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Original Research Article

A Cross-Sectional Study of Various Factors Defining Metabolic Syndrome and Association between Patients with Metabolic Syndrome

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Abstract

Background: One of the major concerns with global public health is the metabolic syndrome (MetS). Clinical illnesses like metabolic syndrome, which increases the risk of developing cardiovascular diseases, can be brought on by risk factors.

Methods: This study took into account all of the patients who were referred to the department of medicine at the M.G.M. Medical College, Kishanganj, Bihar, India over a period of 22 months.

Results: Out of 100 patients in the current study, 62.9% had metabolic syndrome and a positive family history of hypertension and diabetes mellitus. 70.8% of the patients had metabolic syndrome and a smoking history that was favourable. Patients with a positive history of alcohol use had metabolic syndrome in 64.3% of cases. Patients in 73.9% of cases had metabolic syndrome and positive IHD family history. SBP >130 mmHg in 87% of individuals with metabolic syndrome, while DBP >85 mmHg in 78.85%. Furthermore, metabolic syndrome was seen in 71.8% of individuals using antihypertensive medications. In people with MS, the mean levels of LDL cholesterol, triglycerides, and total cholesterol are higher, whereas the mean levels of HDL cholesterol, an anti-atherogenic lipid, are lower. In more than 95% of patients, there was at least one lipid abnormality. Out of 62 individuals, approximately 81% had metabolic syndrome.

Conclusion: The metabolic syndrome's many elements all had a favourable correlation with abdominal obesity. In participants with abdominal obesity, systolic blood pressure values were noticeably greater than diastolic blood pressure. There are numerous risk factors for metabolic syndrome, which are influenced by different factors such as race, lifestyle, and geography. To comprehend the correlation between the many elements defining it, a larger investigation is required. This high-risk group needs to be encouraged to have a healthy lifestyle that includes avoiding tobacco use and managing their weight in a healthy way.

Introduction

In recent years, the metabolic syndrome has drawn more attention. The goal of this statement from the American Heart Association (AHA) and the National Heart, Lung, and Blood Institute (NHLBI) is to give medical practitioners the most recent advice on how to diagnose and treat persons with metabolic syndrome.

The metabolic syndrome is a collection of linked risk factors with metabolic origins that seem to actively encourage the onset of atherosclerotic cardiovascular disease (ASCVD). [1] Type 2 diabetes mellitus is more likely to develop in patients with the metabolic syndrome. The metabolic risk factors are a result of a different set of circumstances known as the underlying risk factors. In the recent years, a number of expert groups have made an effort to develop straightforward diagnostic standards that can be applied in clinical settings to identify patients who exhibit the numerous symptoms of the metabolic syndrome. Although the particular components of these criteria have varied significantly, they all generally combine underlying and metabolic risk factors.

Obesity in the abdomen and insulin resistance [2-7] appear to be the main underlying risk factors for the syndrome, along with physical inactivity, age [8], and hormonal imbalance. [9] Although it is not directly mentioned as an underlying risk factor for the syndrome, an atherogenic diet (e.g., one high in saturated fat and cholesterol) might increase a person's chance of developing cardiovascular disease. According to one idea, the metabolic syndrome is primarily caused by insulin resistance. [10] There is no denying that type 2 diabetes mellitus' hyperglycemia is predisposed by insulin resistance. In addition, other metabolic pathways have been postulated to connect compensatory hyperinsulinemia and insulin resistance to the other metabolic risk factors. [10,11] It is acknowledged that certain individuals, even those who do not meet classic definitions of obesity, have excessive levels of insulin resistance and metabolic risk factors. Examples include people who had two diabetic parents or one diabetic parent and a first- or second-degree relative [12]; this also applies to many people of South Asian ancestry. [13,14] Although those who are insulin-resistant need not be clinically obese, they frequently have an aberrant fat distribution that is predominately made up of upper body fat. Strong links exist between upper body fat and insulin resistance. Extra upper body fat may develop subcutaneously or intraperitoneally (visceral fat).

