

## Study of Clinico-Etiological Profile of Stroke in Young in a Tertiary Care Centre in Central Tamil Nadu

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### Abstract

**Background:** Young population is the most productive age group in a community and contributes major share to the economy. The impact, stroke can leave is disproportionately large. Public health efforts addressing stroke in young is very scarce. Further research is needed in this field to decrease the burden of the disease in our society. The aim of our study was to find out the risk factors and to study the clinical and etiological profile of stroke in young.

**Materials and Methods:** This is a hospital-based prospective cross sectional study in patients in the age group 18-45 years, attending the Neurology Outpatient Department, casualty and Department of Internal Medicine of a tertiary care centre, in central Tamil Nadu, with history suggestive of stroke and in whom brain imaging showed evidence of stroke. The study was done for a period of 1 year.

**Results:** Among the 160 young persons with stroke, most affected were males (68.75%), ischemic stroke was seen in 50.625%, followed by intracerebral hemorrhage (ICH) in 35.0%, cortical venous thrombosis (CVT) in 7.5%, subarachnoid hemorrhage (SAH) in 6.875%. Hemiparesis was the most common presenting symptom. Alcohol consumption was the most prevalent risk factor for development of stroke, followed by other risk factors such as smoking and hypertension.

**Conclusion:** Stroke was predominantly seen in young male patients. Other than the traditional risk factors which are associated with stroke in young, unfavorable behavioral patterns like alcohol abuse, smoking also may promote development of stroke in young.

**Keywords:** Atherosclerosis; Hemiparesis; Hemorrhage; Ischemia; Subarachnoid.

### Introduction

The country has seen a rise in incidence of stroke in young adults in the last few years. The etiology may remain unknown in about a third of these patients.

Stroke is very uncommon in young adults. It constitutes about 10%–20% of all stroke patients<sup>1</sup>. As the victims belong to the reproductive age group

, this can have huge impact on the economy. The morbidity due to stroke is higher in young adults as most of them end up being dependent on others for the rest of their lives. Younger stroke patients have been shown to have an increased risk of death compared with the older patients with stroke. The modifiable risk factors like dyslipidemia, alcoholism, smoking, and hypertension are more common in young stroke. High risk behavior

is also more common in this age group. The main stay in reducing the incidence of stroke is primary prevention in the form of reducing high risk behaviours. Secondary prevention is done in the form of aggressive treatment of systemic hypertension, dyslipidemia and other additional risk factors. There is lack of specific consensus in the management of stroke in young adults. Hence stroke in young warrants a different approach to work up and management than stroke in older population considering the variations in the frequencies of the underlying etiologies. Although in younger patients determined and undetermined causes are common, atherosclerosis still contributes to a large proportion of stroke and hence conventional risk factors also has to be tested for and should be managed aggressively.

### ***Aims And Objectives***

In young stroke, the risk factors and etiology are varied and most of the time disparate when compared to the older population. Hence the younger population require different diagnostic and therapeutic interventions. Studies on stroke in young are less from the southern part of India. The aim is to study the risk factors, clinical profile and etiological factors of stroke cases among the young.

### **Materials And Methods**

This is a prospective hospital-based study of stroke in young, done in the Department of Neurology, at a tertiary care centre in central Tamil Nadu. The study was conducted for a period of 1 year, between October 2019 and October 2020. This was done in 160 patients who were clinically diagnosed to have stroke. All the patients included in the study were subjected to CT brain or MRI brain with MR Venogram and MR Angiogram. Patients attending the Neurology Outpatient Department, Casualty and Department of Internal Medicine with history suggestive of stroke and meeting the American Stroke Association (ASA) criteria were included in the study. Patients with conclusive evidence on imaging, metabolic encephalopathy and presence of intracranial space occupying lesions on imaging were excluded from the study. A pre-tested proforma meeting the objectives of the study was used to collect the data. Informed written consent was taken after explaining the objectives of the study. Detailed history was obtained regarding the clinical features, alcohol addiction, smoking and other high risk behaviours. Routine blood investigations along with CT brain/ MRI Brain with Venogram were done for all the patients. Detailed physical examination for any

evidence of anaemia, Cardiac murmur, carotid bruit and neurological examination by two neurologists blinded to the imaging and findings of other was done. The data were registered as demographic characteristics, family history, risk factors, neurological examination and diagnostic data.

Approval for the study was obtained from the institutional ethical committee.

### ***Inclusion criteria***

Patients in the age group of 18–45 years admitted in the hospital, who fulfilled the ASA definition of stroke.

### ***Exclusion criteria***

Patients with past history of stroke, head trauma preceding admission and secondary cause of intracerebral bleed like brain secondaries with bleed were excluded from the study.

The patients underwent neuroimaging initially with computed tomography (CT) scan and later with magnetic resonance imaging (MRI) with magnetic resonance venography (MRV) and MR angiogram (MRA). Other tests including blood coagulation profile, routine hemogram, blood glucose test, serum lipid profile, viral markers, blood venereal disease research laboratory (VDRL), electrocardiogram (ECG), echocardiography, carotid Doppler, and chest X-ray. Coagulation profile and vasculitis profile were done in necessary situations.

