

# Assessment of Metabolic Syndrome as a Risk Factor for Cardiovascular Diseases in Tertiary Care Hospital in Western Maharashtra

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## ABSTRACT

**Introduction:** A wide range of traditional and nontraditional cardiovascular risk factors that may promote and foster the development of atherosclerosis have been reported in association with the metabolic syndrome, including atherogenic dyslipidemia, prothrombotic and proinflammatory milieu, and endothelial dysfunction. The present study was conducted to study the cardiovascular risk factors among the cases presented with metabolic syndrome in a tertiary healthcare institute.

**Material and methods:** It was a cross sectional observational study conducted among 100 cases diagnosed with metabolic syndrome attending outpatient department of department of medicine, KIMS. Written consents were taken from the participants.

**Results:** Mean Waist Circumference in cm was  $99.62 \pm 9.2$ , Hip Circumference was  $106.3 \pm 8.67$  cm. The W/H ratio was  $0.93 \pm 0.79$ . These indices were higher as compared to the controls. 7.5 % cases had peripheral vascular disease, 8.2% cases had coronary artery disease, 4% had nephrotic syndrome, 6% had history of cerebrovascular disease.

**Conclusions:** Evaluation of the parameters in metabolic syndrome can be a simple clinical tool to assess potential risk for development of cardiovascular diseases and hence assessment of prognosis and to establish and prioritize the resources appropriately.

**Keywords:** Metabolic Syndrome, Cardiovascular Diseases, Prognosis, Diabetes Mellitus, Obesity

## INTRODUCTION

The term 'Metabolic syndrome (MS)' was first described as "syndrome X" by Reaven (1998). It was also called as multi-metabolic syndrome or insulin resistance by Kylin, Marañón and others. It was observed to be associated with accelerated atherosclerosis and also as a risk factor in the development of cardiovascular diseases and abdominal obesity was also studied to be an important risk factor associated with CVDs.<sup>1</sup>

The predominant underlying risk factors of the metabolic syndrome appear to be abdominal obesity,<sup>1</sup> and insulin resistance;<sup>2</sup> other associated conditions can be physical inactivity,<sup>3</sup> aging<sup>4</sup> and hormonal imbalance.<sup>5</sup> An atherogenic diet (e.g., a diet rich in saturated fat and cholesterol) although not listed specifically as an underlying risk factor for the condition can enhance risk in people with the syndrome for developing cardiovascular disease. One theory states that insulin resistance is the essential cause of metabolic syndrome.

The prevalence of metabolic syndrome varies by definition and therefore the population studied.<sup>3</sup> per third National Health and Nutrition Examination Survey (1988 to 1994), the prevalence of metabolic syndrome (using the NCEP-ATP III criteria) reported between 16 PF to thirty seventh.<sup>3</sup> Patients with the metabolic syndrome often show elevated small and dense LDL cholesterol particles and elevated levels of apolipoprotein B.<sup>12</sup> Small, dense LDL particles are more atherogenic than the large ones, and apolipoprotein B-100 is the major apolipoprotein component of the atherogenic lipoproteins (VLDL, LDL, and intermediate density lipoprotein).<sup>13</sup> Increased levels of clotting factors (tissue factor VII and fibrinogen), inhibition of the fibrinolytic pathway (increased plasminogen activator inhibitor-1 and decreased tissue plasminogen activator activity), and increased platelet aggregability also have been described in the metabolic syndrome, which therefore can be considered a prothrombotic condition.<sup>14</sup> Furthermore, the metabolic syndrome signals the presence of a proinflammatory state. In fact, increased C reactive protein levels often can be found in patients with the metabolic syndrome, and there is a linear relationship between the number of components of the metabolic syndrome and the degree of inflammation.<sup>15</sup> An impairment in endothelial function, as indicated by a higher transcapillary escape rate of albumin and defective forearm response to acetylcholine, also has been described in untreated hypertensive patients who did not have diabetes but had the metabolic syndrome without overt cardiovascular disease.<sup>16</sup> These abnormalities contribute to the development of asymptomatic structural and functional abnormalities at the vascular and cardiac levels and may lead to the onset of major cardiovascular events.

The present study was conducted to study the cardiovascular

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risk factors among the cases presented with metabolic syndrome in a tertiary healthcare institute.

## MATERIAL AND METHODS

It was a cross sectional observational study conducted among 100 cases diagnosed with metabolic syndrome attending outpatient department of department of medicine, KIMS. Written consents were taken from the participants.

**Method:** A detailed clinical history of the cases was recorded with the help of semi-structured, pre-validated, standard case record proforma. All the relevant clinical, personal, past, family history were recorded.

**Examination:** A clinical assessment and thorough general and systemic examinations of the study subjects was carried out to exclude any significant systemic illness and recorded in the case record proforma.

**Investigations:** Complete blood count, haemoglobin was estimated. Lipid profile of all study subjects was done. Total cholesterol (TC), and high density lipoprotein (HDL), low density lipoprotein (LDL) were analysed. Readings were taken after 20 min of rest in supine position. Anthropometric measurement: Weight, height, waist circumference, hip circumference were measured and recorded. Body mass indices of all the study subjects were calculated.

## STATISTICAL ANALYSIS

The data was further analysed and represented with the help of tables and graphs to present frequency distribution of various clinical parameters. Microsoft Excel software was used to analyse the data.

