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A STUDY OF ASSOCIATION OF METABOLIC SYNDROME IN YOUNG STROKE PATIENTS

General Medicine

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ABSTRACT

Aim: The present study was carried out to estimate the prevalence and assess the association of the metabolic syndrome in a population of young stroke patients. **Material And Method:** This study was conducted on 50 patients of Cerebrovascular accident/Stroke. These patients were studied for prevalence and association of stroke with metabolic syndrome. Patients presenting with neuroradiological features of stroke (clinically and CT/MRI Brain proven) of age >15 years and <55 years were included in the study. Detailed history, physical examination and necessary investigations were undertaken. **Results:** The prevalence of metabolic syndrome in stroke patients was found to be 56% which was most prevalent in the age group of 40-50 years (50.0%). Prevalence of metabolic syndrome was more in females but the difference was statistically insignificant (p=0.144). Diabetes and Hypertension were the most common risk factors in metabolic syndrome patients and on statistical analysis the difference was significant (p<0.05). The difference was statistically significant for all the components of metabolic syndrome (Waist circumference, HDL, TGL, FBS, SBP, DBP). **Conclusion:** Prevalence of metabolic syndrome in young stroke patients is higher and we found a strong association of metabolic syndrome with young stroke patients.

KEYWORDS

Cerebrovascular Accident, Stroke, Metabolic Syndrome, Diabetes, Hypertension,

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 is the most common reason of disability, affecting more than 7,00,000 individuals. It is the third leading cause of death in the world per year. Stroke manifests by various neurological signs and symptoms depending on extent, area of involvement and the underlying cause. These include hemiplegia, monoplegia, cranial nerve palsy, coma, speech disturbance and sensory impairment, etc. Globally approximately 15 million new acute onset stroke events occur every year .Two third of these individuals live in low and middle income countries.[2]

The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2017 showed that stroke was the third-leading cause of death and disability combined (as measured by disability-adjusted life-years [DALYs]) and the second-leading cause of death in the world in 2017.[3,4] The results from GBD 2016[4] showed that 87·9% of ischemic stroke DALYs and 89·5% of hemorrhagic stroke DALYs were due to potentially modifiable risk factors measured in GBD, demonstrating the enormous potential to reduce the burden of stroke through reductions in risk factor exposure. According to WHO, effective stroke prevention strategies include reducing the risk associated with Hypertension (high systolic blood pressure), Dyslipidemia, Diabetes (high fasting plasma glucose), smoking, low physical activity, unhealthy diet, and abdominal obesity (high body-mass index [BMI])[5] which is similar to the findings from GBD 2016[4] The National Survey of Stroke revealed that only 3.7% of all strokes occurred in patients aged 15-45 years.[6] The incidence of stroke rises exponentially with age and is therefore low in young adults.[7,8]

While a specific definition of young stroke is lacking, the 20th edition Harrison's principles of internal medicine consider young stroke in individuals < 60 years of age.[9] The various risk factors and causes of young stroke includes dyslipidemia, smoking, hypertension, diabetes mellitus, premature atherosclerosis, migraine, valvular heart disease, pregnancy and puerperium, vascular malformation, arteritis, sickle cell anemia, Moyamoya disease, arterial dissection, Antiphospholipid arteriopathy, plasma-C protein deficiency and other coagulopathies.[10]

The available data indicate that stroke occurring in young people is more often atherothrombotic in origin in developing countries.[11-13] in contrast to the developed countries where arterial dissection and cardioembolic etiologies predominate.[14-17] Ischemic stroke occurring in young Indians may be a manifestation of accelerated cerebrovascular atherosclerosis, paralleling the early age of onset of cerebrovascular diseases noted for this population.[18] Additionally based on prior data on increased propensity for insulin resistance among South Asians,[19,20] the ischemic stroke in young adults in India may be associated with the metabolic syndrome.

