PREVALENCE OF METABOLIC SYNDROME IN CORONARY ARTERY DISEASE AND CEREBROVASCULAR ACCIDENT PATIENTS

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ABSTRACT

BACKGROUND

Metabolic syndromes are predisposing factors for development of coronary artery disease (CAD) and cerebrovascular accidents (CVA).

Aims and Objectives-

1. To assess the prevalence of metabolic syndrome in patients with coronary artery disease (CAD).
2. To assess the prevalence of metabolic syndrome in patients with cerebrovascular accident (CVA).
3. To compare the prevalence of metabolic syndrome in different groups (Age groups, gender, diabetics and non-diabetics, hypertensives and non-hypertensives, smokers and non-smokers, alcoholics and non-alcoholics) among the patients with CAD and CVA.

MATERIALS AND METHODS

It is a cross sectional study. Out of 100 patients, 50 Patients who had ECG and ECHO findings suggestive of coronary artery disease and 50 patients who had clinical & CT scan findings of cerebrovascular accident were included in the study. The prevalence of metabolic syndrome among these patients was estimated.

RESULTS

The prevalence of metabolic syndrome in patients with Coronary Artery Disease is 54%. The prevalence of metabolic syndrome in CVA patients is 48%. The prevalence of CAD is higher in elderly age groups. Prevalence of Metabolic syndrome is significantly higher in older age group than that in younger age group among patients with either CAD or CVA ($\chi^2 = 12.6$; $P < 0.05$).

CONCLUSION

There was a high prevalence of central obesity in CAD and CVA patients with metabolic syndrome. There is a high prevalence of dyslipidaemia in patients with metabolic syndrome. The prevalence of metabolic syndrome is significantly high in hypertensives among CAD and CVA patients. The prevalence of hypertension is the highest among the components of metabolic syndrome in CAD and CVA patients. The prevalence of metabolic syndrome is significantly high in patients with diabetes among CAD and CVA patients. There is decreased prevalence of metabolic syndrome among mild to moderate alcoholics. As age advances, prevalence of metabolic syndrome also increases. Females have increased prevalence of metabolic syndrome.

KEY WORDS

Metabolic Syndrome, Coronary Artery Disease (CAD) and Cerebrovascular Accident (CVA), Diabetes Mellitus [DM], Obesity, Hypertension [HTN].

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BACKGROUND

The recognition of the existence of metabolic syndrome (MetS) has developed over the last two decades, following the description of insulin resistance syndrome or syndrome X in 1988.¹

Depending on the definition used, the metabolic syndrome may include measures of general obesity (As reflected by BMI), central obesity.

(As reflected by WC or WHR), dyslipidaemia (Low HDL-C and/ or high Triglyceride levels), hyperglycaemia, high blood pressure and resistance to the action of Insulin.

The increasing prevalence of obesity across the world will result in increasing prevalence of metabolic syndrome.²

The various components of metabolic syndrome are predisposing factors for development of coronary artery disease (CAD) and cerebrovascular accident (CVA). Metabolic syndrome can initiate inflammation and atherogenic process in blood vessels and can lead to coronary artery disease and cerebrovascular disease.

The increase in the prevalence of metabolic syndrome leads to increased burden of cardiovascular and cerebrovascular disease in the population.

This study was conducted in hundred patients who presented with either CAD or CVA to know the prevalence of metabolic syndrome and its individual components in them as per NCEP: ATP III 2001 criteria which was revised in 2005.³

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Indian Scenario

Surveys in large cities in different parts of the country suggest that about one-third of the urban population in large cities in India have MetS. All classical risk factors comprising the MetS are prevalent in Asian Indians residing in India; 31.4% abdominal obesity, 45.6 % hypertriglyceridemia, 65.5% low HDL, 55.4% hypertension, and 26.7% raised fasting plasma glucose have been reported from South India.⁴

The rural prevalence of MetS is found to be reasonably low compared to the urban prevalence. A recent survey in Central India observed an overall MetS prevalence as per NCEP ATP III criteria to be 5.0% in the adult rural population.

Chennai Urban Rural Epidemiology study (CURES) estimated the prevalence in Urban South Indian Population to be 23.2% by WHO criteria, 18.3% by ATP III criteria and 25.8% by IDF criteria.⁴

Aims and Objectives

1. To assess the prevalence of metabolic syndrome in patients with coronary artery disease (CAD).
2. To assess the prevalence of metabolic syndrome in patients with cerebrovascular accident (CVA).
3. To compare the prevalence of metabolic syndrome in different groups (Age groups, gender, diabetics and non-diabetics, hypertensives and non-hypertensives, smokers and non-smokers, alcoholics and non-alcoholics) among the patients with CAD and CVA.