## RESULTS

The overall mean age of the study subjects was 62.5±5.28 years. The risk factors were: hypertension in 46.9%, diabetes type 2 in 23.7%, obesity in 41.6%, dyslipidemia in 19%, and 19.7% were smokers. The mean BMI was 30.05± 2.82 kg/m<sup>2</sup> (table-1).

Mean Waist Circumference in cm was 99.62 ± 9.2, Hip Circumference was 106.3±8.67 cm. The W/H ratio was 0.93±0.79. These indices were higher as compared to the controls.

7.5% cases had peripheral vascular disease, 8.2% cases had coronary artery disease, 4% had nephrotic syndrome, 6% had history of cerebrovascular disease.

The mean systolic and diastolic blood pressure was comparatively higher among cases presented with metabolic syndrome as compared to controls.

Also when we compared total cholesterol, LDL, and fasting blood sugar levels, we observed that he levels were comparatively higher among the cases of metabolic syndrome as compared to controls.

## DISCUSSION

In this modern era of globalisation and industrialisation, developing countries like India is facing double burden of diseases. Wide spectrum of communicable diseases among vulnerable age groups of the one hand and lifestyle

Parameter	Metabolic syndrome	Controls
Age (Yrs)	62.5 ± 5.28	60.12
BMI (Kg/m <sup>2</sup> )	30.05± 2.82	24.03± 1.87
WC (cm)	99.62 ± 9.2	91.3 ± 9.2
Hip C (cm)	106.3 ± 8.67	105.8 ± 8.67
WHR	0.93 ± 0.79	0.86 ± 0.79

(BMI) body mass index, (wc) waist circumference, (HC) hip circumference, (WHC) waist hip circumference, (SBP) systolic blood pressure, (DBP) Diastolic blood pressure.

**Table-1:** Anthropometric measurement

SBP	146 ± 6 mmHg	128 ± 4 mmHg
DBP	94 ± 4 mmHg	88 ± 2 mmHg

**Table-2:** blood pressure of the studied group

Parameter	Cases	Controls
TC (mg/dl)	165 ± 26.39	170.68 ± 26.39
HDL (mg/dl)	38.4 ± 9.26	42.76 ± 9.26
LDL (mg/dl)	97.4 ± 24.77	94.65 ± 24.77
FBG (mg/dl)	122.86 ± 9.86	94.5 ± 9.86

AI: atherogenic index; FBG: fasting blood glucose

**Table-3:** Comparison of biochemical parameters among two groups

related non communicable diseases like diabetes mellitus, cardiovascular diseases, hypertension, stroke etc. on the other hand.

There are numerous researches which had been conducted to establish various risk factor associated with causation and progress of these non communicable diseases. In the mean time, Obesity, insulin resistance associated with lipid level disturbances was seen as metabolic syndrome. Later Metabolic syndrome was also proven as a risk factor in development and progression of cardiovascular disorders.

The current study was also begun with the aim to study the metabolic syndrome cases, and hence its association with development of cardiovascular disorders among the cases presented with metabolic syndrome in a tertiary healthcare institute KIMS Karad in Maharashtra.

As a side effect of improved and modernised lifestyles, the prevalence of consumption of junk, high calorie food is increased and on the same side physical activity has been reduced, which reflected in increased prevalence of obesity in India and globally too. On the similar rate, prevalence of metabolic syndrome is also increasing. Metabolic syndrome may affect most of the population and it may generate both vascular and metabolic complications.<sup>8</sup> The severity of inflammation in the metabolic syndrome measured by determining C-reactive protein and leukocytes is influenced by the number of criteria that make up metabolic syndrome.<sup>9</sup> Pro-inflammatory mechanisms can be considered as a base of increased cardiovascular risk.

Obesity related metabolic syndrome is associated with increase in the levels of a number of markers of inflammation especially CRP.<sup>10</sup> This subclinical or low grade inflammatory state in simple obesity is associated with increased risk for cardiovascular disease and diabetes.<sup>11</sup> Detection of this

systemic inflammation may help to identify children and adolescents at high risk for developing cardiovascular disease and diabetes later in the adulthood. In this study obese adolescent had higher systolic and diastolic blood pressure, and fasting blood glucose. Total cholesterol was higher in obese than normal, HDL was higher in obese rather than normal.

It has been reported that BMI and waist circumference are strong predictor of central body fatness. The increase of body weight and adiposity, in particular central depots in childhood and adolescents are associated to change in the metabolic profile and cardiovascular problems even early in adult life.<sup>12</sup>

In the present study, mean weight, body mass indices were more in study groups as compared to controls. Also the mean systolic and diastolic blood pressures were on higher side among the cases presented with metabolic syndrome as compared to controls (table-2). These results are consistent with some previous studies.<sup>13</sup> The results of the current study suggests that the inflammatory state that occurs in obesity may contribute to elevation of blood pressure, unlike other study.<sup>14</sup>

We also studied the lipid profile parameters in the current study. The mean LDL, Total cholesterol was higher among cases presented with metabolic syndrome as compared to control. The mean HDP levels were lower among cases presented with metabolic syndrome as compared to controls (table-3).

Hence this study observed that the hypertension may also increase cardiovascular risk by causing chronic endothelial injury promoting structural and functional vascular alterations, especially in the microvascular network.

## CONCLUSION

Metabolic syndrome is a risk factor for development of cardiovascular diseases. Evaluation of the parameters in metabolic syndrome can be a simple clinical tool to assess potential risk for development of cardiovascular diseases and hence assessment of prognosis and to establish and prioritize the resources appropriately.

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