



## Original Article

# Demographic Profile of Patients with Metabolic Syndrome in Bangladeshi Population

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### Abstract

This was a hospital based study done to see the demographic profile of patients with metabolic syndrome in Bangladesh. A total of 334 patients attending in medicine OPD BSMMU were included in this study. According to modified NCEP ATP III criteria 27.2% of subjects aged  $\geq 20$  years had the metabolic syndrome and it was more commonly seen in women than in men (32.4% vs 21.7%). The metabolic syndrome increased with age in both sexes (40-49 years age groups 24.2% to 50-59 years age groups 35.2%). The metabolic syndrome was also significantly associated with postmenopausal period, family income, leisure time exercise ( $<60$  min/wk), low physical activity, self reported high intake of carbohydrate diet, presence of family history and past history of components of the metabolic syndrome.

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### Introduction

Metabolic syndrome is a global health problem of great magnitude. People with the metabolic syndrome are at increased risk of diabetes mellitus or coronary artery disease.<sup>1</sup> Metabolic syndrome is strongly associated with atherosclerosis. It is an under appreciated, under recognized, and under diagnosed responsible for more illhealth than other condition. It is also under treated. NCEP- ATP III showed that the prevalence rate is approximately 22% of US adult.<sup>2</sup> It increased with age in both sexes<sup>3, 4</sup> and among hypertensive patient (34%).<sup>5</sup> Metabolic syndrome is common in urban Asian Indian adults using modified ATPIII criteria; 41% of subjects aged  $\geq 20$  years had features of this syndrome<sup>4</sup>. There is no population based study in

our country. In Bangladesh there is minimum work on metabolic syndrome. A clinical practice based study showed that 9.3% cases labeled as metabolic syndrome according to NCEP- ATPIII criteria and male female ratio was 1:1.8.<sup>6</sup> All of these indicate a need to establish prevalence of the metabolic syndrome in our population. This study can give the prevalence and pattern of component of metabolic syndrome and will help in formulation of strategy for prevention.

### Aims and objectives

To study the prevalence of the metabolic syndrome, its components and demographic profile among patients attending in the medicine out patient department of BSMMU.

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## Methodology

It a cross sectional study carried out in medicine out patient department of Bangabandhu Sheikh Mujib Medical University (BSMMU) from September 2005 to May, 2007. All the patients attending in the MOPD of BSMMU were interviewed in alternate day during study period and a total of 334 patients were selected by systemic sampling with an interval of 1:5. The laboratory test was carried out in the Biochemistry department of BSMMU, Dhaka. Inclusion criteria was 1) Patients attending in MOPD, 2) Both sex , 2) Age  $\geq$  20 years. Acutely ill patients were excluded. For the data of this study, 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. The metabolic syndrome is defined by "Modified NCEP ATP III criteria" : presence of three or more of the following five risk factors eg fasting plasma glucose  $\geq$  6.1 mmol/L , central obesity measured by waist circumference of men  $>90$ cm , women  $>80$ cm, triglycerides  $\geq$  150 mg/dl ( $\geq 1.7$  mmol/L) , high density lipoprotein cholesterol men =  $< 40$  mg/dl ( $< 1.03$ mmol/L) and women =  $< 50$ mg/dl ( $< 1.29$  mmol/L) , blood pressure  $\geq 130/\geq 85$  mmofHg.

## Results

**Table 1.** Age and sex distribution of the studied patients (n 334)

Age in years	Sex				Total (n=334)		P value
	Male (n=161)		Female (n=173)		No.	%	
	No.	%	No.	%			
<30	37	23.0	49	28.3	86	25.7	
30-39	39	24.2	44	25.4	83	24.9	
40-49	38	23.6	38	22.0	76	22.8	
50-59	31	19.3	30	17.3	61	18.3	
$\geq 60$	16	9.9	12	6.9	28	8.4	
<b>Mean <math>\pm</math> SD</b>	<b>41.7<math>\pm</math>12.1</b>		<b>38.6<math>\pm</math>12.2</b>		<b>40.1<math>\pm</math>12.2</b>		<b>0.020</b>

The mean age of the male patients was  $41.7 \pm 12.1$  years and the female patients was  $38.6 \pm 12.2$  years. Among the male patients highest percentage were in the age group 30-39 years (24.2%). However, among the female patients, highest percentage were in the age group less than 30 years (28.3%).