MATERIALS AND METHODS

It is a cross sectional study. This study was conducted in Katuri Medical College and Hospital, Guntur, Andhra Pradesh. The study period extended between January 2016 and October 2017.

All patients were thoroughly evaluated with a detailed history and appropriate investigations as per proforma. Metabolic syndrome in study subjects was diagnosed as per NCEP: ATP III 2001 criteria which was revised in 2005.

1. To measure waist circumference, top of right iliac crest is located. A measuring tape was placed in a horizontal plane around abdomen at level of iliac crest. Before reading measurement, it is estimated that the tape is snug but does not compress the skin and is parallel to floor. Measurement was at the end of normal expiration.
2. Blood samples for fasting blood glucose were taken after eight hours overnight fast. Blood samples for lipid profile were taken after 12 hours of overnight fast. Blood pressure was recorded in right upper limb with patient in sitting posture and for CVA patients it was recorded in supine posture.
3. Age and sex distribution were correlated with the patient having metabolic syndrome with CVA or CAD.
4. DM and hypertension were correlated with the patient having metabolic syndrome with CVA or CAD
5. Lipid profile of all the patients was correlated with the patient having metabolic syndrome with CVA or CAD
6. Patients were grouped according to the grouped assigned according to the report.

Sampling Methods

Stratified sampling.

Inclusion Criteria

1. 50 Patients who had ECG and ECHO findings suggestive of coronary Artery disease.
2. 50 Patients who had clinical & CT scan findings of cerebrovascular accident.

Exclusion Criteria

Patients with-

1. Valvular Heart disease
2. Schizophrenic Patients
3. Patients on Antipsychotics, antiretroviral therapy
4. Patient on oral contraceptives.
5. Systemic Malignancy, Nephrotic syndrome, Patients with vasculitis.

Statistical Methods

χ^2 test was used to compare the prevalence of metabolic syndrome in various groups like diabetics and non-diabetics, hypertensives and non-hypertensives, age groups, etc., among the CAD and CVA patients. A p-value of less than 0.05 is considered significant.

RESULTS

Sl. No.	Age	No. of Patients	With MetS	Without MetS	Prevalence of MetS
1.	31 - 40	11	3	8	27.3%
2.	41 - 50	15	4	11	26.6%
3.	51 - 60	39	22	17	56.4%
4.	61 - 70	25	13	12	52%
5.	>70	10	9	1	90%

Table 1. Age Specific Prevalence of Metabolic Syndrome in CAD and CVA Patients

This study shows that the prevalence of Metabolic syndrome is significantly higher in older age group than that in younger age group among patients with either CAD or CVA ($\chi^2 = 12.6$; $P < 0.05$).

Group	No. of Patients	With MetS	Without MetS	Prevalence of MetS
Male	71	31	40	43.6%
Female	29	20	9	68.9%

Table 2. Sex Specific Prevalence of Metabolic Syndrome in CAD & CVA Patients

In this study, the prevalence of metabolic syndrome in female patients (68.9%) with either CAD or CVA is found to be higher than that in male patients (43.6%) with either CAD or CVA. This higher prevalence in female Patients is statistically significant ($\chi^2 = 4.311$; $P < 0.05$).

Group	No. of Patients	With MetS	Without MetS	Prevalence of MetS
Diabetic	26	22	4	84.6%
Non-Diabetic	74	28	46	37.8%

Table 3. Prevalence of Metabolic Syndrome in CAD and CVA Patients With Diabetes and Without Diabetes

This study shows that the prevalence of metabolic syndrome in patients with either CAD or CVA is much higher in diabetics (84.6%) than that in patients without diabetes (37.8%). This difference is statistically extremely significant ($\chi^2 = 15.021$; $P < 0.001$).

Group	No. of Patients	With MetS	Without MetS	Prevalence of MetS
Hypertensive	33	25	8	75.7%
Non-Hypertensive	67	25	42	37.3%

Table 4. Prevalence of Metabolic Syndrome in CAD and CVA Patients With Hypertension & Without Hypertension

In this study, it is found that prevalence of metabolic syndrome is higher in hypertensive patients (75.7%) with either CAD or CVA than that in non-hypertensive patients (37.3%) with either CAD or CVA. This difference is statistically extremely significant ($\chi^2 = 11.578$; $P < 0.001$).

