Research Article

Incidence of Metabolic Syndrome in Ischemic Stroke Patients in South Indian Population

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Article info

Abstract

Stroke is an increasing public health concern throughout the world. The metabolic syndrome gives a 2 to 3 fold increased risk for coronary heart disease and a similar risk for future ischemic stroke .The present study was carried out to assess the prevalence of the metabolic syndrome in stroke patients at a multispecialty corporate hospital in South India. A prospective observational study was conducted over a period of six months with sample size of 35 subjects of both female and male patients of acute ischemic stroke within the age group of 30-70 years. The incidence of metabolic syndrome was ascertained by Adult Treatment Panel (ATP) III criteria. The prevalence of metabolic syndrome in the study population was found to be 60% (21/35). Among the population identified with the metabolic syndrome, 76.19% were men and 23.8% were women .On the basis of age, the metabolic syndrome was found to be more prevalent in the 60-69 years age group. Social habits indicated, smoking to be higher in the metabolic syndrome group. Out of the 21 ischemic stroke patients in the metabolic syndrome group, 14(66.67%) were predominantly non-vegetarians. Mean blood pressure was 113.42 ± 12.02 mmHg and fasting blood sugar were 155.09 ± 60.1 mg/dl and 16.4. 47 ± 76.69 mg/dl. The waist hip ratio had a mean value of 0.96± 0.02 cm and the mean body mass index was 26.32± 2.33 Kg/cm^2. The mean serum cholesterol, triglycerides and low density lipoproteins were 212.14±40.34 mg/dl, 225.14 ± 71.39 mg/dl and 189.66±34.5 mg/dl, respectively. The levels of high density lipoproteins were low in this group, with a mean value of 30.04± 8.55 mg/dl. There is a strong association between stroke and metabolic syndrome makes it a great burden for societies and a challenge to health care in developing countries including India.

1. INTRODUCTION

Stroke is an increasing public health concern throughout the world. It is the second commonest cause of death and the leading cause of long term disability[1]. More than two-third of the global burden of stroke is borne by developing countries, where the average of patients with stroke is fifteen years younger than that in developed countries [2]. In the developing world, stroke affects individuals in the most productive part of their life[3].

The metabolic syndrome is a substantial predictor of coronary artery disease and cardio vascular disease[4]. Hyperinsulinemia, impaired glucose tolerance, hypertriglyceridemia, abdominal obesity (apple body configuration) and hypertension, the combination commonly referred to as 'metabolic syndrome X' is important in the in the Indian context [5]. The metabolic syndrome gives a 2 to 3 fold increased risk for coronary heart disease and a similar risk for future ischemic stroke[6]. Several prior reports have associated the metabolic syndrome with stroke risk in middle aged to older adults [7,8]. The relative contribution of genetic predisposition and extraneous influence such as food, tobacco and environmental factors in the pathogenesis of metabolic syndrome among the South Indian population is at present unknown [9].

With large-scale urbanization and high stress lifestyles of modern Indians, the metabolic syndrome appears to be set to become an epidemic. The present study was carried out to assess the prevalence of the metabolic syndrome in a population of stroke patients at a multispecialty corporate hospital in South India.

2. MATERIALS AND METHODS

2.1 Study Design
A prospective observational study.

2.2 Study Site
The study was conducted in the department of neurology, Kovai Medical Center and Hospital, a multispeciality hospital in Coimbatore, South India. For obtaining the clearance certificate, an application along with study protocol was submitted to the Chairman of the KMCH Ethics Committee, Kovai Medical Centre and Hospital, The study was approved by Committee by issuing ethical clearance certificate

2.3 Study Period
The study was conducted over a period of six months from June 2007 to December 2007.

2.4 Study Population
A total of 35 subjects were included in this study.

2.5 Study Criteria
The following are the inclusion and exclusion criteria for the study:

2.5.1 Inclusion Criteria
- Both female and male patients of acute ischemic stroke within the age group of 30-70years.
- Patients with no evidence of intracranial or subarachnoid hemorrhage.

2.5.2 Exclusion Criteria
- Patients with hemorrhagic stroke.

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- Patients who diagnosed as Transient Ischemic Attack (TIA).

2.6 Sources of Data

The data was collected from various sources such as patients' case reports, treatment charts, and laboratory reports and also through direct patient interview.

Patients who met the study criteria were included in the study. The diagnosis of ischemic stroke was supported in every patient by axial CT and/or MRI. The study was explained to the patients and their relatives and oral consent were taken. Patient demographics include weight, height, waist-hip ratio, social and dietary habits, past medical history etc. were collected through patient interview. The other necessary findings like laboratory investigations, prescribed drugs were collected from the patient case reports and treatment charts.

2.7 Statistical Analysis

The incidence of metabolic syndrome was ascertained by Adult Treatment Panel (ATP) III criteria[10]. Individual variables were expressed as percentages. Significance of the differences between the means of different groups was assessed by the Students 't' test Significance was set at the $p < 0.05$ level.

