Original Research Article

Frequency of metabolic syndrome in stroke: a study in a tertiary health care centre in north Kerala

Swapna P. K.*

Department of Medicine, Pariyaram Medical College, Kerala, India

*Correspondence:
Dr. Swapna P. K.,
E-mail: pk.sapna@gmail.com

ABSTRACT

Background: Stroke is a leading cause of death and disability in developing countries beginning to affect young adults. Key components of the metabolic syndrome are important risk factors for stroke. This study intended to study the prevalence of metabolic syndrome in patients with stroke. Screening adolescents and young adults for components of metabolic syndrome will prove useful in clinical management, and its elements ultimately become important therapeutic targets for the reduction of stroke burden in the general population.

Methods: Data was collected from 150 patients who were admitted with cerebrovascular accident (CVA) in the Department of Medicine. Frequency tests were conducted for various risk factors. Chi-square and Fisher exact test were used to test the significance of proportion of study parameters in the classes. The observations in this study were analysed using SPSS software.

Results: Metabolic syndrome was present in 46% of the study population. Among the components of the metabolic syndrome, Hypertension was the most prevalent risk factor (68%). 67.14% of the population had 2 components of metabolic syndrome which predisposes them to a greater risk of developing metabolic syndrome over a period of few months to years.

Conclusions: With the obesity epidemic, the impact of the metabolic syndrome is likely to increase. Thus, diagnosing and adequately managing metabolic syndrome is an important step in the preventing cerebrovascular disease. This study emphasises the need to target the population with one or more components of the metabolic syndrome as they are at high risk of developing stroke in the future.

Keywords: Diabetes mellitus, Hypertension, Hypertriglyceridemia, Metabolic syndrome, Obesity

INTRODUCTION

The incidence of stroke is on the rise in the past few years. The prevalence of the stroke is increasing to epidemic proportions not only in the developed countries but also in developing nations. There has also been a surge in the incidence of metabolic syndrome in the past few years. In the national health and nutrition examination survey among 10,357 subjects, the prevalence of metabolic syndrome was significantly higher in persons with a self-reported history of stroke (43.5%) than in subjects with no history of

cerebrovascular disease (22.8%).[1] Metabolic syndrome was independently associated with stroke history in all ethnic groups and in both sexes (odds ratio, 2.16; 95% confidence interval, 1.48 to 3.16).[1] Metabolic syndrome includes the clustering of abdominal obesity, insulin resistance, dyslipidemia and elevated blood pressure. These components are independent risk factors for stroke. This association boosts the clinical use of the metabolic syndrome in the identification of individuals who are at a higher risk of suffering a stroke. If the young adults and adolescents can be screened for presence of metabolic syndrome early and managed appropriately, the incidence

of stroke could be reduced and thereby the morbidity. This emphasizes the importance of this study.

Studies have revealed that South Asians develop metabolic abnormalities at a lower body mass index and waist circumference than other ethnic population.[2] Most studies show that the metabolic syndrome is associated with an approximate doubling of cardiovascular disease risk and a 5-fold increased risk for type-2 Diabetes Mellitus.[2] Metabolic syndrome also plays a crucial role in development of stroke. It also increases the risk of non-alcoholic fatty liver disease, and fertility disorders.[2]

Abdominal adiposity and insulin resistance appear play a central role in the pathogenesis of this syndrome and its individual components. The increased risk of cardiovascular disease in patients with the metabolic syndrome is due to the inflammatory and hypercoagulable states that may occur in these patients.[3] In the presence of visceral obesity, several circulating inflammatory mediators including tumour necrosis factor (TNF), leptin, interleukin-6 (IL-6) and angiotensinogen are produced by the adipose tissue, thus suggesting the crucial role of visceral obesity in this syndrome.[4]

TNF inhibits insulin signaling and contributes to insulin resistance. Increase in blood pressure is due to Leptin which activates the immune system. IL-6 stimulates the production of C-reactive protein in the liver in obese subjects. Angiotensin II which is produced from angiotensinogen exerts its adverse endocrine effects through angiotensin II type 1 receptor (AT1) leading to aldosterone secretion and its effects, oxidative stress, sympathetic stimulation and vasoconstriction.[4] The metabolic syndrome is also associated with increased plasma levels of fibrinogen, coagulation factor VII and factor VIII causing a potential hypercoagulable state along with increased levels of plasminogen activator inhibitor-1, thus leading to a hypofibrinolytic state. All these elements predispose to thrombosis and hence increase the probability of stroke and coronary artery disease.[4] Hence lifestyle modification and weight loss should therefore be at the core of treating and preventing the metabolic syndrome and its components.