Group	No. of Patients	No of MetS Patients	Prevalence
CAD	50	27	54%
CVA	50	24	48%
Total	100	51	51%

Table 5. Prevalence of Metabolic Syndrome in CAD & CVA Patients

This study shows that the prevalence of metabolic syndrome in patients who are suffering from either CAD or CVA is 51%. Among CAD patients it is 54% and in CVA patients it is 48%.

Risk Factor	Male	Female	Total
Central Obesity	48%	78%	59%
TGL ≥ 150 on Treatment for Hypertriglyceridemia	61 %	94%	73%
Low HDL < 40 and < 50 in Males and Females Respectively	77%	77%	77%
BP $\geq 130/85$ or on Rx for Hypertension	74%	94%	96%
FBG ≥ 100 mg/ dl or on Rx for Diabetes.	74%	56%	67%

Table 6. Prevalence of Individual Risk Factors in Metabolic Syndrome Patients with CAD And CVA

In this study, among the CAD and CVA patients who are having metabolic syndrome, hypertension is the most prevalent component of metabolic syndrome, followed by dyslipidaemia.

DISCUSSION

Age Distribution in CAD Patient

In this study, it is observed that the number of coronary Artery disease patients increase as the age advances (Table 1)

This observation is supported by study of Sumita Dadani MD who showed in her study that age ≥ 40 is independently associated with coronary artery disease.⁵

Age Distribution in CVA Patients

In this study, it is observed that cerebrovascular accidents were more common in the patients as their age increases.

This observation is supported by Heart and stroke statistical update by AHA stroke statistics in 2008 which says that stroke can occur at any age, but it is primarily a disease of older people⁶. Starting at age 55, the risk of stroke doubles in each successive decade of life

Sex Distribution in CAD and CVA Patients

In this study it is observed that prevalence of CAD and CVA in a total of 100 cases is more common in males when compared to females (Tables 2).

This observation is supported by study of Orlando et al who showed that the prevalence of both cardiovascular disease and cerebrovascular is more common in males.⁷

Age Specific Prevalence of Metabolic Syndrome in CAD & CVA Patients

In this study it was observed that prevalence of metabolic syndrome is higher in elderly, almost 90% in the age group > 70 yrs. when compared to 27.2% in 31-40-year age group (Table 1). The prevalence of metabolic syndrome is significantly higher in elderly people when compared to younger people among the patients with either CAD or CVA.

This observation is supported by John E. Morely who stated in his editorial that metabolic syndrome is directly related to age.⁸

Thus, age is a non-modifiable major risk factor for MetS.

Sex Specific Prevalence of METS in CAD & CVA Patients

As per this study, it is observed that metabolic syndrome prevalence is higher in females i.e., 68.9%, when compared to males i.e., 43.6% (Table 2).

This study is supported by the study of Azizi et al., who showed that the metabolic syndrome was more commonly seen in women than in men (42% vs.

24%, $P < 0.001$) in a population of 10368 adults.⁹

This shows that although the prevalence of MetS is almost equal among men and women or a little higher in men in younger age groups, in the elderly age groups among whom the metabolic syndrome is common, its prevalence is higher among women. This can be attributed to higher prevalence of dyslipidaemia in women among the elderly age groups.

These studies which are done in general population showed significantly higher prevalence of metabolic syndrome in women. The current study which is done in a group of patients with CAD and CVA also showed a significantly higher prevalence in women ($\chi^2 = 4.311$, $P < 0.05$).

Prevalence of Metabolic Syndrome in Diabetics & Non-Diabetics Among Patients with CAD and CVA

In this study, about 84.6% of diabetics had metabolic syndrome and 37.8% of non-diabetics had metabolic syndrome (Table 3). So, prevalence of metabolic syndrome is significantly higher in diabetics than that in non-diabetics ($\chi^2 = 15.021$; $P < 0.001$).

This observation is supported by MM Alshkri and RR Elmehdawi et al who showed that there is high prevalence of NCEP ATP III criteria defined MetS in patients with type-2 diabetes mellitus.¹⁰

All these studies show a high prevalence of metabolic syndrome among diabetics. Insulin resistance which is the cause for type 2 diabetes mellitus is also a major contributor

for metabolic syndrome. Therefore, it is important for those caring for people with diabetes to be aware of whether their patients also meet the criteria for MetS. Overall, metabolic syndrome can serve as a simple clinical approach to identify persons for intervention to reduce both cardiovascular and cerebrovascular diseases and also type 2 DM.

Prevalence of Metabolic Syndrome in Hypertensives and Non-Hypertensives Among Patients with CAD and CVA

This study shows that the prevalence of metabolic syndrome is significantly high in hypertensives, i.e. 75.7% when compared to 37.3% in non-hypertensives (Table 4).

