



Original Article

Comparison of Prevalence of the Metabolic Syndrome by Using Different Defining Criteria

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Abstract

This cross sectional study was done to see the prevalence of the metabolic syndrome and its components among patients attending in the medicine out patient department of BSMMU by using different defining criteria. The metabolic syndrome according to the modified NCEP ATP III criteria was 27.2% (female 32.41% > male 21.7%). However, according to original NCEP ATP III criteria, proportion of the metabolic syndrome was 22.5% (female 30.6% > male 13.7%). But the metabolic syndrome defined by the modified WHO criteria was 9.0% (male 10.6% > female 7.5%).

Comparative analysis of the metabolic syndrome indicated that the proportion of the metabolic syndrome differs in different criteria. In modified WHO criteria the metabolic syndrome was less than NCEP ATP III (modified and original) criteria and there was male preponderance. The proportion of the metabolic syndrome defined by modified and original ATP III criteria is more or less similar.

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Introduction

Metabolic syndrome is a global health problem of great magnitude and a major public health concern in developed and developing countries. People with the metabolic syndrome are at increased risk of diabetes mellitus and coronary artery disease relative to people without the syndrome.¹

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

Comparison of definitions of the metabolic syndrome:

ATP III, 2001 clinical identification of the metabolic syndrome (ATP III 2001)³ Three or more of the following five risk factors

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Risk factors	Defining level
Central obesity <ul style="list-style-type: none"> Men Women 	Waist circumference * <ul style="list-style-type: none"> > 102 cm (> 40 inch) > 88 cm (> 35 inch)
Triglycerides	≥ 150 mg/dl (1.7 mmol/L)
HDL cholesterol <ul style="list-style-type: none"> Men Women 	< 40 mg/dl (1.03 mmol/L) <ul style="list-style-type: none"> < 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 Pacific region includes waist circumference for men is > 90 cm and for women is > 80 cm.

WHO clinical criteria for the metabolic syndrome, 1999⁵

Diabetes or impaired fasting glycaemia or impaired glucose tolerance or insulin tolerance plus 2 or more of the following risk factors :	
Risk factor	Defining level
Central obesity <ul style="list-style-type: none"> Men Women 	BMI : > 30kg/m ² and/or waist to hip ratio <ul style="list-style-type: none"> > 0.9 > 0.85
Dyslipidaemia <ul style="list-style-type: none"> Triglycerides HDL-cholesterol Men Women 	≥ 1.7 mmol/L (≥ 150 mg/dl) <ul style="list-style-type: none"> < 0.9 mmol/L (35 mg/dl) < 1.0 mmol/L (39 mg/dl)
Blood pressure	≥ 140/≥ 90 mm of Hg
Microalbuminuria <ul style="list-style-type: none"> Urinary albumin excretion rate Albumin creatinine ratio 	≥ 20µ gm/min <ul style="list-style-type: none"> ≥ 30 mg/g

Modified WHO criteria

Fasting plasma glucose ≥ 6.1 mmol/L plus two or more of the followings (1) central obesity BMI : ≥ 25kg/m² and/or waist to hip ratio > 0.9 in men, > 0.85 in women (2) Triglycerides ≥ 1.7 mmol/L (≥ 150 mg/dl) (3) HDL-cholesterol < 0.9 mmol/L (35 mg/dl) in men, < 1.0 mmol/L (39 mg/dl) in women (4) Blood pressure ≥ 140/≥ 90 mm of Hg.

Results

This cross sectional study was done from September 2005 to May 2007. The main objective of the study was to see the prevalence of the metabolic syndrome and its components among patients attending the medicine out patient department of BSMMU by using original and modified ATP III and modified WHO criteria and to evaluate the more applicable and practical

defining criteria in epidemiological and clinical practice. All the patients attending in the MOPD of BSMMU were interviewed in alternate day and a total of 334 patients of both sexes who were ≥ 20 years of age were included in the study by systemic sampling with an interval of 1:5.

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

Age in years	Gender				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	
≥60	16	9.9	12	6.9	28	8.4	
Mean ± SD	41.7±12.1		38.6±12.2		40.1±12.2		0.020

p value reached from unpaired student's t test

Table 2. Number of components of metabolic syndrome in modified and original ATP III criteria

Age	Number of components					
	Modified ATP III			Original ATP III		
	3	4	5	3	4	5
All	44	35	12	35	33	7
<30	3	4	0	2	4	0
30-39	9	6	0	5	6	0
40-49	11	9	2	9	7	1
50-59	16	10	6	16	11	3
≥60	5	6	4	3	5	3
Male	20	9	6	12	7	3
<30	1	0	0	1	0	0
30-39	3	0	0	0	0	0
40-49	7	3	0	4	1	0
50-59	5	4	4	5	4	2
≥60	4	2	2	2	2	1
Female	24	26	6	23	26	4
<30	2	4	0	1	4	0
30-39	6	6	0	5	6	0
40-49	4	6	2	5	6	1
50-59	11	6	2	11	7	1
≥60	1	4	2	1	3	2

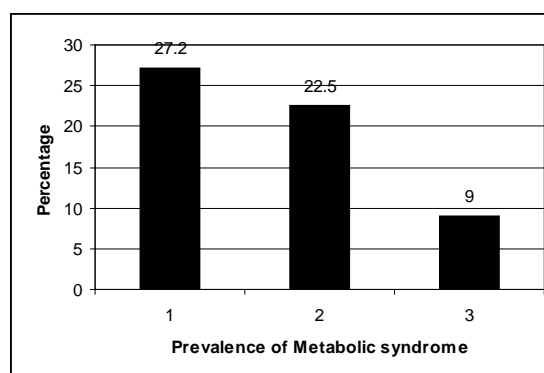


Figure 1. Prevalence of metabolic syndrome by modified NCEP ATP III (1), original NCEP ATP III (2) and modified WHO (3) criteria