## 3. RESULTS AND DISCUSSION

In this population based prospective study, potentially modifiable risk factors for ischemic stroke; metabolic syndrome and were evaluated among a total of 36 subjects with ischemic stroke during the period of June 2007 to December 2007. One patient was excluded from the study population. Even though she was admitted for ischemic stroke, she had no complaints of hypertension or diabetes. However, she had a past medication history of anti psychotic treatment for the past 20 years.

On the basis of National Cholesterol Education Program (NCEP) definition, the prevalence of metabolic syndrome in the study population was found to be 60% (21/35) (Table.1)

**Table 1:** Prevalence of Metabolic Syndrome among the Study Population (n=35)

Prevalence	Number of subjects (n=35)	Percentage (%)
Metabolic syndrome	21	60
Without metabolic syndrome	14	40

Among the population identified with the metabolic syndrome, 76.19% were men and 23.8% were women (Fig.1)
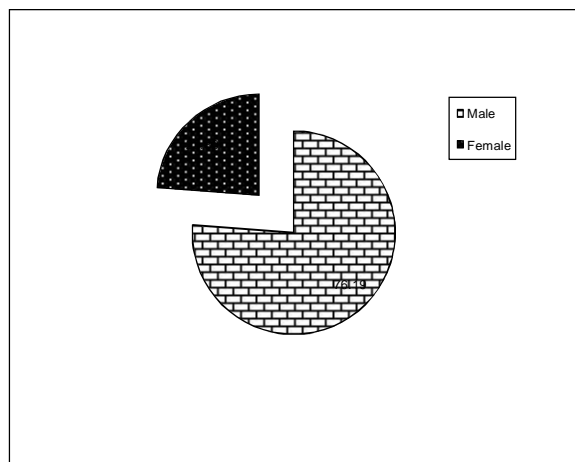
Figure 1: Gender wise distribution of the study population under metabolic syndrome (n=21)

On the basis of age, the metabolic syndrome was found to be more prevalent in the 60-69 years age group. Even though, people below 50 years of age are considered to be at a lower risk of stroke [11] in our study population, 23.8% were in the 40-49 years range. (fig.2)
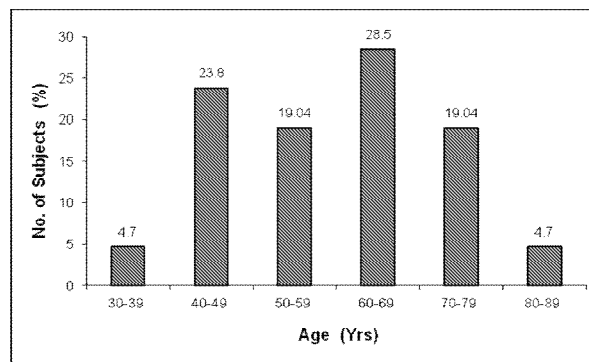
Figure 2: Age wise distribution of the study population under metabolic syndrome (n=21)

Social habits indicated, smoking to be higher in the metabolic syndrome group (Table.2)

Table 2: Social Habits of the study population under metabolic syndrome

Social habits	Metabolic syndrome group (n=21)	
	Number	Percentage (%)
Smoking	06	28.57
Alcohol	00	00
Smoking + Alcohol	05	23.80
Chewing Tobacco	00	00
Smoking+Alcohol+Chewing Tobacco	05	23.80
None	05	23.80

Out of the 21 ischemic stroke patients in the metabolic syndrome group, 14(66.67%) were predominantly non-vegetarians, while 5 were vegetarians and 2 patients were pure non-vegetarians. (Table: 3)

Table 3: Dietary habits of the study population under metabolic syndrome

Dietary habits	Metabolic Syndrome group (n=21)	
	Number	Percentage (%)
Purely Non-Vegetarian	02	9.25
Predominantly Non-Vegetarian	14	66.66
Predominantly Vegetarian	04	19.04
Purely Vegetarian	01	4.76

The clinical and laboratory data of the metabolic syndrome group are shown in table 4. Each parameter varied significantly from the control group. Mean blood pressure was 113.42 ± 12.02 mmHg and fasting blood sugar were 155.09 ± 60.1 mg/dl and 16.4. 47 ± 76.69 mg/dl. The waist hip ratio had a mean value of 0.96± 0.02 cm and the mean body mass index was 26.32± 2.33 Kg/cm^2.

