**Scholars Journal of Applied Medical Sciences (SJAMS) ISSN: 2347-954X (P) & 2320-6691(O)**
**Sch. J. App. Med. Sci., 2013; 1(5):506-510**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2013.v01i05.0038

**Research Article**

# A Retrospective Study of Stroke in Young Adults from Tertiary Care Hospital

**Dr. Mohan. D. Kashinkunti*, Nikhitha Mantri, Dhananjaya M**
Department of Medicine, SDM College of Medical Sciences and Hospital, Manjushree Nagar, Sattur, Dharwad-09. Karnataka

**Corresponding author**
Dr. Mohan D Kashinkunti
**Email:** drmohandk@gmail.com

**Abstract:** Multiple etiologies are responsible for cases of stroke in young adults. This 2 years retrospective study comprises the causes of types of stroke (ischemic, intracerebral hemorrhage and embolism) in young adults aged 15 to 45 years, admitted to our tertiary care center from October 2011 to September 2013. The Aim and objective of the study was to determine the relative frequency of causes of stroke in young adults. There were 72 cases identified. Thirty cases of ischemic stroke (41.6%), 26 cases of intracerebral hemorrhage (36.1%) and embolism in 22.2% were identified. The leading cause of ischemic stroke was atherosclerosis in 18 cases (60%). Among cardiac causes infarction was attributable to consequences of rheumatic heart disease in 5 cases. In 3 cases a cessation or decrease in dose of warfarin was followed directly by an ischemic stroke. The most leading cause of intracerebral hemorrhage was hypertension (42%). Other causes were anticoagulant therapy, intratumoral hemorrhage, leukemia, and arteriovenous malformations. In conclusion it can be said that cardioembolism and hypertension were the most leading causes of ischemic and hemorrhagic stroke in young adults admitted in our hospital.
**Keywords:** Stroke, cerebral infarction, intracerebral hemorrhage, young adults, etiology, epidemiology.

## INTRODUCTION

Stroke is defined by the World Health Organization as “rapidly developed clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or until death, with no apparent non-vascular cause” [1]. Stroke is a leading cause of disease and death throughout the world [2].Stroke incidence rises steeply with age; therefore, stroke in younger people is less common; however, stroke in a young person can be devastating in terms of productive years lost and impact on a young person’s life. Some causes of stroke are more frequent in adults under 45 years of age compared to more aged populations [3]. We here provide an overview of the incidence and etiology of young stroke.

While a specific definition of “young stroke” is lacking, the vast majority of authors consider “young stroke” to pertain to individuals under 45 years of age. The three causes of ischemic stroke which are responsible for about 95 percent of cases in all agegroups, *i.e.* large vessel atherosclerosis, cardioembolism, and intracranial small vesseldisease and constitute only about 50 percent of causes ofischemic stroke in young adults [4-9]. Rare etiologies account for the other 50percent of cases [4-9]. Less than 5 percentof cerebral infarctions have been reported to occur inyoung adults [4, 7, 8], although more than 10% hasalso been reported [8].

Age has the strongest association with the incidence of stroke. For example, an 80 year old has about 30 times the risk of ischemic stroke than a 50 year old [10].The age-specific incidence of stroke increases progressively with increasing age. In a systematic review of 15 population-based stroke incidence studies, [11] the rate of total stroke for those aged less than 45 years ranged from 0.1-0.3 per 1000 person years, while for those aged 75-84 years, the range was 12-20 per 1000 person years in most studies.

Arterial dissection, which was reported in less than 10 percent of cases in the past [7, 8] is now diagnosed in up to 20 percent of cases [6, 12]. Cases of vertebrobasilar dissection, which was rarely diagnosed in the past, are now emerging as a common cause of stroke in young adults [3].

