Evaluation Of Prevalence And Clinical Profile Of Patients Of Metabolic Syndrome

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Abstract: Background: The metabolic syndrome is a highly prevalent condition among the patients with detrimental impact on short-term outcome. Early diagnosis, treatment including lifestyle modification and prevention of the metabolic syndrome may reduce the development of cardiovascular diseases like myocardial infarction including its complications. So, in this study we tried to find out prevalence of metabolic syndrome and study clinical profile, analyze biochemical parameters and study risk factors in patients with metabolic syndrome. Material And Methods: A prospective cross-sectional study was conducted in the department of medicine of tertiary care teaching hospital, Ahmedabad, India. Between August 2017 to August 2019. A total of 280 patients were selected randomly who visited the medical OPD. Diagnosis of Metabolic syndrome is based on: NCEP-ATP III 2001 (National cholesterol Education Program Adult Treatment Panel III). A detailed medical history of the patient including symptomatology, details of past illness, occupation, habits (smoking and alcohol) was obtained. A complete physical examination and systemic examination was performed. Results were expressed as mean± SD for continuous data and were compared by chi square test between two groups. Result: Out of the 280 cases, metabolic syndrome was present in 184 cases with incidence of 65.72%. 30% of males and 70% of females had metabolic syndrome. Mean age of metabolic syndrome in was 58 (57.84+11.35) years with age of patients ranged from 20 to 85 years with maximum number of cases were in the 51-60 years age group (33.2%). The most common mode of presentation in metabolic syndrome group was chest pain 45 (24.5%), followed by headache, 41 (22.3%), gabharaman, 29 (15.8%), fatigability, 29 (15.8%), and giddiness, 28 (15.2%). 31.5%, 22.3% and 22.8% of metabolic syndrome patients had past history of diabetes mellitus, hypertension and IHD respectively. In patients with metabolic syndrome, mean values of fasting blood glucose, serum triglyceride level, systolic blood pressure were 155.19mg/dl, 179.16mg/dl, 143.43 mm of Hg respectively. In patients with metabolic syndrome mean values of hdl level were 31.29mg/dl and 39.29mg/dl in male and females respectively. The most common biochemical abnormality was found to be increased triglyceride levels followed by increased fasting blood sugar. Conclusion: Early diagnosis, treatment including lifestyle modification and prevention of the metabolic syndrome may reduce the development of cardiovascular diseases like myocardial infarction including its complications. So, cardiovascular disease patients with metabolic syndrome must be identified and managed aggressively to reduce both morbidity and mortality. In this study, metabolic syndrome was more common amongst women who can be particularly attributed to high BMI, low HDL and increased waist circumference. [Suthar H Natl J Integr Res Med, 2021; 12(6): 40-47]

Key Words: Metabolic Syndrome, High Blood Pressure, Increased Triglyceride, Hyperglycemia

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Introduction: Metabolic syndrome is the term given to address a collection of risk factors. These risk factors are considered to increase risk for diabetes mellitus, coronary artery disease and cerebrovascular accident[1]. These diseases in turn lead to adverse outcomes causing 1.6 times increase in mortality. The Metabolic syndrome is a specific clustering of cardiovascular risk factors (central obesity, dyslipidemia, hypertension, glucose intolerance, a prothrombotic state and a proinflammatory state)[2-4]. Obesity and resistance to insulin are found to be mainly caused by absence of physical work, sedentary lifestyle and poor dietary habits like fatty foods. Studies have revealed the pathophysiology of this syndrome, with close to a sixfold increase in cardiovascular mortality in those possessing this disorder[5]. The increased risk of morbidity and mortality associated with the metabolic syndrome makes it essential that there be a clear understanding of the dimensions of this syndrome for the allocation of health care and research resources[6].

The guidelines issued by Adult Treatment Panel III(ATP-III) of National Cholesterol Education Program (NCEP)used to diagnose includes resistance to insulin, elevated blood pressure, elevated lipid profile and obesity[7]. All

components of metabolic syndrome are mostly preceded by obesity. At least 3 out of five components are necessary to make a diagnosis of metabolic syndrome. Ethnic and national specificity is required for waist circumference.

