

## Prevalence and Profile of Metabolic syndrome following Stroke in patients admitted in Hospital

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### Abstract

**Introduction-** Stroke manifests by various neurological signs and symptoms depending on extent, area of involvement and the underlying cause. These include coma, hemiplegia, paraplegia, monoplegia, cranial nerve palsy, speech disturbance and sensory impairment, etc. Of these, hemiplegia is the most common presentation, seen in about 90% of patients. **Objectives-1.**To study the incidence of metabolic syndrome in stroke patients. **2.**To study the role of various components of metabolic syndrome in association of stroke. **Methods-** All patients with stroke age more than 30 years and less than 60 years admitted in Chalmeda Hospital attached to Chalmeda Anand Rao Medical College, Karimnagar, Telangana during the study period from November 2013 to August 2015. Minimum of 50 subjects of stroke aged more than 30 years and less than 60 years. Simple random sampling was used. SPSS (22.0) was used for analysis. A detailed history of all subjects especially family history of hypertension, diabetes mellitus, history of weight gain, alcohol use and History of other cerebrovascular disease risk factors (including obesity, smoking, hyperlipidemia, diabetes) will be taken. **Results-** Out of 50 patients of stroke, 28 patients had metabolic syndrome. Incidence of metabolic syndrome in stroke was 56%. 70% were males and 30% were females. The incidence of metabolic syndrome was more common in female when compared to males. However it is not statistically significant. The most common mode of presentation in both stroke with metabolic syndrome and stroke without metabolic syndrome was weakness followed by deviation of angle of mouth, aphasia and loss of consciousness. **Conclusion-** Long-term follow-up population-based studies have demonstrated that healthy individuals with the Metabolic syndrome are at a markedly increased risk for major cardiovascular events, including stroke, and cardiovascular mortality.

**Keywords:** Stroke, metabolic syndrome, diabetes, aphasia, dyslipidemia, cerebrovascular disease.

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### Introduction

World Health Organisation defined stroke as “rapidly developing clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin”[1]. Stroke manifests by various neurological signs and symptoms depending on extent, area of involvement and the underlying cause. These include coma, hemiplegia, paraplegia, monoplegia, cranial nerve palsy, speech disturbance and sensory impairment, etc. Of these, hemiplegia is the most common presentation, seen in about 90% of patients. A WHO collaborative study in 12 countries showed that the incidence rates of stroke ranged from 0.2 to 2.5 per 1000 population per year. In most European countries the incidence was 4-8 per 1000 and in Japan it was 15 per 1000. In females ratios were 30 percent lower than males[2].

In India, analysis of data from major urban, university hospitals suggests that nearly 2 percent of all hospital cases, 4.5 percent of medical cases and 20 percent of neurological admissions are from stroke[3]. Globally approximately 15 million new acute onset stroke events occur every year. Two third of these individuals live in low and middle income countries like India. By 2050 it is anticipated that 80% stroke events will occur in people living in these regions. Stroke is the leading cause of death and disability in developing countries and average age of presentation of patients with stroke is 15 years younger than that in developed countries. Metabolic syndrome has attracted tremendous attention in recent years and more than five definitions of metabolic syndrome have been proposed by various medical societies. Among them new international diabetes federation definition is suitable for Indian population as it gives different waist circumferences for different ethnic groups. Studies have shown that prevalence of metabolic syndrome in developed countries is about 22-39% and India has strikingly high prevalence rates compared to rest of Asia approaching developed countries. Studies have shown that metabolic syndrome accounted for 30% of all ischemic strokes among women compared to 4% among men. Metabolic syndrome is associated with an increased risk of acute ischemic stroke in elderly subjects with significant contributions from its individual components. In the presence of metabolic syndrome, HDL cholesterol loses its protective role against ischemic stroke[4,5]. The metabolic syndrome is unfortunately a rampant condition and the syndrome may represent an independent risk factor above and beyond its components that will necessitate aggressive behavioural and possibly pharmacologic management geared at averting future stroke events.

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**Materials and Methods**

All patients with stroke age more 30 years and less than 60 years admitted in Chalmeda Hospital attached to Chalmeda Anand Rao Medical College, Karimnagar, Telangana during the study period from November 2013 to August 2015.

**Sample size**

Minimum of 50 subjects of stroke aged more than 30 years and less than 60 years.

**Sampling method**

Simple random sampling.

**Inclusion criteria**

- Both male and female patients presenting with neuroradiological features of stroke (clinically and ct scan proven including major and minor stroke) The criteria used in the clinical diagnosis of stroke were those set forth by the Adhoc committee of national institute of neurological diseases and blindness
- The patients with age more than 30 years and less than 60 years.