METHODS

It is a Hospital-based cross-sectional, observation study. Data was collected from 150 patients who were admitted with cerebrovascular accident (CVA) in the Department of Medicine at Pariyaram Medical College Hospital, Kannur, Kerala, India.

Informed written consent was taken from the study participants. Detailed history including risk factors in the development of CVA, history of smoking, a history of stroke, family history of stroke, use of antidiabetic, antihypertensive and antihyperlipidemic drugs, clinical findings and investigation reports were recorded in a pre-tested semi-structured questionnaire.

The diagnosis of metabolic syndrome was made based on the modified NCEP-ATPIII criteria.[5] Patients were diagnosed as metabolic syndrome on the basis of ATPIII criteria which include presence of at least three features:

- Blood pressure of >130/85 mmHg or treated hypertension
- Serum triglyceride level of ≥150 mg/dl (1.7 mmol/L)
- HDL cholesterol of <40 mg/dl (1.03 mmol/L) in men and <50 mg/dl (1.29 mmol/L) in women
- fasting glucose of >100 mg/dl (5.6 mmol/L) or previously diagnosed with type 2 diabetes and
- Central obesity measured by waist circumference.

Waist circumference was taken as greater than 90 cm in men and 80 cm in female according to waist circumference values for Asians as mentioned in the IDF criteria.[5] For all patients, blood pressure was taken after a rest period of 15 minutes. It was measured by a mercury sphygmomanometer with the patient in supine position in the upper limb not involved due to hemiparesis. The final blood pressure estimate was the average of three readings. Individuals on antihypertensive medications were considered as hypertension patients regardless of blood pressure levels. Waist circumference was measured by using a measuring tape positioned midway between the lowest rib and the iliac crest. Frequency tests were conducted for various risk factors. Chi-square and Fisher exact test have been used to test the significance of Proportions of study parameters in the classes. A p-value of 0.05 was considered as statistically significant. The observations in this study were analysed using SPSS version 16 software.

RESULTS

The highest prevalence of stroke was seen in the 8th decade. In males, the prevalence of stroke was highest in the 8th decade, and in females, the prevalence of stroke was highest in the 6th decade (Table 1).

Table 1: Age and sex-wise distribution of study population.

Age (years)	Males (No.)	Females (No.)
40-49	6	5
50-59	16	15
60-69	21	12
70-79	33	12
80-89	11	6
90-99	3	0
Total	90	50

Hypertension was prevalent in 68% of the study population. 37.14 % of the study population had Diabetes Mellitus. Impaired glucose tolerance was prevalent in 39% of the study population. Ischemic heart disease was the commonest cardiac disease associated with stroke (65%) followed by atrial fibrillation (19%), and

rheumatic heart disease (12%). 17.14% of the study population were detected to have elevated triglyceride levels and 58.57% of the study population had low HDL levels (Figure 1).
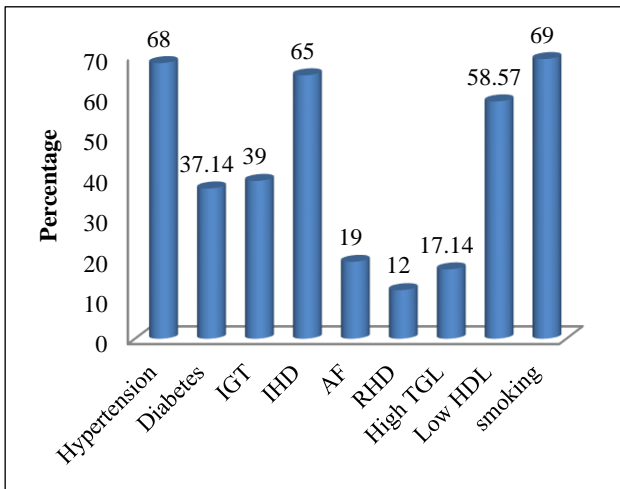

Figure 1: Prevalence of risk factors among the study subjects.