Genetics, ageing, state of inflammation and changes in hormone may also have a causal effect, but the role of these may vary depending on ethnic group. Certain risk factors that are non-classic like C - reactive protein, abnormal oxidized low-density lipoprotein-cholesterol and adiponectin are very much related to metabolic syndrome.

From a practical clinical perspective and also from a clinical standpoint people at high metabolic risk are identified by using the metabolic syndrome criteria[8]. A high level of low-density lipoprotein-cholesterol which is a traditional risk factor may be absent and so the individuals at high risk might be overlooked if these metabolic syndrome criteria are not utilized.

As metabolic syndrome being the important factor leading to two major diseases, cardiovascular diseases and type 2diabetes, there is an immense need on social, moral and on medical perspective for early detection of people with metabolic syndrome. Thus, the onset of diseases like diabetes, cardiovascular disease can be prevented very well by identifying metabolic syndrome earlier. These people can be advised and subjected to lifestyle modifications and started on appropriate treatment[9-11]. Thus, metabolic syndrome is helpful in rapid identification of people at high metabolic risk.

This study is undertaken to identify and assess the prognosis of metabolic syndrome by clinical and biochemical parameters as factors individuals.

Material & Methods: A prospective cross-sectional study was conducted in the department of medicine of department of medicine of tertiary care teaching hospital, Ahmedabad, India, between August 2017 to August 2019. A total of 280 patients were selected randomly who visited the medical OPD during the study years. Patients satisfying inclusion criteria were taken for the study. They were briefed about the study and their informed consent was taken. National Cholesterol Education Program Adult Treatment Panel III (ATP III) criteria was used to define metabolic syndrome in the study group. All patients selected underwent a thorough clinical examination and laboratory examination pertaining to metabolic syndrome.

Inclusion Criteria: Patients more than 20 years of age who consented for the study. Patients who were willing for regular follow up.

Exclusion Criteria: Patients aged <20 years. Patients who were pregnant. Patients not willing to participate in study. Patients with critical illness in the form of renal failure, liver failure, acute myocardial infarction, carcinoma. The confirmed cases for the study were finally analyzed and assessed clinically and by appropriate laboratory investigations.

Sample Size: Sample size was calculated by the help of prevalence rate obtained from a recent study in Gujarat (2015) [12]

Formula Used: $N= (Z_{1-a})^2 [P(1-P)/D^2]$, where N=sample size,1-a = confidence interval which is taken as 95%, P= prevalence, D= absolute precision required which is taken as 5%.

On applying the above mentioned formula the sample size was taken as 280. A detailed medical history of the patient including symptomatology, details of past illness, occupation, habits (smoking and alcohol) was obtained. A complete physical examination and systemic examination was performed.

Diagnosis of Metabolic syndrome is based on: NCEP-ATP III 2001 (National cholesterol Education Program Adult Treatment Panel III).

Definition of metabolic syndrome[13] includes: Three or more of the following:

- Central Obesity: waist circumference > 102 cm (40 in) male or > 88 cm (35 in) female.
- Hypertriglyceridemia: TGs ≥ 150mg/dl (>/=1.7 mmol/L)
- HDL Cholesterol: < 40mg/dl(male) or <50mg/dl(female)
- Hypertension: BP ≥130 /85 mmHg or specific medication.
- Fasting plasma glucose ≥ 110mg%(>/=5.6mmol/L) or on specific medication.

IDF Guidelines: Abdominal obesity as defined by waist circumference of >/= 90 cm for men and >/=80 cm for female specific for South Asians was used. Metabolic syndrome score ≥ 3 were taken as having metabolic syndrome in this study.

Sitting blood pressure was measured in brachial arteries of both arms with an appropriate mercury sphygmomanometer after 10 minutes of resting and the average of 2 systolic and diastolic blood pressures was taken. If a high BP was recorded then it was repeated and 3rd time blood pressure was taken after 30 mins and lowest of them was recorded finally.

