



## Original Article

# Association of Metabolic Factors with Essential Hypertension

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### Abstract

**Background-**Metabolic syndrome is a risk factor for cardiovascular disease, so it should call attention. South Asian person has preponderance to it.

**Objectives-**The proper findings of metabolic syndrome are a key to prevent cardiovascular disease. Hypertension is a component of metabolic syndrome with which patients are at increased risk for cardiovascular disease.

**Methods-**This study was carried out in cardiology outdoor of Shaheed Suhrawardy medical college hospital, Dhaka. A total of 322 patients were enrolled from January 2008 to December 2010. Metabolic syndrome was defined as three of the followings: (a) Abnormal fasting serum level of glucose ( $>_{110}$  mg/dl or 6.1 mmol/L), (b) abdominal obesity (waist circumference  $>_{102}$  cm in men and  $>_{88}$  cm in women), (c) Triglycerides ( $>_{150}$  mg/dl), (d) High density lipoprotein cholesterol ( $<_{40}$  mg/dl in men and  $<_{50}$  mg/dl in woman), (e) Hypertension, which was common in all patients.

**Results-** Among hypertensive's patients 31.8% had hyperglycemia, 37.9% had high waist circumference, 69.8% had low HDL cholesterol and 54.3% high triglycerides. As per definition of NCEP-ATP-III, metabolic syndrome had been detected in 17% of male, 37% of female and 27% of the total population.

**Conclusion-** Metabolic factors are a common association in hypertensive cases. These patients are at increased risk of coronary and cerebro-vascular disease and require more vigorous prevention. Furthermore in all hypertensive patients metabolic screening is recommended.

**Key Words:** Hypertension, metabolic syndrome.

TAJ 2010; 23(2): 21-25

### Introduction

Metabolic syndrome is a conglomeration of obesity, abnormal glucose metabolism, dyslipidemia and hypertension. These factors tend to aggregate together and in that case increase the risk of cardiovascular disease development<sup>1</sup>. Metabolic

syndrome predicts the onset of diabetes<sup>2</sup> and cardiovascular disease<sup>3</sup>.

The national Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III)<sup>4</sup> defined metabolic syndrome as presence of any three or more of the following; (a) waist

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circumference > 102 cm in men, > 88 cm in women, ( b) low HDL <40 mg/dl in men, <50 mg/dl in women, ( c) hypertriglycemia >\_ 150 mg/dl, (d) high blood pressure >\_ 130/85 mm of Hg or documented use of antihypertensive therapy, (e) high fasting blood glucose >\_ 110 mg/dl or 6.1 mmol/L. Metabolic syndrome in Asia is more prevalent than any other part of the world. Asians generally tends to have higher prevalence of CHD. This is because Asians have central obesity and diabetes.<sup>4</sup> High BP is considered to be one of important features of metabolic syndrome<sup>6</sup>.

Hypertension is a common cardiovascular risk factor. Other cardiovascular risk factors cluster together around hypertension which ultimately manifest into CHD<sup>7</sup>. Therefore an early diagnosis of metabolic syndrome in hypertensive patients in Bangladesh deserves due attention for prevention of diabetes and CHD. This is important because it is largely prevented by lifestyle modifications. But magnitude of metabolic syndrome in Bangladeshi population is not known. We therefore studied to see the prevalence of metabolic syndrome and cardiovascular risk factors in hypertensive patients.

### **Material and Methods**

This study was carried out in outdoor of department of cardiology, Shaheed Suhrawardy medical college hospital, Dhaka. A total of 322 patients were enrolled from January 2008 to December 2010. Patients with high records of blood pressure or history of hypertension with medication are being selected for study. Clinical history, dietary habit, hypertension, treatment regarding diabetes, and anthropometric measurement (height, weight and waist circumference) were taken. Patients were advised to take rest for 5 minutes, than blood pressure was measured in sitting position with arm at the level of the heart. Systolic pressure was noted at appearance of Korotkoff sound (phase-I) and diastolic pressure was noted at disappearance of sound (korotkoff phase-V). Pressure was recorded in both arms and average measurement was taken. In this study hypertension was defined as systolic blood pressure 140 mm of Hg and diastolic blood pressure of 90 mm Hg or more or use of anti