Similarly, use of advanced cardiac imaging has led recently to the identification of more cases of patent foramen ovale (PFO) which is considered the leading cause of cardio embolism in young adults in developed countries [4-6]. Intracerebral hemorrhage (ICH) has been poorly studied in young adults. Only 2 studies were specifically devoted to this condition [13, 14]. However, the causes and their relative proportion were clearly different in this age group. Amyloid angiopathy, estimated to cause about 10 percent of all intracerebral hemorrhages, was extremely rare in young adults. In one report, arteriovenous malformation was twice among common as hypertension as the cause of ICH in young adults [13]. The objective of the present study was to review the causes of two types of stroke (ischemic and intracerebral hemorrhage) in the young adults admitted to our tertiary care center.

## MATERIALS AND METHODS

This is a retrospective, record-based study of patients of stroke in the age group of 15-45 years admitted to tertiary care of North Karnataka. The patients were identified from the medical records, starting from October 2011 to September 2013. Consent was sought for accessing the medical records. 72 patients fulfilled the WHO definition of stroke. Important subtypes of stroke were included (i.e., ischemic, hemorrhagic, embolic). Patients who presented with drop attacks and loss of consciousness due to other causes were excluded. The following information was noted in a semistructuredproforma: the sociodemographic patient characteristics (like age, sex and occupation), presenting symptoms, risk factors present (like hypertension, diabetes mellitus, smoking, alcoholism, family history, cardiac disease and dyslipidemias, investigations performed and outcome following stroke.

### Stroke subtypes

Cardio embolic: presence of potential cardiac sources of embolism as documented from the ECHO cardiograph.

Hemorrhagic stroke: as documented from the cranial computerized tomography (CT) scan.

Ischemic stroke: supported by axial CT or digital subtraction angiography.

### Outcome of stroke

The cases were categorized into the following classes based on Activities of Daily Living (ADL). The data were fed into SPSS version 12 and analyzed. A chi-square test was used to determine whether the differences observed were statistically significant. A *P*-value <0.05 was considered to be significant.

## RESULTS

Of the 72 cases of stroke, 30 (41.6%) were ischemic stroke, 26 (36.1%) were hemorrhagic stroke and 16 (22.2%) were embolic stroke. Overall, there is male preponderance (38 out of 72) in all subtypes of stroke. Stroke is more common (27 out of 72) among the 31–45 years category as compare with the <30 years category.Cases of embolic stroke mostly presented with weakness in the limbs. Mostly (18 cases), they woke up in the morning and noticed loss of power. Headache was more common among hemorrhagic stroke, and it occurred in the evenings, between 4 pm and 6 pm. No pattern could be observed in the headache occurring among cases of ischemic stroke. Vomiting and seizures were more common among hemorrhagic stroke than in the other stroke subtypes.

### Risk factors

There were 43(59.7%) smokers, 38 (52.7%) alcoholics, 46 (63.9%) hypertensive and 25 (34.7%) diabetics. Family history of stroke was present in 18 patients. Using the body mass index (≥25) criteria, 42 were overweight, of which 24 were males. Abnormal platelets and coagulation parameters were found in four cases, all of which had hemorrhagic stroke. Elevated homocysteine was found in two cases, all of which had ischemic stroke (Table 1).

The diagnosis of atherosclerosis was based on evidence of atherosclerosis in Doppler ultrasonography of carotid and the presence of risk factors (long term diabetes, hypertension, smoking). Other causes of ischemic stroke were antithrombin III deficiency, vasospasm due to subarachnoid hemorrhage, and malignancy (endometrial myosarcoma with pulmonary metastasis). Possible causes of ischemic stroke were oral contraceptive pills (OCP) 2 cases and mitral valve prolapse (MVP) in 1 case. The causes of cardioembolism, ischemia and hypertension are shown in table 2. The underlying disease in cases of prosthetic heart valve and in the case of stroke after cardiac surgery (mitral valve replacement) was rheumatic heart disease (RHD) based on the history. Atrial fibrillation was present in 5 cases of RHD with mitral stenosis (MS). In 3cases (two with prosthetic valve and one with MS and atrial fibrillation) stroke occurred a few days after the cessation or decrease in dose of anticoagulant therapy with warfarin.The reasons were reduction the dose of warfarin for dental procedures and cessation by the patient.