Each patient's anthropological measurements were obtained with emphasis on height, weight, waist circumference, body mass index (BMI).

Waist girth was measured at a half way distance between anterior ischial crest and lower rib margin with full abdominal relaxation. Standing hip girth was taken. Girth measured at intertrochanter level. Weight was measured in KGs (kilograms) using calibrated weighing scale.

Height was measured in cm(centimeters) without footwear in standing position. BMI was calculated by dividing weight by height squared (kg/m^2).

Venous blood was collected in evacuated tubes after an overnight fast of 8-12 hours for serum triglycerides, hdl cholesterol, ldl cholesterol and fasting blood glucose levels. Individuals taking antihypertensive or statins or other lipid lowering agents were classified as having hypertension and dyslipidemia. Individuals taking insulin or oral hypoglycemic medications were classified as having diabetes.

Individuals who have been diagnosed as hypertension and diabetes but did not take any medications were not classified as having hypertension and diabetes. ECG was taken according to standard method and calibrated instruments after resting of patient. Results were expressed as mean± SD for continuous data and were compared by chi square test between two groups. A p value of 0.05 or less was considered for statistical significance.

Results: In out of the 280 cases, metabolic syndrome was present in 184 cases with incidence of 65.72%. Out of the 280 cases, 118(42.0%) were males and 162(58%) were females; 30% of males and 70% of females had metabolic syndrome. The incidence of metabolic syndrome was more common in females who were 129(70.1%) when compared to males who were 55(29.9%) which was statistically significant (p<0.0001). Mean age of metabolic syndrome in our study group was 58 (57.84±11.35) years with age of patients ranged from 20 to 85 years.

Maximum numbers of cases were in the 51-60 years age group (33.2%) followed by 41-50 years, 51(27.7%). Female cases predominated in group with metabolic syndrome (70%).

Results were expressed as mean SD for continuous data and were compared by chi square test between two groups.

In present study, the most common mode of presentation in metabolic syndrome group was chest pain 45 (24.5%), followed by headache, 41 (22.3%), gabharaman, 29 (15.8%), fatigability, 29 (15.8%), and giddiness, 28 (15.2%).

Breathlessness,18 (19.8%), weight gain, 11 (6.0%), polyuria/polyphagia, 11 (6%) were less common presentations. The past history of diabetes mellitus 58 (31.5%), hypertension 41 (22.8%) and history of ischemic heart disease 42 (22.8%) were more common in the metabolic syndrome group compared to those without metabolic syndrome who had past history of DM were 18 (18.8%), Hypertension were 10 (10.4%) and IHD were 9 (9.4%) and was significant statistically (p value < 0.05).

In metabolic syndrome patients, there were 36 (19.6%) patients who smoked and 16 (16.7%) patients had history of alcohol consumption. In patients of metabolic syndrome, all the components such as FBS ≥110mg% 119(42.5%), BP≥130/85 mm Hg 97 (34.64%), serum triglyceride ≥150mg/dl 135 (48.21%), HDL <40mg/dl [(M) 34(12.14%) and <50mg/dl (F) 111 (39.64%)], WC >/=90cm [(M) 43 (15.36%) and WC>/=80cm (F) 119 (42.5%)] were more common than patients without it and were strongly significant (p<0.0001). Out of 280 cases, 139 cases had their blood pressure in the metabolic syndrome range. 97 cases with metabolic syndrome had blood pressure of above 130/85 mm of hg. In them 63 cases were female and 34 were males. Higher number of hypertensive patients with metabolic syndrome was found to be statistically significant.

Out of 280 cases in the present study, 160 (103 females, 57 males) had serum triglycerides in the syndrome. Higher number of patients with increased triglycerides had metabolic syndrome and was found to be statistically significant than non-metabolic group. In present study of 280 cases, 182 cases had their fasting blood sugar in the metabolic syndrome range. Out of 182 cases, 136 (42.5%) had metabolic syndrome. In 136 cases, 37 were male and 99 were female.