hypertensive drugs. Anthropometric measurements included waist circumference in cm, height in cm and weight in kg. Waist circumference was measured in standing position with feet together and arms at the side and abdomen relaxed. A tap was placed around the waist at the level of umbilicus midway between the bottom of rib and top of hipbone. Tape was placed firmly with no cloths in between. Patients were asked to do biochemical investigation in the biochemistry department of this medical college on the following day after overnight fasting. Venous whole blood samples were collected for measuring glucose, total cholesterol, HDL- cholesterol, LDL cholesterol, and triglycerides. Serum glucose level was measured using the glucose oxidase method and lipid profile by enzymatic methods. Measurement was performed in the department of biochemistry by the auto analyzer Stat Fax 3300 USA machine.

### **Statistical Analysis**

Data were analyzed using statistical analysis system. Mean and standard deviations were calculated for the quantitative variables. Percentage and standard error were calculated for frequency variables. A p value <\_0.05 considered statistically significant.

### **Results**

The mean age of the patients was 47.7 +\_ 11.1. The patients' characteristics and mean level of variables are given in table-I. Age specific prevalence of individual trait of metabolic syndrome is shown in table-II. Large waist circumference and high blood glucose level were more frequently observed in 40-70 years of age where as no difference were observed in any age group regarding HDL cholesterol and triglycerides. Among hypertensive's patients 31.8% had hyperglycemia, 37.9% had high waist circumference, 69.8% had low HDL cholesterol and 54.3% high triglycerides (table-III). As per definition of NCEP-ATP-III, metabolic syndrome had been detected in 17% of male, 37% of female and 27% of the total population. All traits were present in 1.5% of male and 13.9% of female (tableIII).

**Table-I:** Mean and standard deviation of quantitative variables in patients with hypertension.

	Men	Men	Women	Women	Total	Total
	mean	SD	Mean	SD	Mean	SD
<b>Non-biochemical variables</b>						
<b>Numbers</b>	<b>212</b>		<b>110</b>		<b>322</b>	
Age, years	47.7	11.1	44.99	9.6	46.35	10.35
Height, cm	159.9	6.4	149.1	5.5	155	6.0
Weight, Kg	64	9.4	57.2	9.0	60.6	9.2
Body mass index, kg/m <sup>2</sup>	22.5	2.4	23.7	3.2	23.1	2.8
Waist circumference, cm	85.1	7.9	84.5	9.3	84.8	8.6
Pulse beats/minute	79.1	9.0	80.3	10.1	79.7	9.56
Blood pressure, mm Hg						
Systolic	154.7	22.2	156.0	22.1	155.4	22.15
Diastolic	94.6	11.6	95.2	11.2	95.0	10.4
<b>Biochemical variables</b>						
<b>Numbers</b>	<b>159</b>		<b>145</b>		<b>304</b>	
Plasma glucose, mmol/L	5.6	1.7	4.6	2.1	5.1	1.9
Total cholesterol, mg/dL	182.6	37.2	187.6	39.7	185.1	38.5
HDL cholesterol, mg/dL	39.2	6.1	39.4	8.3	38.3	7.2
LDL cholesterol, mg/dL	105.1	36.6	110.5	39.11	107.8	37.9
Triglycerides, mg/dL	191.8	19.7	179.8	11.4	185.8	15.6

**Table-II:** Percent of categorical variables in patients with hypertension.

Variables	Men	women	Total
<b>Number</b>	<b>212</b>	<b>110</b>	<b>322</b>
Sedentary occupation	59.1	63.3	61.2
Smoker			
Ex	29.6	.2	14.9
Current	20.5	.7	10.6
Chewing tobacco users			
Ex	5	4.2	4.6
Current	9.7	20.5	15.1
Alcohol drinker	1.4	0	1.4
Medication for			
Hypertension	64.5	69.7	67.1
Diabetes	11.7	11.2	11.45

