

## Research Article

# Clinical and Etiological Profile of Ischemic Stroke in Young Adults: A Prospective, Observational, Hospital based Study from Seacoast Population of South India

Kumar NSS\*, Padala R, Vallampalli G, Thatikonda A and Prasad PNS

Department of Neurology, Narayana Medical College, Nellore - 524003, India

\*Corresponding author: Kumar NSS, Department of Neurology, Narayana Medical College, Nellore - 524003, Andhra Pradesh, India

Received: December 17, 2016; Accepted: January 30, 2017; Published: February 01, 2017

## Abstract

**Objectives:** To evaluate the clinical and etiological profile and outcome of the acute ischemic stroke in young adults in a tertiary-care hospital of south India.

**Methods:** This study was conducted among 50 acute ischemic stroke patients (clinically and radiologically confirmed) irrespective of sex within the age group of 15-45 years admitted to Department of Neurology after clearance from Institutional Ethical Committee (IEC). A proforma for each of the acute ischemic stroke patients was maintained where all clinical information in brief including particulars of the subject, chief complaints, past history, proper general physical examination and systemic examinations etc were recorded. The patients had been undergone plain CT (computed tomography) scan/MRI (Magnetic Resonance Imaging) brain at admission for radiological confirmation and to localize the site of lesion in brain. All the included patients were followed upto 3 months of discharge to assess the outcome.

**Results:** Hypertension (56%) was the most common risk factor among acute ischemic stroke in young adults. Majority of the acute ischemic stroke patients presented with motor weakness (94% - either in the form of hemiparesis or hemiplegia). Stroke of other determined etiology (62%) with predominant hypercoagulable disorders (Hyperhomocystinemia-55%) was the most common etiology. Beside, imaging findings confirmed right sided brain lesion in majority of the patients (60%) and middle cerebral artery circulation (80%) as the most common territory involved in the brain. Most patients had a good functional outcome after 3 months of discharge with NIHSS score of 0-5 in 90% and mRS score 0-2 in 92% patients.

**Conclusion:** Most common clinical presentation is hemiplegia among the young onset acute ischemic stroke patients. Hypertension is most common risk factor and Stroke of other determined etiology is the most common etiology with middle cerebral arterial circulation being commonly involved and most patients had good functional outcome. Thus, the knowledge of the risk factors, clinical presentation and radiological findings and outcome of acute ischemic stroke in young adults can help in prevention, better understanding of pathogenesis and therapeutic decision making in the disease management.

**Keywords:** Ischemic stroke; Young adults; Hemiplegia; South india

## Introduction

Stroke is defined by the sudden onset of a neurological deficit due to a focal vascular cause. Acute ischemic stroke, a major subtype of acute stroke, occurs due to loss of blood supply to a part of the brain which initiates ischemic cascade due to free radical production and damage to endothelial lining. The high variability of the clinical presentation of stroke is because of the complex anatomy of the brain and its vasculature [1]. Ischemic stroke in young adults can affect the individuals and indirectly their families, and societies in general, as the patients are affected in the economically productive period of their lives. Almost two thirds of the global burden of acute ischemic stroke is in developing countries [2]. Nearly 10%-30% of all stroke patients in India are within the young adult age group [3-5].

The risk factors of acute ischemic stroke in young adults are more diverse compared to those in the elderly. Proper knowledge of the risk factors of acute ischemic stroke in young patients can prevent the burden of the disease and its recurrences appropriately [6]. The study was conducted to evaluate the risk factors, clinical presentation and outcome of the acute ischemic stroke in young patients in the tertiary care hospital of South India.

## Materials and Methods

This study had been carried out in the Department of Neurology at Narayana medical college, Nellore for a period of 1 ½ year from January 2014 to June 2015. A total of 50 acute ischemic stroke patients (clinically and radiologically confirmed) within the age group of

**Table 1:** Risk factors of acute ischemic stroke in young adults.

Risk factors (n = 50)	Frequency (n=50)	Percentage (%)
HTN	28	56%
Dyslipidemia	24	48%
Smoking	22	44%
Alcohol	16	32%
Diabetes	10	20%
Valvular Heart disease	7	14%
Atrial fibrillation	7	14%
Anaemia	6	12%
Family history of stroke	3	6%
Severe Left Ventricular (LV) Dysfunction	2	4%
Prosthetic valve	2	4%
Previous history of TIA	1	2%
Coronary artery disease (CAD)	1	2%

**Table 2:** Clinical presentations of acute ischemic stroke in young adults.

Clinical manifestations	Frequency (n=50)	Percentage (%)
Motor weakness	47	94%
Facial palsy	44	88%
Speech disturbances	36	72%
Headache	23	46%
Altered level of consciousness	19	38%
Giddiness	10	20%
Aphasia	6	12%
Vomiting	6	12%
Sensory loss	5	10%
Seizures	3	6%
Visual disturbances	3	6%
Ataxia	2	4%