Maximum number of females with metabolic syndrome fell in impaired fasting glucose 45 (35%) and diabetes mellitus 44 (34%). Maximum number of males were in the diabetes mellitus group 27 (49%) followed by cases in normoglycemia18 (32.7%). Higher number of patients with increased FBS in metabolic syndrome as compared to non-metabolic syndrome was statistically significant.

metabolic syndrome range. Out of the above 160, 135 (96 females, 39 males) had metabolic Out of 280 cases, 189 cases had HDL in the metabolic syndrome range out of which 104 cases had metabolic syndrome. Females with metabolic syndrome were 70 (54.2%) who had HDL <40mg/dl while the number of male cases were 34 (61%).

Among the components of metabolic syndrome fbs >/=110 mg% (42.5) was the most prevalent component in both the groups (42.5% in metabolic syndrome and 32% in without metabolic syndrome groups), followed by high triglycerides (48.21%) and high waist circumference in females (42.5%), low hdl (39.64) in females, hypertension (34.64%) or and high waist circumference in males (15.36%), in that order and was significant statistically.

Table 1: Demographic Profile Of Patients Of Metabolic Syndrome

Gender	Metabolic Syndrome (N=184)	No Metabolic Syndrome (N=96)	No Of Patients (N=280)	P Value
Male	55(29.9%)	63(65.6%)	118(42.1%)	<0.0001
Female	129 (70.1%)	33 (34.4%)	162 (57.9%)	
SYMPTOMS				
Chest Pain	45 (24.5%)	33 (34.4%)	78 (27.9%)	0.1512
Headache	41 (22.3%)	15 (15.6%)	56 (20.0%)	0.1629
Giddiness	28 (15.2%)	12 (12.5%)	40 (14.3%)	0.9425
Gabharaman	29 (15.8%)	14 (14.6%)	43 (15.4%)	0.9652
Fatigability	29 (15.8%)	12 (12.5%)	41 (14.6%)	0.5142
Breathlessness	18 (9.8%)	14 (14.6%)	32 (11.4%)	0.2017
Weight Gain	11 (6.0%)	9 (9.4%)	20(7.1%)	0.5692
Polyuria/Polyphagia	11 (6.0%)	2 (2.1%)	13 (4.6%)	0.3182
Risk Factor				
H/O Dm	58 (31.5%)	18 (18.8%)	76 (27.1%)	0.0412
H/O Htn	41 (22.3%)	10 (10.4%)	51 (18.2%)	0.0131
Ihd	42 (22.8%)	9 (9.4%)	51 (18.2%)	0.0042
Smoking	36 (19.6%)	16 (16.7%)	52 (18.6%)	0.4245
Alcohol	12(6%)	10(10.41%)	22(7.8%)	0.3597
Components Of Metabolic Syndrome				
FBS ≥110MG%	119 (42.5%)	32 (11.43%)	151(53.93%)	0.0006
BP ≥130/85 MM HG	97 (34.64%)	42 (15%)	139 (49.64%)	<0.0001
TGS ≥150MG/DL	135 (48.21%)	26(9.29%)	161 (57.5%)	0.0014
HDL <40MG/DL (M)	34 (12.14%)	27 (9.64%)	61 (21.79%)	<0.0001
HDL <50MG/DL (F)	111 (39.64%)	17 (6.07%)	128 (45.71%)	<0.0001
WC >/=90CM (M)	43 (15.36%)	25 (8.93%)	68 (24.29%)	<0.0001
WC >/=80CM (F)	119 (42.5%)	21 (7.5%)	140 (50.0%)	<0.0001

Table 2: Age Wise Distribution Of Patients

Age (Years)	Metabolic Syndrome (N=184)	No Metabolic Syndrome (N=96)	No Of Patients (N=280)
21-30	3 (1.6%)	1 (1%)	4 (1.4%)
31-40	2 (1.1%)	3 (3.1%)	5 (1.8%)
41-50	51 (27.7%)	33 (34.4%)	84 (30%)
51-60	61 (33.2%)	25 (26%)	86 (30.7%)
61-70	48 (26.1%)	20 (20.8%)	64 (24.3%)
71-80	13 (7.1%)	11 (11.5%)	24 (8.6%)
>81	6 (3.3%)	3 (3.1%)	6 (3.2%)
Mean Age	58.12 ± 11.12	57.29 ± 11.84	57.84 ± 11.35
P Value	0.5623		