**Exclusion criteria**

- Patients with age less than 30 years and more than 60 years
- Neurological deficit not fitting into above clinical/radiological criteria for stroke

Data collected using a pretested proforma meeting the objectives of the study. Detailed history, physical examination and necessary investigations have been undertaken. The purpose of the study explained to the patient and informed consent taken.

The analysis of data will be done using appropriate statistical methods. Ethical committee approval has been taken for the study.

**Investigations**

- Routine blood examination: Hb%, TC, DC, ESR, Blood Urea, Serum Creatinine
- Fasting blood glucose and post prandial blood glucose
- Lipid profile
- Optic fundus examination
- ECG
- CT Scan
- MRI Scan (only in selected cases)

**Details of the study subjects**

A detailed history of all subjects especially family history of hypertension, diabetes mellitus, history of weight gain, alcohol use and History of other cerebrovascular disease risk factors (including obesity, smoking, hyperlipidemia, diabetes) will be taken. All subjects were subjected to thorough physical examination which included all peripheral pulses including carotids to rule out atherosclerosis Examination of waist and hip circumferences were measured, optic fundoscopic examination for any hypertensive changes, cardiovascular, respiratory, abdominal and CNS examination. At least three blood pressure measurements with same standard mercury sphygmomanometer and Littman's stethoscope in supine position.

**Statistical Analysis**

Recorded observations were collected and were analysed using SPSS software (Version 22.0). Chi-Square test was used for analysis.

**Results****Table 1: Incidence of metabolic syndrome in stroke**

	Stroke with metabolic syndrome	Stroke without metabolic syndrome
Incidence of metabolic syndrome in stroke	28	22

As per table 1 Out of 50 patients of stroke, 28 patients had metabolic syndrome. Incidence of metabolic syndrome in stroke was 56%.

**Table 2 : Association of Age and Gender with Stroke with Metabolic Syndrome**

Age group (years)	Stroke with metabolic syndrome	Stroke without metabolic syndrome	Total	p-value
31-40	10 (35.7%)	3 (13.6%)	13 (26%)	0.02*
41-50	8 (28.6%)	10 (45.5%)	18 (36%)	
51-60	10 (35.7%)	9 (40.9%)	19 (38%)	

As per table 2 Out of 50 patients with stroke majority of those with metabolic syndrome were in the 51-60 age group (38%). Thus it is statistically significant. 70% were males and 30% were females. The incidence of metabolic syndrome was more common in female when compared to males. However it is not statistically significant.

**Table 3: Symptomatology at the time of presentation**

Symptoms	Stroke with metabolic syndrome	Stroke without metabolic syndrome	Contingency coefficient	p-value
Weakness	27 (96.4%)	19 (86.4%)	0.181	>0.05
Deviation of angle of mouth	19 (67.9%)	12 (54.5%)	0.135	>0.05
Loss of consciousness	11 (39.3%)	6 (27.3%)	0.125	>0.05
Aphasia	7 (25%)	10 (45.5%)	0.210	>0.05

As per table 3 In our study, the most common mode of presentation in both stroke with metabolic syndrome and stroke without metabolic syndrome was weakness followed by deviation of angle of mouth, aphasia and loss of consciousness.

**Table 4: Major and Common risk factors**

Risk factors	Stroke with metabolic syndrome	Stroke without metabolic syndrome	Contingency coefficient	p-value
Diabetes mellitus	16 (57.1%)	3 (13.6%)	0.407	<0.05
Hypertension	21 (75%)	4 (18.2%)	0.491	<0.05

As per table 4 both diabetes mellitus and hypertension were most important risk factors in stroke with metabolic syndrome and were statistically significant. Alcohol and smoking as a risk factor are more common in patients of stroke with metabolic syndrome. However are not statistically significant. Finally history was same in both stroke with metabolic syndrome and stroke without metabolic syndrome.

**Table 5: Components of Metabolic Syndrome**

Components	Stroke with metabolic syndrome	Stroke without metabolic syndrome	Contingency coefficient	p-value
Waist circumference >90 for males >80 for females	28 (100%)	1 (4.5%)	0.660	<0.05
TG >150 mg/dl	21 (75%)	6 (27.3%)	0.429	<0.05
FBS >100 mg/dl	19 (67.9%)	6 (27.3%)	0.374	<0.05

DBP >85 mmHg	14 (50%)	5 (22.7%)	0.269	<0.05
SBP >130 mmHg	11 (30.3%)	3 (13.6%)	0.273	<0.05
HDL (mg/dl) <40 in males <50 in females	16 (57.1%)	5 (22.7%)	0.327	<0.05

As per table 5 all the components like waist circumference, triglycerides, fasting blood sugar, diastolic blood pressure, systolic blood pressure and HDL were found to be statistically significant ( $p < 0.05$ ) which concludes that patients having stroke with metabolic syndrome these components played a significant role.