Cardioembolism was a frequent cause of ischemic stroke in both men and women in equal incidence. Also cardioembolism was a more frequent cause of ischemic stroke in the 15-30 year age group than in 31-40 year age group. Hypertension was diagnosed as the cause of ICH in 11 (42%) of cases. Hypertension was more frequent in the 31-40 year age group than in the 15-30 year age group. Hypertension was also a more frequent cause of ICH in men compared with women.

Mortality was lower (9, 12.5%) than disability (21, 29.1%), and 32 (44.4%) had good outcome.

## DISCUSSION

A study from India performed on all subtypes of stroke in young adults [15] which found that ischemic stroke as the most common subtype followed by hemorrhagic and embolic sroke. Male preponderance of stroke was observed overall. Similar findings had been reported from Denmark in cases of thromboembolic stroke [16]. The higher proportion of males was found in the 31-45 years age group as reported by Nayak *et al*. [17].

Chopra and Prabhakar [18] and Nayak *et al*.[17], Kumar HNH *et al*.[19] had reported similar symptoms to those that has been found in our study.

Smoking, alcoholism and hypertension are found to be significantly associated with ischemic stroke [17, 20] and in all subtype strokes. Diabetes mellitus is reported to be a risk factor for ischemic stroke from India [21] and Switzerland [20], while it is not found to be a risk

factor in Sweden [4]. Hypercholesterolemia and hypertriglyceridemia are known to be associated with stroke in young adults [20, 22]. The proportion of patients who did not have an abnormal lipid profile was so low in this study and hence could not undertake a meaningful analysis. Association of elevated homocysteine levels in sroke was reported from the USA but requires further investigation in Indian setting [23]. Hematological disorders also have been considered to be the cause of ischemic stroke [12, 24].

**Table 1: Patient demography and characteristics in different types of stroke**

| Characteristics | | Ischemic | Hemorragic | Embolism |
|---|---|---|---|---|
| **Age** | 15-25 | 8 | 6 | 7 |
| | 16-25 | 10 | 9 | 5 |
| | 36-45 | 12 | 11 | 4 |
| **Sex** | Male | 17 | 13 | 8 |
| | Female | 13 | 13 | 8 |
| **Smoking** | Yes | 19 | 14 | 10 |
| | No | 11 | 12 | 6 |
| **Hypertension** | Yes | 16 | 22 | 8 |
| | No | 14 | 4 | 8 |
| **Diabetes** | Yes | 11 | 8 | 6 |
| | No | 19 | 18 | 10 |
| **Obesity** | Yes | 17 | 16 | 9 |
| | No | 13 | 10 | 7 |
| **Hypercholesterolemia** | Yes | 18 | 8 | 10 |
| | No | 12 | 18 | 6 |

**Table 2: etiological factors of stroke in young**

| Types | Patient |
|---|---|
| **Ischemia** | |
| Atherosclerosis | 18 |
| Hypercoagulable State | 4 |
| Vasospasm | 3 |
| OCP | 2 |
| Mitral Valve Prolapse | 1 |
| No Definitive Cause | 2 |
| **Hemorrhage** | |
| Hypertension | 11 |
| Anticoagulation | 3 |
| Av Malformation | 2 |
| Leukemia | 2 |
| No Definitive Cause | 6 |
| **Embolism** | |
| Rheumatic Heart Disease | 5 |
| Prosthetic Valve | 5 |
| Infective Endocarditis | 2 |
| ASD | 2 |
| Atrial Myxoma | 1 |
| Cardiac Surgery | 1 |

The proportion of cases with Intracerebral hemorrhage (ICH) in young adults varies between 9 to 23 percent in different reports [12, 24, 25] although a report reveals that the proportion of hemorrhage was superior to that of infarct [26]. In two studies for intracerebral hemorrhage in young adults, one study had shown that arteriovenous malformations were diagnosed in 20 cases out of 72 patients aged 15 to 45 years (29%). Other etiologies were hypertension (15%), use of sympathomimetic drugs (7%), and aneurism (9%) [27]. Other study on 91 patients aged 15 to 40 years had found hypertension as the most common etiology that was diagnosed in 30% of cases [14].

