al. 2004)[2]. This study aimed to study the prevalence and pattern of component of metabolic syndrome and to help in formulation of strategy for prevention.

Defining the Metabolic Syndrome

A number of expert groups have developed clinical criteria for the metabolic syndrome. The most widely accepted of these have been produced

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by World Health Organization (WHO), the European Group for the study of Insulin Resistance (EGIR), NCEP ATP III and International Diabetes Federation (IDF). 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. In our study we used modified ATP III criteria to identify metabolic syndrome.

ATP III, 2001 clinical identification of the metabolic syndrome (ATP III 2001) [3]

Three or more of the following five risk factors

Risk factors	Defining level
Central obesity	Waist circumference *
Men	> 102 cm (> 40 inch)
Women	> 88 cm (> 35 inch)
Triglycerides	≥ 150 mg/dl (1.7 mmol/L)
HDL cholesterol	
Men	< 40 mg/dl (1.03 mmol/L)
Women	< 50 mg/dl (1.29 mmol/L)
Blood pressure	≥ 130/≥ 85 mm of Hg
Fasting glucose	≥ 110 mg/dl (≥ 6.1 mmol/L)

- Modified NCEP ATP III criteria in the Asia Pacefic region includes waist circumference for men is > 90 cm and for women is > 80 cm.

Methodology

This was a cross sectional study carried in medicine out patient department of Bangabandhu Sheikh Mujib Medical University (BSMMU) from September 2005 to May, 2007. The laboratory test will be carried out in the biochemistry department of BSMMU, Dhaka. A systemic sampling technique was done to find out the metabolic syndrome among the attended patients with or without metabolic disorders. All the patients attending in the MOPD of BSMMU were interviewed in alternate day from June 2006 to January 2007 from 11 AM to 1 PM. However, the patients were selected by systemic sampling with an interval of 1:5. So, a total of 334 patients ultimately included in this study. Inclusion criteria

were: Patients attending in MOPD, Both sex, Age ≥ 20 years. Exclusion Criteria was acute illness. Data was collected by investigator himself after taking informed consent of the patient. History taking, clinical examination and necessary investigation was performed. The questionnaire form includes history of diabetes, hypertension, past and present habits, life style factors, weight, height, blood pressure, biochemical parameters like S. triglyceride, HDL-C, LDL-C and fasting plasma glucose.

Table 1 : Frequency distribution of individual metabolic abnormality among the studied patients (n=334)

Metabolic syndrome components	No.	%
Low high density lipoprotein (mg/dl)	248	73.4
Abdominal obesity	201	60.2
Serum Triglycerides (≥150 mg/dl)	100	29.9
Blood pressure ≥130/≥85 mmHg	81	24.3
Fasting plasma glucose (≥6.1 mmol/l)	51	15.3

Table 1 shows the frequency distribution of the individual components of metabolic abnormalities in studied patients with highest percentage of patients with lower limit of high density lipoprotein (73.4%) followed by abdominal obesity (60.2%), hypertriglyceridaemia (29.9%), high blood pressure (24.3%) and high fasting plasma glucose (15.3%).
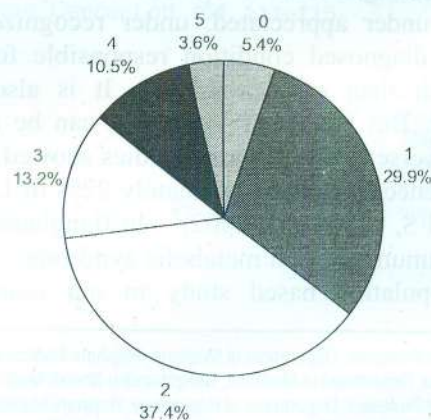

Figure 1 : Distribution of studied patients by number of components of metabolic syndrome (n=334)

Mean ± SD = 2.04 ± 1.2; Range = 0-5
Figure 1 More than one third (37.4%) of the patients had at least two components of metabolic syndrome followed by one component (29.9%), three components (13.2%), four components (10.5%) and five components (3.6%).