**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

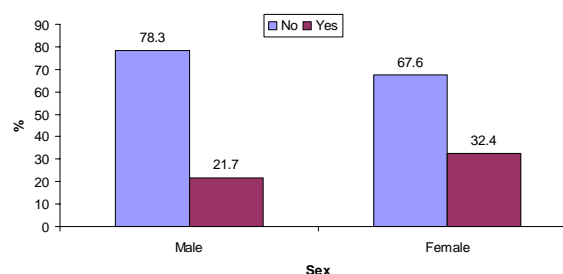
Based on criteria of metabolic syndrome ( $\geq 3$  parameters) the overall proportion of metabolic syndrome was 27.2%.

**Table 3.** Distribution of patients by metabolic syndrome and gender (n=334)

Metabolic syndrome	Gender				Total		p value
	Male		Female		No.	%	
	No.	%	No.	%			
No	126	78.3	117	67.6	243	72.8	0.029
Yes	35	21.7	56	32.4	91	27.2	
<b>Total</b>	<b>161</b>	<b>100.0</b>	<b>173</b>	<b>100.0</b>	<b>334</b>	<b>100.0</b>	

Based on criteria of metabolic syndrome ( $\geq 3$  parameters) it is more commonly seen in women than in men (32.4% vs 21.7%)

**Figure 1.** Distribution of patients by metabolic syndrome and gender (n=334)



Analysis of the above table indicated that the proportion of metabolic syndrome was higher among the female patients (32.4%) compared to male patients (21.7%) and the difference was statistically significant ( $p < 0.05$ ).

**Table 4.** Relationship between metabolic syndrome and selected socio-demographic characteristics (n=334)

Variables	Metabolic syndrome				p value
	No (n=243)		Yes (n=91)		
	No.	%	No.	%	
<b>Age in years</b>					
<30	79	32.5	7	7.7	0.001
30-39	68	28.0	15	16.5	
40-49	54	22.2	22	24.2	
50-59	29	11.9	32	35.2	
≥60	13	5.3	15	16.5	
<b>Sex</b>					
Male	126	51.9	35	38.5	0.029
Female	117	48.1	56	61.5	
<b>Marital Status</b>					
Married	215	88.5	91	100.0	0.001
Unmarried	28	11.5	0	0	
<b>Educational status</b>					
None	57	23.5	26	28.6	0.091
Primary	71	29.2	28	30.8	
Secondary	58	23.9	27	29.7	
Higher	39	16.0	9	9.9	
University	18	7.4	1	1.1	
<b>Monthly family income (Tk.)</b>					
≤4000	81	33.3	11	12.1	0.001
4001-6000	72	29.6	30	33.0	
6001-8000	53	21.8	15	16.5	
≥8001	37	15.2	35	38.5	

Table 4 shows the relationship between metabolic syndromes and selected socio-demographic characteristics. Data analysis revealed that a statistically significant association was found between metabolic syndrome and age of the patients, sex, marital status and monthly family income ( $p < 0.001$ ) indicating that the metabolic syndrome was significantly increase with age of the patients, female patients and income of the family. But no statistically significant association was found between metabolic syndrome and level of education of the patients ( $p > 0.05$ ) though the metabolic syndrome was found to be high among the female patients.