This observation is supported by S Thakur et al, who in their study conducted in Himachal Pradesh, showed that 68.6% and 63.6% of hypertensive patients had MetS according to the modified NCEP-ATP III criteria and IDF criteria, respectively.¹¹

These findings highlight the importance of hypertension as a potential risk factor for both cardiovascular and cerebrovascular events. They signify the potential contribution of hypertension to causation of metabolic syndrome and resultant morbidity and mortality. It has been demonstrated in this study that all patients of essential hypertension should be screened for various parameters of metabolic syndrome, as it was found that this population is at a higher risk of developing metabolic syndrome and its associated complications.^{12,13}

Prevalence of Metabolic Syndrome in CAD and CVA Patients

Prevalence of metabolic syndrome is 54% in CAD patients and 48% in stroke patients as per this study (Table 5). Overall, the prevalence of metabolic syndrome in patients with either CAD or CVA is 51%.

In the study done by Ravinder Garg et al., Prevalence of metabolic syndrome in CAD patients was 58% and in CVA patients it was 46%. Overall prevalence including both types of cases was found to be 52%.^{14,15}

Metabolic syndrome consists of multiple, interrelated risk factors of metabolic origin that appear to directly promote the development of cardiovascular and cerebrovascular diseases. The metabolic risk factors consist of central obesity, atherogenic dyslipidaemia (Elevated triglycerides and low HDL cholesterol concentrations), elevated blood pressure and elevated plasma glucose. Each component of metabolic syndrome is an individual risk factor for developing a cardiovascular or a cerebrovascular disease or both. If a person is having metabolic syndrome, it is suggestive that the person is having more than two or all of these risk factors. Hence such a person is more prone to develop cardiovascular or cerebrovascular disease than those without metabolic syndrome or those having only one of these risk factors.

In India, mortality attributable to cardiovascular disease is rising rapidly. So, there is an overwhelming moral, medical and economic imperative to identify individuals with metabolic syndrome early so that lifestyle interventions and treatment may prevent the development of diabetes, cardiovascular and cerebrovascular diseases.

Prevalence of Individual Components in Metabolic Syndrome

Among the individual components of metabolic syndrome, it is observed in this study that the decreasing order of prevalence is Hypertension, dyslipidaemia, impaired fasting glucose and increased waist circumference in a total of 49 metabolic syndrome cases (Table 6).

In the study of V. Achari et al, among the risk factors assessed, dyslipidaemia (Particularly abnormal TC/HDL ratio and elevated LDL cholesterol), smoking, hypertension and diabetes were associated with coronary artery disease in decreasing order of prevalence 16. In premature CAD, dyslipidaemia and (In males) smoking are of particular importance.¹⁶

Limitations of the Study

1. Age specific prevalence rates may not reflect exact prevalence in general CAD & CVA patients.
2. Prevalence of Hyperinsulinemia was not determined in this study as serum Insulin measurement is not a criterion for diagnosis of MetS as per NCEP: ATP III. Waist circumference in most of the stroke patients could only be measured in supine posture.

CONCLUSION

1. The prevalence of metabolic syndrome in patients with Coronary Artery Disease is 54%. This is higher than that in general population.
2. The prevalence of metabolic syndrome in CVA patients is 48%. This is higher than that in general population.
3. There is a high prevalence of central obesity in CAD and CVA patients with metabolic syndrome.
4. There is a high prevalence of dyslipidaemia in patients with metabolic syndrome.
5. The prevalence of metabolic syndrome is significantly high in hypertensives among CAD and CVA patients. The prevalence of hypertension is the highest among the components of metabolic syndrome in CAD and CVA patients.
6. The prevalence of metabolic syndrome is significantly high in patients with diabetes among CAD and CVA patients.
7. There is decreased prevalence of metabolic syndrome among mild to moderate alcoholics.
8. As age advances, prevalence of metabolic syndrome also increases.
9. Females have increased prevalence of metabolic syndrome.

There is an urgent need to explore nutrition and physical activity and their role in the prevention and treatment of disorders directly or indirectly in patients with metabolic syndrome. Early diagnosis and aggressive management of modifiable risk factors like diabetes, hypertension, dyslipidaemia, obesity, can halt this epidemic and hence reduce the burden of cardiovascular and cerebrovascular diseases.

So, Cardiometabolic Risk Initiative should be taken as national effort encouraging health care providers and general public to focus on the prevention, recognition and treatment of all risk factors of metabolic syndrome.

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