Diagnosis of the cause of stroke in young adults requires dedicated evaluation. Search should be performed by transesophageal echocardiography, carotid-vertebrobasilar angiography, Doppler ultrasonography and hematological tests. Only after a complete evaluation the cause can be determined with reasonable certainty [4-9].

In our study, hypertension was the leading cause whereas arteriovenous malformation was diagnosed in only two cases. A majority of the cases had good outcome and low mortality, which is comparable with other Indian studies [17, 28].

There are some limitations in our study. Apart from inadequate numbers, all the patients had not underwent all the investigations, thereby making analysis and interpretations difficult. Being a tertiary care center, the referred patients' profiles may not be representative, creating a bias. Because of paucity of information, this study gives an idea of the sample size required to undertake more detailed studies with bigger sample sizes to explore the associations and risk factors.

## CONCLUSIONS

In summary, cardiac causes were the leading causes of ischemic stroke in young adults and hypertension was the leading cause of intracerebral hemorrhage.

In future, detailed study with more complete investigations including activated protein C resistance (APCR), Leiden type of factor 5, coagulation factor 8 level, G20210A prothrombin mutation, homocystinemia and its acquired or genetic causes such as MTHFR mutation, transesophageal echocardiography (TEE), transcranial Doppler (TCD), could be more helpful [28].

It might turn out through more evidence that stroke in young Indians might not be very different from that in other countries; the implications in a developing country are many. Preventive measures could aid immensely in bringing down costs and emotional burden on the family. But this would need prior and correct identification of burden and risk factors prevailing in the community. Of added interest would be risk factors, both acquired and genetic, which are unique to this geographic area.

## REFERENCES


1. The World Health Organization MONICA Project (monitoring trends and determinants in cardiovascular disease): a major international collaboration. WHO MONICA Project Principal Investigators. J Clin Epidemiol., 1988;41:105-114.
2. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ; Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet, 2006; 27; 367(9524):1747-1757.
3. Sturm JW, Mackay M, Thrift AG; Stroke among women, ethnic groups, young adults and children. In Handbook of Clinical Neurology. Fisher M editor, volume 92, Elsevier, New York, NY, USA, 2009.
4. Kristensen B, Malm J, Carlberg B, Stegmayr B,Backman C, Fagerlund M, Olsson T; Epidemiology and etiology of ischemic stroke in young adults aged 18 to 44 years in northern Sweden. Stroke, 1997; 28(9):1702-1709.
5. Adams HP Jr, Kappelle LJ, Biller J, Gordon DL, Love BB, Gomez F, Heffner M; Ischemic stroke in young adults. Experience in 329 patients enrolled in the Iowa Registry of stroke in young adults. Arch Neurol., 1995; 52(5): 491-495.
6. Bogousslavsky J, Pierre P; Ischemic stroke in patients under age 45. Neurol Clin., 1992; 10(1):113-124.
7. Hart RG, Miller VT; Cerebral infarction in young adults: a practical approach. Stroke, 1983; 14(1): 110-114.
8. Adams HP Jr, Butler MJ, Biller J, Toffol GJ; Nonhemorrhagic cerebral infarction in young adults. Arch Neurol., 1986; 43(8): 793-796.
9. Carolei A, Marini C, Ferranti E, Frontoni M, PrencipeM, Fieschi C; A prospective study of cerebral ischemia in the young.Analysis of pathogenic determinants.The National Research Council Study Group. Stroke, 1993; 24(3):362-67.
10. Warlow CP, Dennis MS, Gijn van J, Hankey GJ, Sandercock PA, Bamford JM, *et al*. Stroke A Practical guide to management. 2nd edition, Oxford: Blackwell Sciences, 2001.
11. Feigin VL, Lawes CM, Bennett DA, Anderson CS; Stroke epidemiology: A review of population-based studies of incidence, prevalence, and case-fatality in the late 20 th century. Lancet Neurol., 2003; 2(1): 43-53.
12. Gautier JC, Pradat-Diehl P, Loron P, Lechat P, Lascault G, Juillard JB, *et al*.; Cerebral vascular accidents in young subjects. A study of 133 patients 9 to 45 years of age. Rev Neurol. (Paris), 1989; 14(6-7): 437-442.
13. Toffol GJ, Biller J, Adams HP Jr; Nontraumatic intracerebral hemorrhage in young adults. Arch Neurol., 1987; 44(5): 483-485.
14. Lin CL, Howng SL; Nontraumatic intracerebral hemorrhage in young adult. Kaohsiung J Med Sci., 1997; 13(4): 237-242.
15. Bonita R, Mendis S, Truelsen T, Bogousslavsky J, Toole J, Yatsu F; The global stroke initiative. Lancet Neurol., 2004; 3(7): 391–394.
16. Lidegard O, Soe M, Andersen NM; Cerebral thromboembolism among young women and men from Denmark 1977-1982. Stroke, 1986; 17(4): 670–675.
17. Nayak SD, Nair M, Radhakrishnan K, Sarma PS; Ischemic stroke in the young adult: Clinical features, risk factors and outcome. Natl Med J India, 1997; 10(3): 107–112.