Table 4: Clinical and laboratory parameters of the study population under metabolic syndrome (n=21)

Parameters	Control Group Mean ± SD (n=10)	Metabolic Syndrome group Mean ± SD (n=21)
Blood pressure (mm/Hg)	94.1±11.1	113.42±12.02*
Body mass index (BMI) (kg/cm²)	21.3±1.82	26.32±2.33*
Waist – Hip Ratio (WHR) (cm)	0.74±0.03	0.96±0.02*
Fasting blood sugar (FBS in mg/dl)	84.4±9.34	155.09±60.1*
Random blood sugar (RBS in mg/dl)	98.9±9.83	164.47±76.69*
Total serum cholesterol (mg/dl)	157.7±10.91	212.14±40.34*
Triglycerides (mg/dl)	117±46.29	225.14±71.39*
High density lipoproteins (HDL in mg/dl)	50.1±4.6	30.04±8.55*
Low density lipoproteins (LDL in mg/dl)	86.1±7.25	189.66±34.5*
Very low density lipoproteins (VLDL in mg/dl)	24.9±6.08	32.33±12.31*

* $p = < 0.001$

Dyslipidemia which is hall mark of the metabolic syndrome was a prominent feature in the study group. The mean serum cholesterol, triglycerides and low density lipoproteins were 212.14±40.34 mg/dl, 225.14 ± 71.39 mg/dl and 189.66±34.5 mg/dl, respectively. The levels of high density lipoproteins were low in this group, with a mean value of 30.04± 8.55 mg/dl.

The prevalence of the individual components of metabolic syndrome in the study population as per the ATP III criteria are shown in Table 5 thus proving the presence of the metabolic syndrome

Table 5: Baseline characteristics of study population having metabolic syndrome according to ATP III criteria

Parameters	Control Group Mean ± SD (n=10)	Metabolic Syndrome group Mean ± SD (n=21)
Waist circumference (Cm) Men Women	82.20±2.86 74.40±1.67	90.75±4.58* 84.20±4.27*
Blood pressure (mm/Hg)	94.1±11.1	113.42±12.02*
Fasting blood pressure (mg/dl)	84.4±9.34	155.04±60.14*
Triglycerides (mg/dl)	117±46.29	225.14 ± 71.39*
High density lipoproteins (mg/dl) Men Women	30.31±5.91 52.60±1.95	47.60±5.32* 33.20±6.46*

* $p = < 0.001$

The metabolic syndrome is a combination of several factors – each of which is a risk factor for occlusive vascular disease. The recognition of the existence of the metabolic syndrome has developed over the last two decades following the description of insulin resistance syndrome or syndrome X in 1988 [12].

The metabolic syndrome includes measures of general obesity (Body mass index), central obesity (waist circumference or waist-hip ratio), dyslipidaemia, high blood pressure and resistance to the action of insulin or dysglycaemia. The clustering of these factors increases the risk of cardiovascular and cerebrovascular diseases and therefore necessitates the measurement and treatment of the individual factors to reduce the incidence of occlusive disorders.

Convincing evidence has emerged in the last decade that there are important ethnic differences in the prevalence of the metabolic syndrome and researches show a higher prevalence of the metabolic syndrome in south Asians, Black African – Caribbeans and Hispanics.[13] In our study, the prevalence of metabolic syndrome in the ischemic stroke population, was high (60%), corroborating the above fact.

Prevalence of most individual factors of the metabolic syndrome increases with age – till late middle age[14].Our results show a similar trend with the number of patients with the syndrome being more in the 60-69 age groups. However, the 40-49 years age group also showed a preponderance of the syndrome, which may be attributed to lifestyle problems.

The metabolic syndrome has been found to be prevalent more in men than in women[15]. However there have been instances where the trend has been reversed[16]. Our results show a higher prevalence in males.

Obesity is an important factor influencing prevalence of the metabolic syndrome. Central obesity, measured as the waist circumference or the waist hip ratio (WHR) are good indictors of central obesity. Excess accumulation of visceral abdominal fat is associated with a higher prevalence of metabolic syndrome, particularly in those with normal body weight[17]. South Asians showed a pronounced tendency to central obesity[18]. In our study population the mean WHR was 0.96±0.02 cm and individually for men it was 0.96±0.12cm and for women it was 0.97±0.04. The waist circumference for men was 90.75 ± 4.58cm and women 84.20 ± 4.27cm. The WHR vales are indicative of central obesity.

Dyslipidemia is another factor common among South Asians. They had lower HDL and higher triglycerides than Europeans. Results in our study further corroborate this fact with high triglyceride levels and low HDL levels. Women were found to have lower HDL levels than men (33.20± 6.46mg/dl Vs 47.60 ± 5.32).

4. CONCLUSION

The strong association between occlusive cerebrovascular disease like stroke and metabolic syndrome make it a great burden for societies and a challenge to health care in developing countries including India. Our study aimed to evaluate the prevalence of the risk factors and metabolic syndrome in the incidence of ischemic stroke among an Indian population.

The prevalence of metabolic syndrome was found to be higher among the population. Men were more predisposed to metabolic syndrome. The percentages of smokers were high. Smoking, alcohol consumption and tobacco use is well marked. The dietary habit has a pronounced role in the incidence of metabolic syndrome, and is observed through central obesity which was found to be high in this population. General obesity as measured by BMI was absent but central obesity, which is particularly pronounced in South Asians, was a prominent feature of this group. Increased waist circumference which is a more substantial predictor of abdominal obesity was high in the population having metabolic syndrome. Triglyceride levels were increased in metabolic syndrome population, whereas high density lipoproteins were low. The blood pressure values in this group were not high but that was because of antihypertensive treatment. Antihypertensive treatment also happens to be a factor, to be considered in the ATP III criteria

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