Stroke was classified as arterial and venous stroke such as ischemic stroke, ICH, CVT and SAH. Ischemic stroke is classified as atherosclerotic, cardioembolic stroke, other determined cause, and undetermined cause (cryptogenic stroke). Hemorrhagic stroke was categorized as basal ganglionic, lobar, thalamic, pontine, cerebellar, and intraventricular (primary, or secondary).

### **Results**

A total number of patients included in the study were 160.

Most of the patients were in the age group 35–45 years. The mean age of stroke was 38 years. The ratio of male to female was 2.2:1, showing male preponderance.

All patients underwent CT brain on admission. MRI brain with MRA and MRV was done in 137 patients. 23 patients underwent only CT brain/CT angiography. Routine blood tests, electrocardiography and echocardiography were

done in all the patients. In patients with ischemic stroke carotid Doppler was done. Ischemic stroke was seen in 81 patients (50.625%), hemorrhagic stroke in 56 patients (35.0%), cortical venous thrombosis in 12 patients (7.5%), subarachnoid hemorrhage in 11 patients (6.875%). (fig.1)

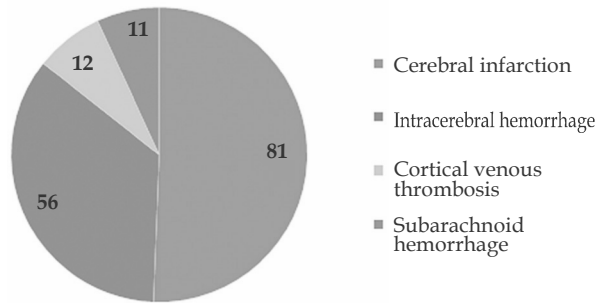


Fig.1: Distribution of cases.

Overall, the most common presenting symptom was hemiparesis which was seen in 82.5% patients. Headache was more common in hemorrhagic stroke. Headache was presenting symptom of all the patients with SAH and CVT. Seizure was seen in 19.6% of hemorrhagic and 7.40% of ischemic stroke and 50% of patients with CVT. Neck rigidity was detected in all the patients with SAH, 28.57% patients of ICH with intraventricular extension and the patient with intraventricular hemorrhage.

Out of the total, 34.37% of them were detected to have hypertension. 8.1% of them were already known case of systemic hypertension on treatment. 6.25% of them were diagnosed to have diabetes out of which one patient was already a known case on treatment. 80.35% of the patients with hemorrhagic stroke were detected to have systemic hypertension, with a male to female ratio of 1.64:1. Hypertension as risk factor was only seen in 12.34% of the patients with ischemic stroke.

The total number of patients with ischemic stroke was 50.625%. The most common category of stroke was atherosclerotic which was seen in 48.14%, followed by cardioembolic in 22.22%, other determined causes in 4.93%, and undetermined causes in 24.69%. 75.30% of the patients with ischemic stroke were males. The most common risk factor in ischemic stroke was alcohol abuse seen in 66.66%. History of smoking was present in 49.38%. Hypertension which is a common risk factor of stroke was detected in 12.34% patients. Similarly, diabetes mellitus was detected in 4.93%. Lipid profile was deranged in 4.93% of patient. Atherosclerosis was found in about 39 patients with the help of CV Doppler, CT angiogram or MR angiogram. CV Doppler showed ICA thrombus in two male patients

with ischemic stroke. In cardioembolic stroke, the most common cardiac lesion was rheumatic heart disease in 55.55%, followed by coronary artery disease with global hypokinesia in 27.77%, and cardiomyopathy in 16.66%. Transeosophageal ECHO was done in patients in whom a cause could not be identified and any cardiac lesion was ruled out. Vasculitis was detected in two female patients, which was due to systemic lupus erythematosus. Evidence of neurosyphilis in the form of blood and CSF VDRL positivity and blood Treponemapallidum agglutination test (TPHA) positive was detected in one male. One male patient was detected to have human immunodeficiency virus infection. Tuberculosis work up was negative in all the patients. Cause of infarction could not be ascertained in 20 (24.69%) patients. (fig. 2)

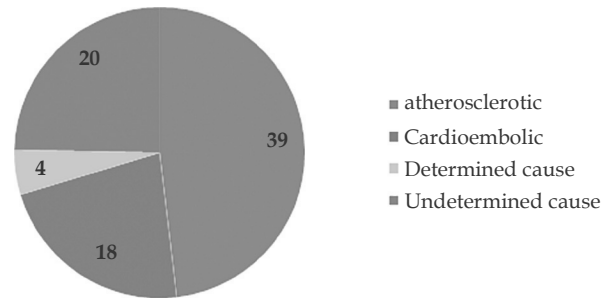


Fig.2: Distribution of ischemic stroke.