The NCEP/ATP III modified Asian criteria require the presence of 3 or more of the following[21] :

Abdominal obesity	Waist circumference ≥ 90 cm in men and ≥ 80 cm in women
Triglyceride Level	>150 mg/dL or specific treatment for this lipid abnormality.
HDL Cholesterol Level	<40 mg/dL in males, <50 mg/dL in females or specific treatment for this lipid abnormality.
Blood pressure	Systolic BP>130 mmHg Or Diastolic BP>85 mmHg or treatment of previously diagnosed hypertension.
Fasting plasma glucose	FPG> 100 mg/dl or previously diagnosed type 2 diabetes or drug treatment of elevated glucose levels.

The presence of Metabolic Syndrome has been associated with an increased risk of prevalent stroke in the existing literature. In the National Health and Nutrition Examination Survey among 10357 subjects, the prevalence of Metabolic Syndrome was significantly higher in persons with a history of stroke (43.5%) than in subjects with no history of vascular disease (22.8%).

Metabolic Syndrome was independently associated with stroke history in all ethnic groups and in both sexes. This association supports the clinical use of the Metabolic Syndrome in the identification of subjects who are at an increased risk of experiencing a stroke.[22]

The recognition and management of the Metabolic Syndrome have been recently included in stroke prevention international guidelines. However, there is still controversy regarding whether the individual components of Metabolic Syndrome are equivalent or even better predictors of incident vascular disease than the Metabolic Syndrome itself and whether the Metabolic Syndrome is really more useful than validated risk factor scales in the stratification of stroke risk.

Therefore, the present study was carried out to estimate the prevalence

and assess the association of the metabolic syndrome in a population of young stroke patients.

MATERIALS AND METHODS

This study was carried out over a period of 24 months (2019 – 2021), 50 patients with stroke were recruited for the study after taking informed consent.

Inclusion Criteria:

1. Both male and female patients presenting with neuroradiological features of stroke (clinically and CT/MRI Brain proven).
2. Age >15 years and <55 years.

Exclusion Criteria:

1. Age less than 15 years or more than 55 years
2. Patients not giving informed consent.
3. Patients with previous history of stroke.

Data was collected using a performa, meeting the objectives of the study. Detailed history, physical examination and necessary investigations were undertaken. Anthropometry (including waist circumference, height, weight), cardiovascular, respiratory, abdominal and CNS examination was done. The analysis of data was done using appropriate statistical methods. Ethical committee approval was taken for the study.

Investigations Performed Were:

1. Complete Blood Count
2. Blood Urea, Serum Creatinine
3. Serum Uric Acid levels
4. Fasting blood glucose and Random blood glucose
5. Lipid profile
6. Electrocardiograph (ECG)
7. CT Scan/MRI Scan of Brain
8. USG Abdomen

RESULTS:

Table 1: Frequency And Percentage Of Stroke Patients Having Metabolic Syndrome.

Metabolic Syndrome	Number of patients	Percentage
Present	28	56
Absent	22	44

Table 1 show that out of 50 patients of stroke, 28 patients had metabolic syndrome. Prevalence of metabolic syndrome in stroke was 56%.

Table 2: Age Wise Distribution Of Study Population

Age Group	Stroke patients without metabolic syndrome		Stroke patients with metabolic syndrome		p value
	Number of Patients	Percentage	Number of Patients	Percentage	.064
<40 years	6	27.3%	2	7.2%	
40-49 years	12	54.5%	14	50.0%	
≥ 50 years	4	18.2%	12	42.8%	
Mean age +SD	44.73+7.72 years		46.21+6.52 years		

Table 2 show that out of total 28 stroke patients with metabolic syndrome, majority i.e 14 (50.0%) patients were of age group 40-49 years.More females (57.2%) were observed to have metabolic syndrome than males. However, the difference was not statistically significant. (p=0.144)

Table 3: Prevalence Of Diabetes And Hypertension In Study Population

Parameter	Yes/ No	Stroke patients without Metabolic Syndrome		Stroke patients with Metabolic Syndrome		p value
		Number of Patients	Percentage	Number of Patients	Percentage	
Diabetes Mellitus	Yes	4	19.0%	17	81.0%	0.002
	No	18	62.1%	11	37.9%	
Hypertension	Yes	8	30.8%	18	69.2%	0.050
	No	14	58.3%	10	41.7%	

DM and Hypertension were common risk factors in stroke patients with metabolic syndrome with a statistically significant difference on analysis the difference. (p=0.050).