Finally, the clinical pattern of metabolic risk variables in obese/insulin-resistant people exhibits significant individual and ethnic diversity. [15,16] Each metabolic risk factor most certainly has some genetic control over how it expresses itself, which affects how the body reacts to various environmental exposures. For instance, the worsening of dyslipidemia in obese adults is linked to a number of polymorphisms in genes that impact lipoprotein metabolism. [17,18] Similar to insulin resistance, genetic susceptibility to faulty insulin production can cause abnormally high plasma glucose levels. [19]

Although type 2 diabetes mellitus is unmistakably predisposed by the metabolic syndrome, [20,21] many cardiovascular disease researchers view this condition as a multifaceted risk factor for ASCVD. [22] The metabolic syndrome is linked to a higher risk of cardiovascular disease, according to a number of recent studies, but the risk rises even further once type 2 diabetes mellitus is diagnosed. [23] Finally, fatty liver, polycystic ovarian syndrome, cholesterol gallstones, sleep apnea, lipodystrophies, and protease-inhibitor medication for HIV are only a few of the disorders that are linked to insulin resistance and the metabolic syndrome. These associations are sparking a lot of interest in a number of different medical specialties. [24,25]

Methods

This cross-sectional, population-based, retrospective, and non-randomized cohort study was carried out over a period of twenty-two months, at the department of medicine, M.G.M. Medical College, Kishanganj, Bihar, India. After receiving informed consent, patients with abdominal

obesity were enrolled in the study. All subjects underwent thorough clinical examinations, including weight, height, and abdominal circumference measurements (lipid profile, FBS, PPBS, serum creatinine, Blood urea, ECG, USG abdomen).

Patients who met the inclusion criteria had a waist measurement of > 89 cm for men and > 80 cm for women. (As per NCEP Adult Treatment Panel III - ATPIII). Other than obesity, illnesses such as hypothyroidism, paralytic ileus, ascites, pregnancy, intra-abdominal tumours, organomegaly, and cushing's syndrome that produce abdominal distension were also excluded. In this study, a number of variables were used to define the metabolic syndrome, including family history, smoking, alcohol use, ischemic heart disease (IHD), hypertension, and body mass index. Microsoft Excel was used to code and enter the data, which was then shown as frequency, percentages, and graphs. The study variables of the subjects were described using descriptive statistics.

Mean and standard deviation were used to represent variables in quantitative data, whereas proportions and percentages were used to represent variables in qualitative data. The chi-square test was used to examine the relationship between study risk factors and the prevalence of metabolic syndrome. A P-value <0.05 or lower was considered statistically significant after the P-values had been corrected using the Bonferroni technique. Statistical Package for Social Sciences (SPSS) software version 20 was used to statistically analyse the data.

Results

This cross-sectional, population-based, retrospective, and non-randomized cohort study was carried out over a period of twenty-two months, at the department of medicine, M.G.M. Medical College, Kishanganj, Bihar, India. In this study, 100 patients in total were examined to determine whether individuals with metabolic syndrome were associated with additional risk factors for the condition, such as family history, smoking, alcohol use, ischemic heart disease (IHD), hypertension, and body mass index. The details of the observations made during the investigation are attempted to be summarised in the following data.

According to Table 1 from the current study, 62.9% of the 100 patients had metabolic syndrome and a family history of hypertension or diabetes mellitus. 70.8% of the patients had metabolic syndrome and a smoking history that was favourable. Patients in 64.3% of cases had metabolic syndrome and a positive alcohol history. Patients in 73.9% of cases had metabolic syndrome and positive IHD family history.

Table 1: Prevalence of metabolic syndrome with respect to family history and present history

Family h/o and habits		Metabolic Syndrome				P- Value
		Present		Absent		
		No.	%	No.	%	
Family History	No (n=65)	44	69.1	19	30.7	0.518
	Yes (n= 35)	21	62.8	12	37.2	
Alcohol	No (n=75)	50	68.2	22	31.8	0.433
	Yes (n=28)	18	64.2	9	35.6	
Smoking	No (n=52)	32	63.4	18	36.4	0.718
	Yes (n=48)	19	64.4	11	35.8	
IHD	No (n=77)	49	64.8	26	35.0	0.422
	Yes (n=23)	**16**	**73.8**	**5**	**26.0**	

According to Table 2 of the current study, among the 100 patients, 87% of those with metabolic syndrome had SBPs >130 mmHg and 78% had DBPs >85 mmHg. Furthermore, metabolic syndrome was seen in 71.8% of individuals using antihypertensive medications.