Table 2 : Distribution of patients by metabolic syndrome based on modified ATP III criteria (n=334)

Metabolic syndrome	No.	%
No	243	72.8
Yes	91	27.2

Table 2 showed that, based on modified NCEP-ATP III criteria for metabolic syndrome (≥3 parameters) the overall proportion of metabolic syndrome was 27.2%.
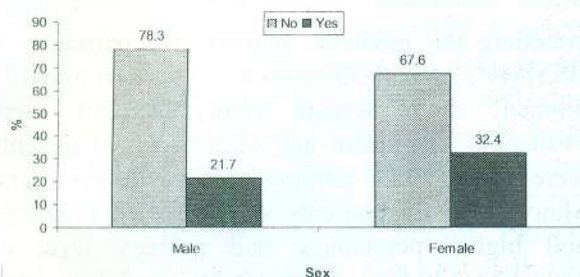

Fig. 2 : Distribution of patients by metabolic syndrome and sex (n=334)

Figure 2 indicated that the proportion of metabolic syndrome was higher among the female patients (32.4%) compared to male patients (21.7%).
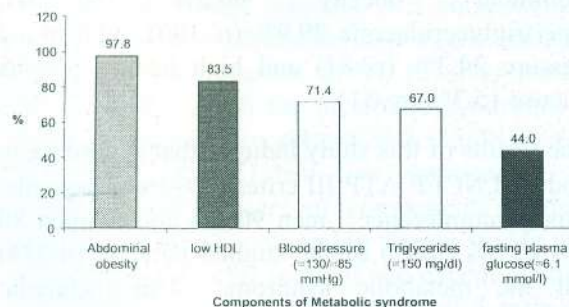

Fig. 3: Proportion of components of metabolic syndrome patients (n=91)

Figure 3 shows the proportion of different components of metabolic syndrome among the 91 metabolic syndrome patients. Data revealed that highest percentage had abdominal obesity (97.8%) followed by low HDL-C (83.5%), blood pressure (>130/>85 mmHg), triglycerides, and fasting plasma glucose.

Table 3: Proportion of number of components of metabolic syndrome (n=91)

Age in years		Number of metabolic syndrome's component		
		3	4	5
All	n91	n44 (48.3%)	n35 (38.4%)	n12 (13%)
<30	7.7	6.8	11.4	0.0
30-39	16.5	20.5	17.1	0.0
40-49	24.2	25.0	25.7	16.7
50-59	35.2	36.4	28.6	50.0
≥60	16.5	11.4	17.1	33.3
Male	35	20	9	6
<30	2.9	5.0	0.0	0.0
30-39	8.6	15.0	0.0	0.0
40-49	28.6	35.0	30.0	0.0
50-59	37.1	25.0	40.0	80.0
≥60	22.9	20.0	30.0	20.0
Female	56	24	26	6
<30	10.7	8.3	16.0	0.0
30-39	21.4	25.0	24.0	0.0
40-49	21.4	16.7	24.0	28.6
50-59	33.9	45.8	24.0	28.6
≥60	12.5	4.2	12.0	42.9

Table 3 shows the percentage distribution of the clustering of components of metabolic syndrome. Data revealed that the percentage of clusters components increase with age of the patients . The pattern of individual component was more or less similar in both male and female patients. Most of those metabolic syndrome had three components 48.3% (n= 44) , 38.4% (n=35) had four and 13% (n=12) had five components.
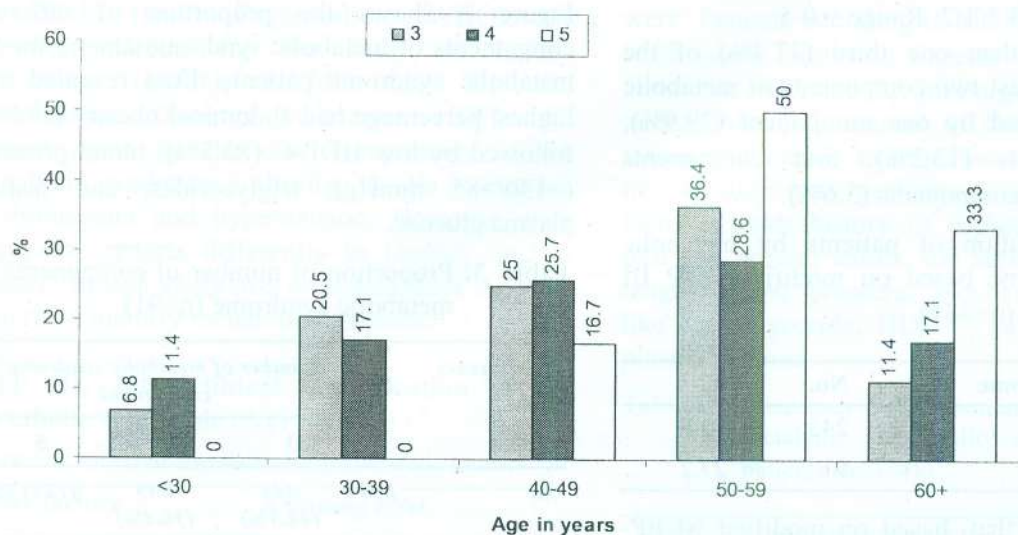
Fig. 4 : Age wise clustering of components of metabolic syndrome