**Table 5.** Relationship between metabolic syndrome and physical activities (n=334)

Variables	Metabolic syndrome				p value
	No (n=243)		Yes (n=91)		
	No.	%	No.	%	
<b>Leisure time exercise</b>					
Inability to work	5	2.1	9	9.9	0.016
≤60 minute/week	132	54.3	50	54.9	
>60 minute /week	106	43.6	32	35.2	
<b>Physical activity at work/home</b>					
Low	50	20.6	31	34.1	0.032
Moderate	179	73.7	57	62.6	
High	14	5.8	3	3.3	
<b>Nature of work</b>					
Non-sedentary job	235	96.7	87	95.6	0.630
Sedentary job	8	3.3	4	4.4	

It was revealed that metabolic syndrome was statistically significantly associated with leisure time exercise ( $p < 0.01$ ) indicating the metabolic syndrome was found to be high among the patients with inability to work and lowest among the patients habituated with exercise more than 60 minute per week. A statistically significant association was also found with among the patients with low physical activity ( $p < 0.05$ ). However, no statistically significant association was found between metabolic syndrome and nature of work ( $p > 0.05$ ) though data support that the metabolic syndrome found to be high among the patients with sedentary nature of job.

Analysis revealed that metabolic syndrome was significantly associated with carbohydrate diet, family history and past history of components of metabolic syndrome and associated disease ( $p < 0.001$ ) indicating the metabolic syndrome was high among the patients moderate carbohydrate diet and family and past history of components of metabolic syndrome and associated disease. Data also revealed that the metabolic syndrome was found to be high among the female patients with postmenopausal period ( $p < 0.001$ ).

**Table 6.** Relationship between metabolic syndrome and life style factors (n=334)

Variables	Metabolic syndrome				p value
	No (n=243)		Yes (n=91)		
	No.	%	No.	%	
<b>Smoking</b>					
Non smoker	169	69.5	61	67.0	0.238
Past smoker	10	4.1	8	8.8	
Current smoker	64	26.3	22	24.2	
<b>Alcohol</b>					
None	241	99.2	91	100.0	-
Moderate	2	.8	0	.0	
<b>Carbohydrate diet</b>					
Moderate	38	15.6	31	34.1	0.001
High	205	84.4	60	65.9	
<b>Family history of components of metabolic syndrome and associated disease</b>					
Yes	164	67.5	42	46.2	0.001
No	79	32.5	49	53.8	
<b>Past history of components of metabolic syndrome and associated disease</b>					
Yes	12	17.1	58	82.9	0.001
No	224	84.8	40	15.2	
<b>Perimenopausal status</b>					
Premenopausal	226	93.0	38	41.8	0.001
Postmenopausal	17	7.0	53	58.2	

**Table 7.** Distribution of patients by nutritional status bases on body mass index and sex (n=334)

Body mass index	Sex				Total (n=334)	p value	
	Male (n=161)		Female (n=173)				
	No.	%	No.	%			
<24.99 (Normal)	92	57.1	107	61.8	199	59.6	0.381
25-29.9 (Overweight)	40	24.8	55	31.8	95	28.4	df=1
30-34.99 (Class I obese)	18	11.2	9	5.2	27	8.1	
35-39.9 (Class II obese)	10	6.2	1	.6	11	3.3	
40+ (Class III obese)	1	.6	1	.6	2	.6	

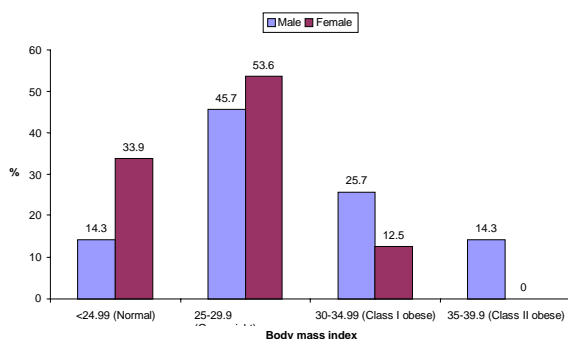
It was found that among the male patients, highest percentage were obese with different grade (42.9%) and among the female patients it was 38.2%, but analysis found no statistically significant difference between male and female patients (p>0.05).