Table 2: Prevalence of metabolic syndrome with respect to Hypertension profile

Hypertension		Metabolic Syndrome				P-Value
		Present		Absent		
		No.	%	No.	%	
DBP	Normal (n=48)	21	45.9	25	54.3	<0.001
	DBP >85 mmHg (n= 52)	12	21.3	42	78.9	
SBP	Normal (n=48)	26	51.8	24	48.0	0.009
	SBP > 130 mmHg (n=52)	5	12.4	41	87.4	
On anti HTN Drugs	No (n=61)	21	36.2	38	63.8	0.415
	Yes (n=39)	10	28.1	29	71.9	

The mean levels of total cholesterol, LDL cholesterol, and triglycerides are higher in MS patients than in controls, as shown in Table 3, whereas the mean levels of anti-atherogenic HDL cholesterol are lower. In more than 95% of patients, there was at least one lipid abnormality.

Table 3: Prevalence of metabolic syndrome with respect to Lipid profile of patients

Lipid Profile		Metabolic Syndrome				P-Value
		Present		Absent		
		No.	%	No.	%	
HDL Group	Normal (n=64)	34	54.6	28	45.2	<0.001
	Abnormal (n= 36)	31	88.8	3	11.0	
LDL Group	Normal (n=27)	10	40.6	15	59.2	0.001
	Abnormal (n=73)	55	76.6	16	23.2	
TGA Group	Normal (n=42)	15	38.0	25	61.8	<0.001
	Abnormal (n=58)	50	87.8	6	12.1	
CHO Group	Normal (n=53)	30	58.4	21	41.4	0.05
	Abnormal (n=47)	35	76.5	10	23.3	

Discussion

Around the world, MS is becoming more common. Although MS and its components are recognised as cardiovascular risk factors, it is anticipated that individuals with CVD will have a higher prevalence of this illness than the general population [26]. Previous research has shown that there are differences in the prevalence of MS depending on factors such gender, age, education level, BMI, and amount of physical activity [27–29]. As previously demonstrated, the bulk of our sample was made up of senior people (with a mean age of 51.0 years), and ageing is responsible for arterial stiffness, which predisposes to hypertension [30]. This could be the reason why all patients presented with hypertension.

It's important to remember that MS affected 61.5% of women and 70% of men in this study, despite the fact that there were no gender differences in MS prevalence or the number of MS components. It has been proven in the past, in various methods, that body weight and MS prevalence are related. In one study, people who were obese had a greater risk of developing MS [29]. Another study found that as BMI rises, MS prevalence also does [32]. A different study that employed two diagnostic criteria revealed

that having an abnormal BMI (low or high) increased the likelihood of developing MS [31].

According to the findings of this study, overweight people have a higher risk of developing MS. In order to emphasise the significance of body weight in MS, a longitudinal study found that MS progression was slowed in participants who were not overweight. When we independently evaluated the participants in our study and compared waist circumference to other anthropometric parameters like BMI, waist circumference was found to be more predictive of the metabolic syndrome. Although waist circumference and BMI don't give a full picture of overall risk, the present study's subject's waist circumference showed stronger connections with a number of risk factors.

This result implies that screening of the general populace can be done using waist circumference. Wei Shen et al., Shaper et al., Shepherd et al., Lofgren et al., and Deepa et al. [33,34] have all made observations that are consistent with ours. Waist circumference assessment seems to offer more detailed information on the likely existence of additional CHD risk factors, such as elevated plasma TG, diastolic blood pressure, and the presence of MS. This study does have some drawbacks. The sample size was small, to start. Second, there is insufficient proof of causality in a cross-sectional study. [35]

Conclusion

The metabolic syndrome's many elements all had a favourable correlation with abdominal obesity. In participants with abdominal obesity, systolic blood pressure values were noticeably greater than diastolic blood pressure. There are numerous risk factors for metabolic syndrome, which are influenced by different factors such as race, lifestyle, and geography. To comprehend the correlation between the many elements defining it, a larger investigation is required. This high-risk group needs to be encouraged to have a healthy lifestyle that includes avoiding tobacco use and managing their weight in a healthy way.

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