**Table 6: Mean Values of Study Parameters**

Components	Stroke with metabolic syndrome	Stroke without metabolic syndrome	t-value	p-value
Waist circumference	94.78	76.36	0.000	<0.05
FBS (mg/dl)	122.7	102.4	0.015	<0.05
SBP (mmHg)	133.1	121.3	0.018	<0.05
DBP (mmHg)	82.4	75.5	0.017	<0.05
TG (mg/dl)	160.1	141.3	0.004	<0.05
HDL (mg/dl)	45.4	55.0	0.008	<0.05

As per table 6 it was observed that all the components were more common in the stroke with metabolic syndrome than in stroke without metabolic syndrome and were significant ( $p < 0.05$ ).

**Table 7: Types of Stroke**

Types	Stroke with metabolic syndrome	Stroke without metabolic syndrome
Ischemic	21 (75%)	17 (77%)
Hemorrhagic	7 (25%)	5 (22.7%)

According to table 7 it was observed that ischemic stroke was more common in patients of stroke with metabolic syndrome than in stroke without metabolic syndrome.

## Discussion

The study was conducted in 50 cases of stroke who had been admitted to Chalmeda Hospital attached to Chalmeda Medical College, Karimnagar. During the period from November 2013 to August 2015. All cases met inclusion criteria and exclusion criteria. Incidence of metabolic syndrome in stroke was 56% in the present study which is comparable to studies conducted by Boden-Albala et al.[6] and Simon-Cronin et al.[7]. Males predominated in patients of both stroke with metabolic syndrome and stroke without metabolic syndrome when compared to other studies conducted by Rodriguez-Colon et al.[8] and Boden-Albala et al.[6] where females predominated. In our study, diabetes mellitus and hypertension are important risk factors. However hypertension is more common when compared to studies conducted by Rodriguez-Colon et al.[8] and Simon-Cronin et al.[7] where diabetes mellitus was more common. In our study, both smoking and alcohol consumption contributed as independent risk factors with 60.7% and 57.1% when compared to studies conducted by Rodriguez-Colon et al.[8] Ashtari F et al.[9] and Kazunori Kayaba et al.[10] In our study, waist circumference was the most prevalence component of metabolic syndrome among all patients admitted with stroke (100% in stroke with metabolic syndrome and 4.5% among stroke without metabolic syndrome).

High triglycerides was the next most prevalent component (75% among stroke with metabolic syndrome and 27.3% among stroke without metabolic syndrome). Waist circumference was the minor component in studies conducted by Rodriguez-Colon et al.[8] Simon-Cronin et al.[7] and Ashtari F et al.[9] as they used NCEP ATP-III criteria where waist circumference was underestimated. In our study, International Diabetes Federation New Definition 2005 for defining metabolic syndrome B used where ethnicity and specific values are considered. In the present study, ischemic stroke was more common compared to other studies conducted by Rodriguez-Colon et al.[8] Simon-Cronin et al.[7] and Shihang Zhang et al.[11] In these studies also ischemic stroke is common compared to hemorrhagic stroke. More than 44% of the cohort had the metabolic syndrome. The metabolic syndrome was associated with increased risk of stroke and vascular events after adjustment for sociodemographic and risk factors. Simon Cronin et al. found growing body of evidence linking metabolic syndrome to stroke and other vascular events. The data were collected in the late 1980s and the baseline demographics depict a high rate (almost 40%) of metabolic syndrome in the general community at that time. Thus, the result extends previous reports of an association between metabolic syndrome and stroke to a younger

and larger at-risk population. Shihong Zhang et al found that metabolic syndrome is an important risk factor for incident stroke. A diagnosis of metabolic syndrome may prove useful in clinical management, and its elements should ultimately become important therapeutic targets for the reduction of the stroke burden in the general population[12,13,14].

## Conclusion

Metabolic syndrome is unfortunately a rampant condition that threatens to increasingly plague society in the years to come. It is associated with an increased risk for acute ischemic stroke/non-embolic stroke with significant contributions from its individual components. Metabolic syndrome is a clustering of risk factors of metabolic origin that are together associated with higher risk of cerebrovascular disease and hence the need to develop strategies for controlling this syndrome and its component conditions. Long-term follow-up population-based studies have demonstrated that healthy individuals with the Metabolic syndrome are at a markedly increased risk for major cardiovascular events, including stroke, and cardiovascular mortality. Moreover, the risk for incident ischemic stroke seems to augment with the increasing number of components of the metabolic syndrome, all of which have been individually associated with an increased risk for future cerebral ischemic events.

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