Figure 4 shows that clustering of five components of metabolic syndrome are more common in above 50 years of old patients.
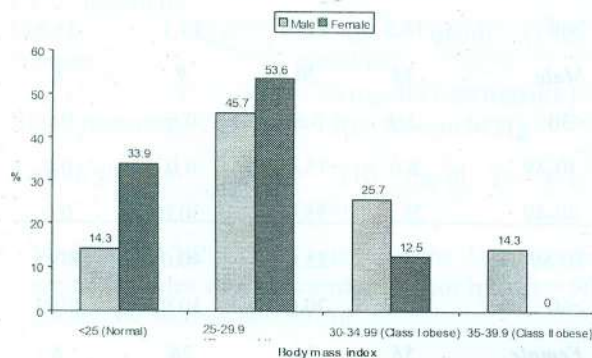

Fig. 5 :. Gender-wise percentage distribution of body mass index among the patients of metabolic syndrome (n=91)

Figure 5 revealed that the percentage of normal body mass index was higher among the female patients than the male patients and also overweight patients also found among the female patients than male patients. However, class I and class II obesity found to be high among the male patients compared to female patients and no female patients with class II obesity found.

Discussion

The main objective of the study was to assess the metabolic syndrome and its components by using modified NCEP ATP III criteria, of the patients

attending the medicine outpatient department of BSMMU. A total 334 patients (161 men and 173 women; male female ratio 0.93:1.0) were evaluated. The mean age of the studied patients were 40.1 ± 12.2 ranging from 20-75 years. Majority of the patients were married (91.61%) and higher percentage had primary level of education (29.6%) followed by secondary level (25.4%). 24.9% of the patients were illiterate. The median family income was taka 6000. The individual component of the metabolic abnormalities in studied patients had highest percentage of patients with lower limit of high density lipoprotein. 73.4% (n=248), followed by abdominal obesity 60.2% (n=201), hypertriglyceridaemia 29.9% (n=100), high blood pressure 24.3% (n=81) and high fasting plasma glucose 15.3% (n=51).

The results of this study indicate that according to modified NCEP ATP III criteria (≥ 3 components; waist circumference : men 90 cm and women 80 cm) 27.2% (n-91) of the studied patients (n-334) had the metabolic syndrome. The metabolic syndrome was more commonly seen in women (n-56, 32.4%) then in men (n-35, 21.7%; $P < 0.05$) and increased with age (40-49 age groups 24.2% to 50-59 age group 35.2%). The male female ratio

was 1:1.6. The metabolic syndrome in this study is lower than the prevalence of Asian Indian which was 41.1% (female 46.5% vs male 36.4%) using modified ATP III criteria (Ramachandran A et al. 2003)[4] and also lower than Korean adults (overall 36.4%; female 38.71%, male 34.2%) (Choi SH et al. 2003)[5]. The metabolic syndrome in this study was higher than US adult using ATP III criteria (Ford FS et al. 2002[1]; Park YW et al. 2003[6]). Park & Fords showed that overall prevalence was 20% (male 22.8%, female 22.6%) and 22% (male 24%, Female 23.4%) respectively. The metabolic syndrome was also higher than the study of Islam QT et al. 2004, in a clinical practice based patients, who stated that, the metabolic syndrome in Bangladesh was 9.3% (M:F=1:1.8) using original ATP III criteria and it was almost twice common in female than male.[2]

The individual component of the metabolic syndrome cases (n=91) in this study had highest percentage of patients with abdominal obesity 97.8% (n=89), followed by low HDL-C 83.5% (n=76), high blood pressure 71.4% (n=65), hypertriglyceridaemia 67% (n=61) and high fasting plasma glucose 44% (n=40). A higher proportion of the metabolic syndrome in women (M:F=1:1.6) might be related to their higher rates of low HDL-C (96.4%) and obesity (96.4%). Ramachandran A et al 2003[4]; Choi SH et al. 2003[5]; Islam QT et al 2004[2] showed that the prevalence of the metabolic syndrome were more common in women. But in US adult different study stated that the metabolic syndrome are more commonly seen in men (Park YW et al 2003[6]; Ford ES et al. 2002[1]; Parikka et al. 2004[7]).

Out of 334 studied subjects, ≥ 3 components of metabolic abnormalities defined as the metabolic syndrome were present in 91 (27.2%) patients. Most of those with the metabolic syndrome had three components (n=44, 48.3%), 35(38.4%) had four, and 12(13%) had five components. The percentage of clusters of components increased with age of the patients and in female sex. In male, it decreased after 60 years of age except female in which the number of components of 5 increased. Clusters of 4 components were identified with some gender variations (M 25.7% and F 48.45%).