Table 3: Mean Values Of Parameters Of Metabolic Syndrome In Patients

Risk Factor	Metabolic Syndrome (N=184)	No Metabolic Syndrome (N=96)	P Value
FBS (mg/dl)	155.19 ± 65.62	137.28 ± 21.63	0.0010
Blood pressure (mm Hg)	143.43 ± 13.89	135.85 ± 22.18	<0.0001
Triglyceride (mg/dl)	179.16 ± 25.09	178.12 ± 22.17	<0.0001
HDL mg/dl (Male)	31.29 ± 5.83	33.03 ± 6.16	<0.0001
HDL mg/dl (Female)	39.29 ± 6.78	34.29 ± 8.60	<0.0001
Waist circumference in cm (Male)	99.74 ± 5.42	95.44± 4.90	0.0236
Waist circumference in cm (Female)	84.36 ± 7.00	90.23 ± 10.17	0.0247

Table 4: Correlation Of IHD And RBS With Metabolic Syndrome

Other Risk Factor	Metabolic Syndrome Odds Ratio	P Value
RBS	1.27 (1.08 - 1.27)	0.0012
Ischemic Heart Disease	0.75 (0.64 - 0.87)	0.0013

In the present study, it was found that parameters such as responsible risk factors of ischemic heart disease and RBS had strong correlation with metabolic syndrome which indicated that independent predictor of CVD mortality in patients with type 2 DM.

Discussion: In the present study, the overall prevalence of metabolic syndrome is 65% which is comparable with study done by Srinivasan et al[20] in which it is 60.9%. In the present study, maximum number of patients having metabolic syndrome were in the age group of 51-60 years, i.e., 61 patients (33.2%) followed by 41-50 years i.e., 51 patients (27.7%) The mean age was found to be 58.12 years which is comparable to J kaur et all[14] in which it was 52.3 years. In our study the females predominated in metabolic syndrome group i.e., 129 (70.1%). Raised BMI, lower level of HDL and increased waist circumference might be the probable reason for the increased occurrence of metabolic syndrome in females. In our study past history of diabetes mellitus (31.5%), hypertension (22.3%) and ischemic heart disease (22.8%) were present. When compared to other studies known diabetic patients,58 (31.5%) was comparable to study done by Saikat et al[21] in which it was found 31.5.

Table 5: Comparison Of Various Components In Metabolic Syndrome Patients In Different Studies

Study	FBS(>/=110mg/dl)	BP (>/=130 /85mm of Hg)	TGs(>/=150mg/dl)	HDL-C (</=50(F), </=40mg/dl, M)	WC (>/=90cms M,>/=80 cms F)
Rothangpui et al[19]	53%	73%	73%	43%	100%
RK Kotokeyb et al[16]	71.5%	37.5%	30%	50.5%	100%
Present study	42.5 %	34.64%	48.21%	52.9%	57.86%

All the components were more common in metabolic syndrome group compared to those without Metabolic Syndrome and were statistically significant. Blood pressure >130/85

mm of hg (34.64%) and and HDL-C level <50 mg/dl in female and <40mg/dl(52.9%) were comparable to R K Kotokey et al[16] in which it was found 37.5% and 50.5% respectively. In the present study, 15.36% of males and 42.5% females with a total of 57.86% had a waist circumference fulfilling the criteria of metabolic syndrome. It is comparable to the study done by RK Kotokey et al[16.] In the present study, the higher waist circumference may reflect the increasing burden of obesity in the current society keeping in mind the increasing prevalence of sedentary lifestyle.

In the present study, 10(6 females,4 males) cases of metabolic syndrome fell under underweight category while 50 cases had normal BMI (25 males and females). 42 (30 female and 12 male) cases came under overweight and 94 cases were obese (68 females and 26 males). Maximum numbers of patients were in overweight and obese category. In the present study 72% patients of metabolic syndrome were either overweight or obese.