**Table-III:** Prevalence (percent) of metabolic factors in patients with hypertension.

Age	Number	High waist circumference	Low HDL	High TG	Hyperglycemia	All
<b>Men</b>						
20-29	31	0.0	60.8	68.7	16.5	0.0
30-39	33	3.6	50.2	60.1	18.9	2.3
40-49	41	6.2	46.3	58.1	26.4	.7
50-59	39	6.1	49.0	57.0	31.9	1.1
60-69	42	6.8	45.1	54.1	45.1	1.8
70-79	26	3.1	48.1	37.3	36.2	1.9
<b>20-79</b>	<b>212</b>	<b>5.2</b>	<b>47.2</b>	<b>55.3</b>	<b>31.1</b>	<b>1.5</b>
<b>Women</b>						
20-29	19	64.1	94.6	51.0	17.9	4.7
30-39	18	79.9	90.4	35.6	22.9	6.8
40-49	24	81.3	93.4	57.3	37.1	16.2
50-59	15	79.3	90.9	53.1	33.9	14.7
60-69	16	71.1	92.1	60.9	44.8	21.7
70-79	18	44.7	90.6	59.3	24.0	8.4
<b>20-79</b>	<b>110</b>	<b>78.1</b>	<b>91.3</b>	<b>53.9</b>	<b>31.8</b>	<b>13.9</b>
<b>Men and women</b>						
20-29	54	24.0	76.0	61.8	16.9	1.9
30-39	52	51.5	76.2	49.8	22.3	5.3
40-49	49	43.8	70.2	59.2	32.8	8.9
50-59	43	35.1	67.1	57.3	33.1	6.5
60-69	51	32.6	64.3	58.1	45.6	9.5
70-79	73	13.1	59.7	44.1	33.2	2.1
<b>20-79</b>	<b>322</b>	<b>37.9</b>	<b>69.8</b>	<b>54.3</b>	<b>31.8</b>	<b>6.5</b>

## Discussion

Cardiovascular mortality is increased in subjects with the metabolic syndrome<sup>8</sup>. In this study it is observed that 17% man and 37% of women are having metabolic syndrome. This is very high as compared to another study conducted in free living sample of rural Bangladeshi women in which the prevalence was less than three percent<sup>9</sup> It is also higher than that was found in Asian (14% man and 19% women)<sup>10</sup> and European (10% men and 13% women)<sup>8</sup>.

Our study has similar result shown by Greenlund et al<sup>11</sup> where it was 25%. In comparison to Europeans, south Asians have higher prevalence of hypertension, diabetes mellitus and dyslipidemia.

The prevalence of metabolic syndrome is more common in women, which increased with age. Gender difference in the prevalence of the metabolic syndrome with age may be related to the higher prevalence of abdominal obesity and prominence of weight gain associated with increase of age in women.

Tobacco consumption was found to be a significant independent risk factor for metabolic syndrome in both man and woman. Furthermore tobacco is known to impair insulin action and may lead to insulin resistance<sup>12</sup>. Cigarette smoking may also induce an increase abdominal obesity, as well as causing hypertension by increasing sympathetic activity. It may elevate TG and lower HDL.

Hyperglycemia is much common (31.8% vs 8%)<sup>13</sup> in this study. 37.9% had higher waist circumference, 54.3% had higher TG and 69.8% had decreased HDL which is much higher than normal population<sup>14</sup>.

South asian living in urban society have a higher prevalence of many of the complications of obesity than other ethnic groups<sup>14</sup>. These complications are associated with abdominal fat distribution that is markedly higher. These findings lead to assumption that there may be genetic susceptibility for development of metabolic syndrome in Bangladeshi people.

Unhealthy lifestyle such as low level of physical activity, tobacco consumption, fatty, salty and sugary diet is the environmental factors.

## Conclusion

Our Findings suggest that the metabolic syndrome is common association in hypertensive patients. Hypertensive patients with the metabolic syndrome are at increased risk of coronary and cerebrovascular disease and require a more vigorous nondrug and pharmacologic preventive approach. The present finding strongly indicates the need for metabolic screening in all hypertensive patients at the first diagnosis.

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