The pattern of individual components was more or less similar in both male and female patients. Azizi F et al[8] also showed similar result that most of those with metabolic syndrome had 3 components (58%), 33% had four and 9% had five components. Ford ES et al[1]. also stated the some result in his study among US adults.

Overall frequencies of components were in the order of abdominal obesity (97.8%) > low HDL-C (83.5% > hypertension (71.4%) > triglyceride (67%) > fasting plasma glucose ≥ 6.1 mmol/L (44%). Abdominal obesity appeared to be the highest frequent components of the metabolic syndrome in both sexes (men 100% and women 96.4%). Low high density lipoprotein was found to be high among the female patients (96.4%) compared to the male patients (62.9%) and the difference was statistically significant (P< 0.05). However, among the male patients, high serum triglyceride (77.1%) appeared to be second frequent components, where as among female patients low HDL-C appeared to be second frequent components. Marchesini G, et al. reported the same result in 2004 (Marchesini G, et al. 2004[9]). Ramachandran A et al[4]. stated that abdominal obesity is the core components of the metabolic syndrome. Another study showed that low HDL-C was the most common metabolic abnormality in both sexes (Azizi F, et al, 2003[8]).

Out of 334 studied patients, 51 (15.3%) had fasting plasma glucose ≥ 6.1 mmol/L, of them 40 (78.8%) patients had metabolic syndrome according to modified ATP III criteria. 56% patients of normal glucose had metabolic syndrome and 44% patients (IFG 23.1% and DM 20.9%) of fasting glucose ≥ 6.1 mmol/L had diagnosed as metabolic syndrome. This result is not consistence with other study. Ramachandran A et al. and Parikka PI et al. reported that the prevalence of the metabolic syndrome increased with deterioration in glucose regulation. Approximately 75% of the subjects with IGT had the metabolic syndrome (Parikka PI, et al. 2004[7]). Metabolic syndrome was present in 27.9% of subjects with FPG < 6.1 mmol/L and its prevalence increased > 70% with higher FPG (≥ 6.1 mmol/L) values (Ramachandran A et al. 2003

[4]). In this study the result may be due to presence of diabetic hospital (BIRDEM) and Endocrinology out patient department of BSMMU near the study place. Patient already diagnosed as diabetes usually took treatment from this two places and without non diagnosed cases came to medicine out patient department of BSMMU for treatment of their disease.

In studied patients, interms of obesity, measured by waist circumference was 60.2% and body mass index was 40.42%. It was revealed that 59.6% of the studied patients had normal body mass index followed by 28.4% had overweight, 8.1% had class I obesity, 3.3% class II obesity and 0.6 had class III obesity. Overall body mass index in terms of overweight, class I to class II obesity increased with age. The percentage of normal body mass index was higher among the female patients than the male patients and overweight patients also found among the female patients than male patients.

49.63% (n=67) patients had metabolic syndrome among overweight and obese (n=135) patients in studied subjects (n=334). In metabolic syndrome patients (n=91), overall 26.4%, 50.5%, 17.6%, 5.5% patients had normal weight, overweight, obese class I, and obese class II. So, the metabolic syndrome was more common in overweight and obese subjects (73.6%) and 26.4% normal weight patients mets the criteria of the metabolic syndrome. According to body mass index, overweight patients (50.5%) had more metabolic syndrome. This study revealed that, the metabolic syndrome was more common in terms of overweight, class I and class II obesity and increased with age and more in the female sex. Same result reported by Park YW [6] et al. that the metabolic syndrome was present in 4.6%, 22.4%, 59.6% of normal weight, overweight and obese men respectively, and similar distribution was observed in women. The study conducted by Marchesini et al. also support this study that minimum criteria for the metabolic syndrome were fullfilled in 53% of obese cases (Marchesini et al. 2004 [9]).

Certain limitations relevant to the interpretation of the results of this study were noteworthy. Firstly, this study was not population based. Assessment of the metabolic syndrome in medicine out patient department, patients refers to the specific subgroups. It may be overestimated when compared with the general population. The occurrence of the metabolic syndrome in this study population may therefore had been overestimated. These results may not from a representative sample of Bangladeshi Population. Secondly, due to constrain of time, because of the small number of sample, there was more or less likelihood error to actual evaluation of the metabolic syndrome. But this was the first report on the evaluation of the metabolic syndrome using modified ATP III criteria from Bangladesh showed a high prevalence of this disorder.

In conclusion, the metabolic syndrome was seen in about 27% of Bangladeshi adults. Occurrence of the metabolic syndrome was different in using two modified (NCEP ATP III, 27.2% AND WHO, 9%) definitions. Further studies are necessary to evaluate the actual picture of the metabolic syndrome by unified definition.

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