Impaired glucose tolerance, an important risk factor for stroke was prevalent in 39% of our study population. Metabolic syndrome was present in 46% of the study population admitted with stroke which indicates significant burden of the disease among south Indians (Figure 2).
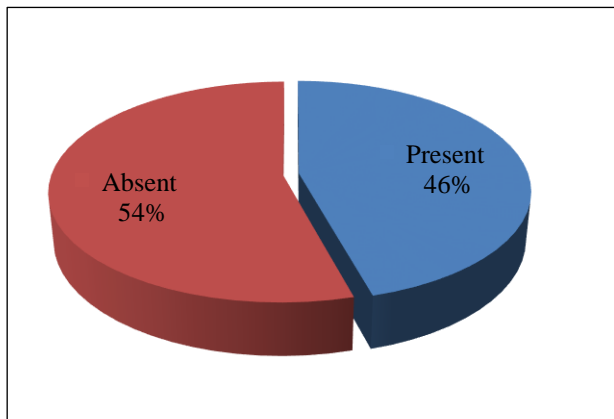

Figure 2: Prevalence of metabolic syndrome among study subjects admitted with stroke.

In the present study, the prevalence of metabolic syndrome was found to be more in males compared to females, in all age groups. This observation could be due to the predominance of males in the study (Figure 3).

Smoking, a risk factor for stroke was present in 69% of the study population. Past history of stroke was present in 13% of the population. 12.86% of the study population had a family history of stroke.
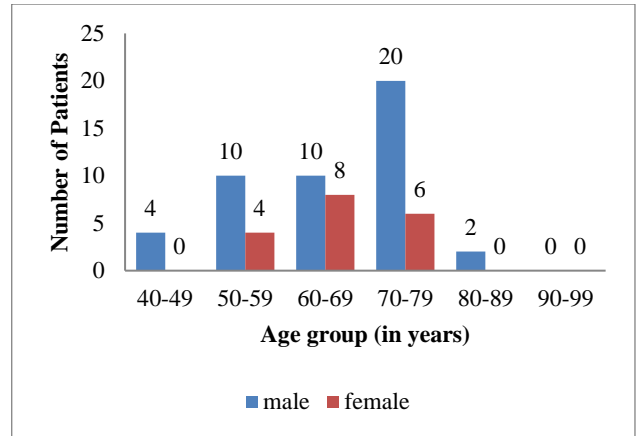

Figure 3: Prevalence of metabolic syndrome in males and females in different age groups.

DISCUSSION

The prevalence of stroke increased with age. This observation is supported by the study conducted by Curb JD et al.[6] A statistically significant association of metabolic syndrome with impaired glucose tolerance (p value: 0.001) was noted in the present study subjects admitted with stroke. The significance of this observation is substantiated by the study performed by Jianjun W et al, which illustrated that impaired glucose tolerance alone is as strong a predictor of stroke as is the metabolic syndrome.[7] The prevalence of metabolic syndrome was also observed to be statistically significant in the proportion of the present study subjects with history of ischemic heart disease (p value: 0.011). This observation substantiates the association of metabolic syndrome with cardiovascular disease.

Statistically significant association of metabolic syndrome with history of transient ischemic attack (p value: 0.024) and past history of stroke (p value: 0.027) was also apparent in the present study. This indicates that the cause for recurrence of stroke could be due to the previously existent metabolic syndrome. The frequency of metabolic syndrome detected in the present study was comparable to the study conducted by Koren and Morag. Et al in which the frequency of Metabolic syndrome was 56%.[8]

67.14% of the present study population had two components of metabolic syndrome which predisposes them to a greater risk of developing metabolic syndrome over a period of few months to years. These patients when targeted for optimal management of metabolic syndrome would prevent the incidence of future cerebrovascular accidents (stroke). As abdominal obesity and insulin resistance play a central role in development of metabolic syndrome, measures directed at preventing obesity and impaired glucose tolerance would eventually also help to prevent development of diabetes mellitus, hypertension and dyslipidemia which are the most important risk factors for stroke.

The Metabolic syndrome has been shown to be an important cluster of cardiovascular risk factors placing patients at an increased risk of Coronary artery disease and Ischemic stroke. In order to reduce the cardiovascular and cerebrovascular mortality and morbidity it is also important to target the population with impaired glucose tolerance and those with one or more components of the Metabolic syndrome as they are at high risk of developing it in the near future. Further understanding of gender and social class differences in terms of their impact on the Metabolic syndrome would help to effectively target populations at increased risk of ischemic stroke. This study, has given the baseline information about the prevalence of Metabolic syndrome in stroke patients in a tertiary care hospital. This data need to be evaluated further for formulation of health policies.

CONCLUSION

With the obesity epidemic, the impact of the metabolic syndrome is likely to increase. Thus, diagnosing and adequately managing metabolic syndrome is an important step in the preventing cerebrovascular disease. This study emphasises the need to target the population with one or more components of the metabolic syndrome as they are at high risk of developing stroke in the future.

ACKNOWLEDGEMENTS

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