18. Chopra JS, Prabhakar S; Clinical features and risk factors in stroke in young. Acta Neurol Scand. 1979; 60(5): 289–300.
19. Kumar HNH, Kalra B, Goyal N; A study on stroke and its outcome in young adults (15-45 Years) from coastal South India. Indian J Community Med. 2011; 36(1): 62–65.
20. Arnold M, Halpern M, Meier N, Fischer U, Haefeli T, Kappeler L *et al.*; Age dependent differences in demographics, risk factors, co-morbidity, etiology, management and clinical outcome of acute ischeamic stroke. J Neurol., 2008; 255(10):1503–1507.
21. Lipska K, Sylaja PN, Sarma PS, Thankappan KR, Kutty VR, Vasan RS *et al.*; Risk factors for acute ischaemic stroke in young adults in South India. J Neurol Neurosurg Psychiatry, 2007; 78(9): 959–963.
22. Lee TH, Hsu WC, Chen CJ, Chen ST; Etiologic study of young ischemic stroke in Taiwan. Stroke, 2002; 33(8):1950–1955.
23. Kittner SJ, Giles WH, Macko RF, Hebel JR, Wozniak MA, Wityk RJ *et al.*; Homocyst(e)ine and risk of cerebral infarction in a biracial population: The stroke prevention in young women study. Stroke, 1999; 30: 1554–1560.
24. Hilton-Jones D, Warlow CP; The causes of stroke in the young. J Neurol., 1985; 232(3):137-143.
25. Bogousslavsky J, Van Melle G, Regli F; The Lausanne Stroke Register: analysis of 1000 consecutive patients with first stroke. Stroke, 1988; 19(9): 1083-1092.
26. Mettinger KL, Soderstrom CE, Allander E. Epidemiology of acute cerebrovascular disease before the age of 55 in the Stockholm County 1973-77: I. Incidence and mortality rates. Stroke, 1984; 15(5):795-801.
27. Toffol GJ, Biller J, Adams HP Jr.; Nontraumatic intracerebral hemorrhage in young adults. Arch Neurol., 1987; 44(5): 483-485.
28. Harirchian MH, Ghaffarpour M, DoratotajD, Akhavirad MB; Stroke in Young Adults: A Retrospective Study of 68 Cases. Acta Medica Iranica, 2006; 44(2): 119-124.