In the present study out of 280 cases, 139 cases had their blood pressure in the metabolic syndrome range. 97 cases with metabolic syndrome had blood pressure of above 130/85 mm of hg. In them 63 cases were female and 34 were males. While 66 females and 21 males with metabolic study had blood pressure of <120/80 mm of hg.

In the present study the mean systolic blood pressure was 143.43mm Hg ±13.89, while the diastolic blood pressure was 86mmHg± 9.66. This was higher than the study done by Srinivasan et al[20] where the mean systolic blood pressure 136.2 mm Hg ±15.9 and diastolic blood pressure was 88.2mmHg ±9.3. In the present study, out of 280 cases, 182 cases had their fbs in the metabolic syndrome range. Out of 182 cases, 136 (42.5%) had metabolic syndrome. In 136 cases, 37 were male and 99 were female. Maximum number of females with metabolic syndrome fell in impaired fasting glucose 45 (35%) and diabetes mellitus 44 (34%). Maximum number of males were in the diabetes mellitus group 27(49%) followed by cases in normoglycemia 18 (32.7%). The mean FBS in metabolic syndrome cases is 155.19 $\pm$ 65.62.

In our study, 81 patients (35.5%) had fasting blood sugar greater than 125mg/dl and were hence newly diagnosed Diabetes Mellitus II patients. 55 patients (45%) had impaired fasting glucose and were hence at an increased risk of developing DM II which is comparable to Ramachandran A et al[22] in which the values were 45.4% and 26.7% respectively. Only 58 patients with metabolic syndrome have fasting blood glucose in the normal Range. In the present study, there are increased number of patients in the pre-diabetic range and lesser in the normoglycemic range compared to the previous study, reflecting increased burden of undiagnosed patients mainly because of the decreased awareness about the magnitude about the problem that diabetes is and also because a major part of the patient come from a lower socioeconomic-class. Lesser number of patients in the normoglycemic range may reflect the increasing incidence of DM II in the current society

In the present study of 280 cases, 184(65.7%) cases had HDL in the metabolic syndrome range out of which 104 cases had metabolic syndrome. Females with metabolic syndrome were 70 (54.2%) who had HDL <40mg/dl while the number of male cases were 34 (61%). 19 (15%) females and 14 (21%) males with metabolic syndrome had normal HDL levels. This is comparable to the Franklin Study in which 72.9% of males and 75.52% of females fulfilled the definition criteria[23]. However, there are a greater number of patients with HDL <40 mg/dl and 40-49mg/dl which can be explained by the lack of proper exercise in the current study population.

In the study done by Gupta R[17] 90.2% of females and 54.5% of males have low levels of serum HDL, while Gupta A[15] did the study in which 54.9% of males and 90.2% of females had HDL values fulfilling the definition criteria. Both the study i.e., by Gupta A and by Gupta R is comparable to the present study. The study done by Ramachandran et al[22] (N=475) had total of 65.5% of the population with low HDL values which is comparable to the present study. This may be because of the current sedentary lifestyle of the patients with lack of regular exercise. Out of 280 cases in the present study, 160 (103 females,57 males) had serum triglycerides in the metabolic syndrome range. Out of the above 160, 135 (96 females, 39 males) had metabolic syndrome. 49 (33 females, 16 males) cases of metabolic syndrome had normal triglyceride levels. In the present study 73.6% females and

71% males had elevated values of serum triglycerides level.

Conclusion: In present study, metabolic syndrome was more common amongst women which can be particularly attributed to high BMI, low HDL and increased waist circumference. The most common biochemical abnormality was found to be increased triglyceride levels followed by increased fasting blood sugar. Early diagnosis, treatment including lifestyle modification and prevention of the metabolic syndrome may reduce the development of cardiovascular diseases like myocardial infarction including its complications. So, cardiovascular disease patients with metabolic syndrome must be identified and managed aggressively to reduce both morbidity and mortality.

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