Smoking and Alcohol intake were not observed as major risk factors with statistically insignificant difference. (p=0.981)

Table 4: Distribution Of Components Of Metabolic Syndrome In The Study Population.

Component	Value	Stroke patients without Metabolic Syndrome		Stroke patients with Metabolic Syndrome		p value
		Number of Patients	Percentage	Number of Patients	Percentage	
Waist Circumference	<80 cm (Females) <90 cm (Males)	14	41.2%	20	58.8%	0.001
	≥ 80 cm (Females) ≥ 90 cm (Males)	8	50.0%	8	50.0%	
High Density Lipoproteins	≥40mg/dL (Males) ≥50mg/dL (Females)	18	69.2%	8	30.8%	0.001
	<40mg/dL (Males) <50mg/dL (Females)	4	16.7%	20	83.3%	
Triglycerides	≤150 mg/dL	19	76.0%	6	24.0%	0.001
	>150mg/dL	3	12.0%	22	88.0%	
Hypertension	Non-Hypertensive	10	71.4%	4	28.6%	
	Previously diagnosed Hypertension or SBP >130 mmHg or DBP >85 mmHg	12	33.3%	24	66.7%	0.015

Table 4 show the components of metabolic syndrome and on statistical analysis the difference was highly significant with a mean value of 91.43±8.51 cm for waist circumference, 150.57±25.28 mmHg for SBP, 87.43±18.51 mmHg for DBP, 40.82±9.43 mg/dL for HDL, 168.32±36.78 mg/dL for triglycerides in stroke patients with metabolic syndrome and a mean value of 84.68±7.32 cm for waist circumference, 131.27±20.24 mmHg for SBP, 79.18±9.67 mmHg for DBP, 48.09±9.28 mg/dL for HDL, 131.14±32.71 mg/dL for triglycerides in stroke patients without metabolic syndrome. These values are lower for the latter group and the difference was statistically significant.

Table 5: Comparison Of Type Of Stroke In The Study Population

Type of Stroke	Stroke patients without Metabolic Syndrome		Stroke patients with Metabolic Syndrome		p value
	Number of Patients	Percentage	Number of Patients	Percentage	
Hemorrhagic	3	13.6%	3	10.7%	0.752
Ischemic	19	86.4%	25	89.3%	

Out of total 28 stroke patients with metabolic syndrome, 3 (10.7%) patients had hemorrhagic stroke and the remaining 25 (89.3%) patients had ischemic stroke. Out of 22 stroke patients without metabolic syndrome, 3 (13.6%) patients had hemorrhagic stroke and 19 (86.4%) had ischemic stroke. On statistical analysis (p=0.752), no statistically significant difference was found.

DISCUSSION

Metabolic syndrome is associated with different kind of diseases such as development of myocardial ischemia, ischemic stroke, extra and intracranial atherosclerotic and asymptomatic carotid atherosclerotic plaques. Sedentary lifestyle, dietary changes, and the obesity epidemic have led to a rising prevalence of Metabolic Syndrome, with the syndrome now affecting an estimated 47 million adults in the United States and other developing nations.

In the present study, the prevalence of metabolic syndrome in stroke patients was 56%. This was comparable to the studies conducted by Kumar et al[26] in 2021 in which the incidence of metabolic syndrome in stroke was observed to be 56 %. This is also in concordance to results reported by Patel K et al[28] in 2018 in which the prevalence of metabolic syndrome was found to be 40%. However, the frequency of metabolic syndrome in a study by Khafagy et al in 2019 was 76% which was higher compared to results of our study[24].