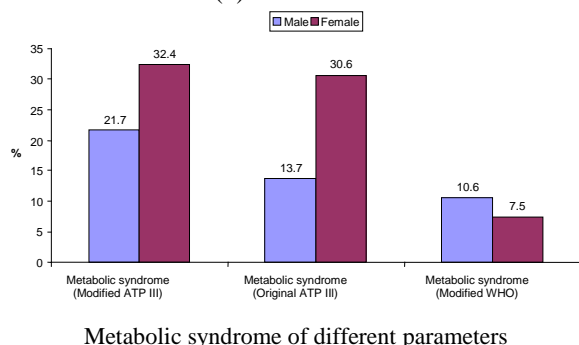


Figure 2. Comparison of metabolic syndrome in modified and original ATP III and WHO criteria by gender.

Gender wise comparison of different parameters revealed that in modified and original NCEP ATP III criteria, female patients shows higher preponderance of metabolic syndrome compared to male patients. But in WHO criteria, the overall proportion of metabolic syndrome was less than the other two criteria with male preponderance.

Table 4. Comparison of metabolic syndrome in modified and original ATP III and WHO criteria by gender

Gender	Metabolic syndrome (Modified ATP III) (n=334)		Metabolic syndrome (Original ATP III) (n=329)		Metabolic syndrome (Modified WHO) (n=334)	
	No (n=243)	Yes (n=91)	No (n=259)	Yes (n=75)	No (n=304)	Yes (n=30)
Male (n=161)	78.3	21.7	86.3	13.7	89.4	10.6
Female (n=173)	67.6	32.4	69.4	30.6	92.5	7.5
Total	72.8	27.2	77.5	22.5	91.0	9.0
p value	0.029		0.001		0.331	

*p value reached from chi square test

Comparative analysis of the metabolic syndrome indicated that the proportion of metabolic syndrome differs in three different criteria. However, a statistically significant sex different was found between male and female patients in modified and original criteria for metabolic syndrome ($p < 0.05$) indicating the proportion of metabolic syndrome was higher among the female patients compared to male patients. However, in

WHO criteria no statistically significant sex differential was found ($p > 0.05$), but shows a male preponderance of metabolic syndrome.

Discussion

The main objective of the study was to assess the metabolic syndrome and its components by using original and modified NCEP ATP III and modified WHO 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.

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 criteria⁶ and also lower than Korean adults (overall 36.4%; female 38.71%, male 34.2%).⁷ The metabolic syndrome in this study was higher than US adult using ATP III criteria. Park & Fords showed that overall prevalence was 20% (male 22.8%, female 22.6%) and 22% (male 24%, Female 23.4%) respectively.^{8,9} 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.¹⁰

In this studied subjects, the metabolic syndrome defined by original and modified ATP III criteria was 27.2% and 22.5% respectively. Decreasing waist circumference from the original ATP III criteria (M=102cm, F=88cm) to modified ATP III criteria (M=90cm, F=80cm) increased the crude prevalence of the metabolic syndrome (from 22.5% to 27.2%). The metabolic syndrome in male using ATP III criteria was 13.7% but increased to 21.7% with the modified ATP III criteria.

Similarly in women using NCEP ATP III original criteria, it was 30.6% and increased to 32.4% with the modified ATP III criteria.

The metabolic syndrome according to the modified NCEP ATP III criteria was significantly higher than according to the WHO criteria. In modified WHO criteria, the overall proportion of the metabolic syndrome was 9% and it was less than the ATP III criteria (modified 27.2% and original 22.5%) with male preponderance. The metabolic syndrome according to the modified WHO criteria was 10.6% of men and 7.5% of women. However, the prevalence increased 2 times (21.7%) in men and approximately more than 4 times (32.4%) in women using the modified ATP III criteria. Similar results showed by Choi SH et al.⁶ The prevalence of the metabolic syndrome according to the modified WHO criteria was 21.8% of men and 19.4% of women. However, the prevalence was increased 1.6 times (34.2%) in men and 2.0 times (38.7%) in women using the NCEP ATP III criteria⁶(Choi SH et al. 2005). In WHO criteria, glucose intolerance is mandatory and hypertension ($\geq 140 / \geq 90$ mmHg) is defined greater than ATP III criteria ($>130 / >85$). So, the metabolic syndrome defined by WHO was decreased in number. In this study, some patients had 3 or 4 components but without glucose intolerance they were not defined as metabolic syndrome. By WHO criteria, these patients are underestimated, but had the metabolic abnormalities, that can make problem for the patients as well as the health care system. Those patients, who had 3 or 4 components but no glucose intolerance, may have insulin resistance. In modified WHO criteria, measurement of insulin resistance is not included. If it included, then the prevalence of metabolic syndrome may be similar as ATP III criteria.

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 refer 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 have 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. This study also first applied the modified WHO criteria to assess the metabolic syndrome and compare this assessment with that obtained with the modified and original ATP III criteria.

Conclusion

The prevalence of metabolic syndrome in Bangladeshi population is significant. Occurrences of the metabolic syndrome are different by using different defining definitions. Proportion of the metabolic syndrome defined by modified NCEP ATP III is nearly similar as different studies in Asia Pacific. So, in Bangladesh, modified NCEP ATP III criteria are more applicable and practical in epidemiological and clinical practice. Further studies are necessary to evaluate the actual picture of the metabolic syndrome by unified definition.

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