The total number of patients with ICH was 56. Male to female ratio was 1.8:1. The most common site for bleed was basal ganglia which was seen in 69.64% patients, followed by lobar in 28.57% patients. 26.78% of patients with ICH had intraventricular extension. In all patients with lobar hemorrhage, MR angiogram was done to rule out any arteriovenous malformation. Work up was also done to rule out any secondary causes of bleed. Primary intraventricular hemorrhage was detected in 1 patient (1.78%). The most common risk factor was hypertension and it was detected in 45 patients (80.35%). All patients with basal ganglia bleed were hypertensive. The second most common risk factor was alcohol abuse which was seen in 29 patients (51.78%). Coagulation abnormality was detected in 14.28%, in the form of elevated prothrombin time and APTT.

Cortical venous thrombosis was seen in 12 patients (7.5%). CVT patients with parenchymal venous infarct/bleed were only included in the study. All the CVT patients were males, all of them consumed alcohol. Substance abuse and smoking was seen in 58.33% of the CVT patients. Subarachnoid hemorrhage was seen in 11 patients (6.875%). Ratio of male to female patients

was 1.75:1(7 and 4)

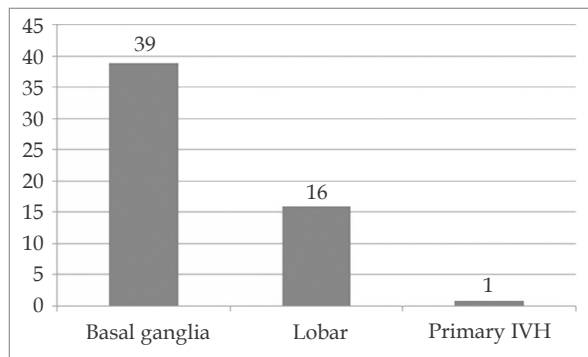


Fig. 3: Distribution of sites of Hemorrhagic stroke.

## Discussion

The present study detected that stroke was very common in young population and more common in young males. The high proportion is probably due to the inclusion of patients with CVT and SAH. The cause could not be determined about one fourth of the patients in our study. The FUTURE study was able to identify a specific risk factor for stroke in at least 94% of the study group<sup>2</sup>. But in practice the etiology is undetermined in about 30-40% of the stroke in young. Strokes of other determined etiology are also common among young patients with stroke<sup>3</sup>. An overall male preponderance was seen which was not different from many other studies. An Indian study conducted by Chandrasekhar et al in Telangana<sup>4</sup> shows a similar data. This is similar to data from other international studies as well<sup>5</sup>. The male preponderance was seen in both ischemic and hemorrhagic stroke. Only a very few studies showed higher incidence in women, especially those in their twenties<sup>6</sup>. The Dijon stroke registry showing trends in ischemic strokes between 1985 and 2011 also showed female preponderance in contrast to our study<sup>7</sup>. (fig.3)

Ischemic stroke is the most common type of stroke in young<sup>8</sup>. The total number of patients with ischemic stroke in our study were 81. The most common category of stroke was due to atherosclerosis (48.14%) in our study. Similar results were seen in various international studies. A study by Varona et al in Spain showed atherosclerosis as the most common risk factor among determined causes of stroke, but cause was undetermined in about one third of their study group<sup>9</sup>. The second most common cause of stroke in our study was undetermined or cryptogenic causes (24.69%), followed by cardioembolic in 22.22%, other determined causes in 4.93%. Whereas a few studies conducted in western countries showed cardioembolic stroke as the main cause

of ischemic stroke<sup>10</sup>. Ischemic stroke was more common in males, with a male-to-female ratio of 3.05:1. The most common risk factor in ischemic stroke was alcohol abuse seen in 66.66%, followed by smoking in 49.38%<sup>11,12,13,14</sup>. Findings from our study were similar to the other studies. All males with CVT consumed alcohol and around 58% of them gave history of substance abuse.

The total number of patients with ICH was 56 (39.09%). The male to female ratio was 1.8:1. In our study the most common risk factor was alcohol abuse seen in 51.78% closely followed by hypertension in 17 patients (30.35%). Almost similar result was seen in a North East Indian hospital based study by Hussain M et al.<sup>15</sup>, whereas as a foreign study by Sandoval et al showed tobacco use as the most common risk factor for hemorrhagic stroke.<sup>16</sup> The most common site of bleed was basal ganglia seen in 69.64%.

There are few limitations to our study. There are other different causes of stroke in young like mitochondrial disorders<sup>17</sup>. These could not be investigated to the full extent.

## Conclusion

Stroke in young warrants a varied approach for management. This is due to the different etiology as compared to the older patients. Our study shows that the modifiable risk factors such as alcohol consumption, smoking contributed to a large proportion of strokes in young along with the traditional risk factors, such as hypertension, diabetes and atherosclerosis that are seen in both elderly and young. Unfavorable behavioral patterns can lead to the development of well-documented risk factors. In young individuals with intracerebral hemorrhage, the possibility of drug abuse should be considered. Prevention is the primary treatment strategy that is aimed at reducing morbidity and mortality related to young stroke, but specific recommendations or guidelines in this regard are scarce<sup>18,19,20</sup>. There is a need for population-based studies of stroke in young, which will provide information on underlying etiology and incidence rates in different population.

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