In our study, majority of stroke patients with metabolic syndrome were in the age group 40-50 years (50.0%) and 42.8% patients were above the age of 50 years of age. This was comparable to studies conducted by Kumar et al[26] in 2021, in which 35.7% of the patients were above 50 years. It is evident from our results and the results of other similar studies that Stroke incidence usually raises with increasing age (p=0.064).

In the present study, more females (57.2%) were observed to have metabolic syndrome than males (42.8%). Rodriguez-Colon et al[29] found 55% of the patients affected were females (p=0.144). In a study conducted by Amir et al[25] in 2020 and Boden-Albala et al[23] in 2008, it was observed that 50% and 62%, respectively stroke females were found to have metabolic syndrome. Kumar et al[26] and Patel K et al[28] found males predominance in patients of both stroke with metabolic syndrome and stroke without metabolic syndrome.

In our study, Diabetes and Hypertension were the most common risk factors ($p<0.05$) whereas smoking and alcohol ($p>0.05$) were not observed to be major risk factors for stroke in patients with metabolic syndrome. However, hypertension is more common as a risk factor when compared to studies conducted by Rodriguez-Colon et al[29] and Simon-Cronin et al in 2009 where diabetes mellitus was more common.[27]

Systolic blood pressure was found to be significantly increased in 66.7% patients with metabolic syndrome in our study (p value = 0.005), thereby implying a significant role in the causation of stroke in metabolic syndrome. Patel et al[28] observed that SBP was increased in 75% of stroke patients with metabolic syndrome, Rodriguez-Colon et al[29] observed that SBP was more than 130 mmHg in 67% of the patients.

On statistical analysis for the presence of various components of metabolic syndrome the difference was found to be highly significant with a mean value of 91.43 ± 8.51 cm for waist circumference, 150.57 ± 25.28 mmHg for SBP, 87.43 ± 18.51 mmHg for DBP, 40.82 ± 9.43 mg/dL for HDL, 168.32 ± 36.78 mg/dL for triglycerides in stroke patients with metabolic syndrome and a mean value of 84.68 ± 7.32 cm for waist circumference, 131.27 ± 20.24 mmHg for SBP, 79.18 ± 9.67 mmHg for DBP, 48.09 ± 9.28 mg/dL for HDL, 131.14 ± 32.71 mg/dL for triglycerides in stroke patients without metabolic syndrome. The observed values of all these parameters were found to be higher in the stroke patients with metabolic syndrome.($p<0.05$). The results were similar to the results of study conducted by Kumar et al[26]. Patel et al[28] and Bang et al [30] in which 45% and 39% patients, respectively had TG levels $\geq$ 150 mg/dL. A study done by Gordon et al (1981)[29] found that elevated level of TG appears to be associated with increased risk of ischemic stroke. These results are in concordance with the results of our study.

In the present study, ischemic stroke was more common than hemorrhagic stroke (p=0.752). These results were in concordance with other studies conducted by Rodriguez-Colon et al[29], Simon-Cronin et al[27] and Shihong Zhang et al[32] where it was observed that ischemic stroke is common compared to haemorrhagic stroke. The metabolic syndrome was associated with increased risk of stroke and vascular events after adjustment for sociodemographic profile and other risk factors. Simon Cronin et al[26] found a growing body of evidence linking metabolic syndrome to stroke and other vascular events.

CONCLUSION

We concluded that the prevalence of metabolic syndrome is higher in young (40-50 years) stroke patients and there is a strong association of various components of metabolic syndrome with stroke. Diabetes and hypertension were the most common risk factors in metabolic syndrome patients and on statistical analysis the difference was significant ($p<0.05$). More intensive lifestyle changes and management protocols (pharmacological treatment directed at decreasing circulating plasma glucose, HTN, weight gain, and dyslipidemia) may be required in these patients for controlling the components of the syndrome. Further prospective cohort study with large sample size is needed to investigate the relationship between metabolic syndrome and stroke for its primary and secondary prevention.

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