**Table 8.** Percentage distribution of the patients by age and body mass index based on metabolic syndrome

Age	N	Body mass index				
		<24.99 (Normal)	25-29.9 (Overweight)	Obesity		
				30-34.99 (Class I)	35-39.9 (Class II)	≥40 (Class III)
<b>All</b>	<b>91</b>	<b>24</b>	<b>46</b>	<b>16</b>	<b>5</b>	<b>0</b>
<30	7	14.3	71.4	14.3	.0	.0
30-39	15	20.0	73.3	6.7	.0	.0
40-49	22	31.8	40.9	22.7	4.5	.0
50-59	32	28.1	53.1	12.5	6.3	.0
≥60	15	26.7	26.7	33.3	13.3	.0
<b>Male</b>	<b>35</b>	<b>5</b>	<b>16</b>	<b>9</b>	<b>5</b>	<b>0</b>
<30	1	.0	100.0	.0	.0	.0
30-39	3	33.3	66.7	.0	.0	.0
40-49	10	30.0	40.0	20.0	10.0	.0
50-59	13	.0	61.5	23.1	15.4	.0
≥60	8	12.5	12.5	50.0	25.0	.0
<b>Female</b>	<b>56</b>	<b>19</b>	<b>30</b>	<b>7</b>	<b>0</b>	<b>0</b>
<30	6	16.7	66.7	16.7	.0	.0
30-39	12	16.7	75.0	8.3	.0	.0
40-49	12	33.3	41.7	25.0	.0	.0
50-59	19	47.4	47.4	5.3	.0	.0
≥60	7	42.9	42.9	14.3	.0	.0

Above table indicated that overall body mass index in terms of overweight, class I to class II obesity increase with age. No patients of class III obesity found in patients with metabolic syndrome. However, among the female patients no patient with class II and class III patients were found.

**Figure 2.** Gender wise percentage distribution of body mass index among the patients of metabolic syndrome (n=91)



Above figure 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  $40.1 \pm 12.2$  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 ( $\geq 3$  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<sup>4</sup> and also lower than Korean adults (overall 36.4%; female 38.71%, male 34.2%).<sup>7</sup> The metabolic syndrome in this study was higher than US adult using ATP III criteria.<sup>8,9</sup> 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.<sup>6</sup>

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; Choi SH et al. 2003; Islam QT, et al 2004 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.<sup>8,9,10</sup>

In this study, a statistically significant association was found between the metabolic syndrome and age of the patients, sex, marital status and monthly family income ( $P < 0.001$ ) indicating that the metabolic syndrome was significantly increased with age of the patients, female sex patients and family income. The metabolic syndrome had statistically significantly associated with leisure time exercise ( $P < 0.001$ ) indicating the metabolic syndrome was found to be high among the patients with inability to work and lowest among the patients habituated with exercise more than 60 minute per week. A statistically significant association was also found with among the patients with low physical activity ( $p < 0.05$ ). This study also revealed that metabolic syndrome was significantly associated with self reported carbohydrate diet, family history and past history of components of metabolic syndrome ( $P < 0.001$ ) indicating the metabolic syndrome was high among the patients with self reported moderate to high carbohydrate diet, family and past history of components of metabolic syndrome. Metabolic syndrome was found to be high among the female patients with postmenopausal period ( $P < 0.001$ ). Lidfeldt J, et al. reported that high leisure time exercise ( $\geq 60$  min/wk), healthy diet, good physical quality of life were negatively associated with the metabolic syndrome.<sup>11</sup>

Park YW, et al. showed that older age, postmenopausal status, low household income, high carbohydrate consumption, physical inactivity were associated with increased prevalence of the metabolic syndrome.<sup>8</sup> Carnethon MR et al. reported that metabolic syndrome risk increased with age and higher intake of carbohydrate diet. Physical activity was protective.<sup>12</sup>

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 slightly 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 definitions. Further studies are necessary to evaluate the actual picture of the metabolic syndrome by unified definition.

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