15-45 years admitted to OPD/Ward/Emergency of Department of Neurology were included irrespective of sex in this study. Exclusion criteria were those patients who refused to take part in the study, head injury, age less than 15 years and more than 45 years, space occupying lesions, subarachnoid hemorrhage, cerebral venous thrombosis, Intracerebral hemorrhage and recurrent cerebrovascular accidents. A pre designed semi-structural proforma, designed for the purpose was used as a study tool. A pro forma for each of the acute ischemic stroke patients was maintained where in a brief clinical information including particulars of the patient, chief complaints, family, personal, dietary history, past history etc were taken. Proper general physical examination and systemic examination were also done and recorded in the pro forma. The acute ischemic stroke patients were subjected to plain CT scan brain or MRI on admission to confirm the diagnosis and also to localize the site of lesion. All the included patients were followed upto 3 months of discharge to assess the outcome of the patients.

This study was conducted after getting approval from Institutional Ethical Committee. Informed consent from the participating individual was also obtained. The data values were entered into MS-

Excel and statistical analysis was done by using IBM SPSS Version 20.0. For categorical variables, the data values were represented as number and percentages.

## Results

The present study is based on the primary data of 50 acute ischemic stroke patients irrespective of sex within the age group of 15-45 years. Majority of the acute ischemic stroke patients were males (76%). Hypertension (56%) was the most common risk factor among acute ischemic stroke in young adults, followed by dyslipidemia (48%), smoking (44%) and alcohol (32%) (Table 1). Majority of the acute ischemic stroke patients presented with motor weakness {either in the form of hemiparesis or hemiplegia} (94%) followed by facial palsy (88%) (Table 2). The most common etiological profile of ischemic stroke in young patients in the present study is stroke of other determined etiology in 31 (62%) followed by cardioembolism in 8 (16%), stroke of undetermined etiology (due to 2 or more causes) in 5 (10%), large artery atherosclerosis in 4 (8%), and small vessel occlusion 2 (4%) patients (Table 3). Of the 31 stroke patients of other determined etiology 29 patients had hypercoagulable disorders as an etiological factor, in whom most patients had hyper homocystinemia (Table 3). Beside, imaging findings were present in 30 (60%) patients on right side of the brain and in 20 (40%) patients on left side. Anterior circulation (86%) was the most common territory involved in the brain (Table 4). Most patients at 3 months after discharge had a good functional outcome with an NIHSS score of 0-5 in 90% and mRS score of 0-2 in 92% patients (Table 5). With one patient who had severe disability requiring constant support as the patient underwent decompressive craniotomy because of the malignant MCA infarction, which also resulted in prolonged duration of the hospital stay (mRs 5) and one patient died (mRs 6) during the hospital stay due to the co-morbid illness (severe left ventricular dysfunction) and post-stroke complications like aspiration pneumonia and sepsis., despite of the appropriate treatment with antiplatelets, statins, antibiotics and mechanical ventilator support etc.

**Table 3:** Etiology of ischemic stroke in young patients.

Etiology of ischemic stroke	Frequency (n=50)	Percentage (%)
<b>Stroke of other determined etiology</b>		
Hypercoaguable disorders	16	32%
Hyperhomocystinemia	6	12%
Low protein C	4	8%
Low protein S	2	4%
Anti thrombin III	1	2%
APLA		
	1	3%
	1	3%
Dissection (Internal carotid artery)		
Infectious vasculitis (Neurocysticercosis)		
Cardioembolism	8	16%
<b>Stroke of undetermined etiology</b>	5	10%
<b>Large artery atherosclerosis</b>	4	8%
<b>Small vessel occlusion</b>	2	4%

**Table 4:** Distribution of acute ischemic stroke in young patients based on the side of the lesion.

Distribution of the infarct		
Side of the lesion	Frequency (n=50)	Percentage (%)
Right side	30	60%
Left side	20	40%
Site of the lesion		
Anterior circulation	43	86%
Posterior circulation	6	12%
Both anterior and posterior circulation	1	2%

**Table 5:** NIHSS & mRS scores of young patients with ischemic stroke.

	NIHSS(n=50)	mRS(n=50)			
	0-5	42901	16-42	0-2	42800
Admission	2(4%)	40(80%)	8(16%)	17(34%)	33(66%)
Discharge	20(40%)	26(52%)	4(8%)	31(62%)	19(38%)
3 months	45(90%)	4(8%)	1(2%)	46(92%)	4(8%)

## Discussion

There is growing evidence for an increase in the incidence of stroke in young adults [7]. In the present study, higher male predominance among the acute ischemic stroke in young adults was observed which may be attributed to a socio cultural bias in India and also males are more exposed to alcohol and smoking. Those patients with alcohol consumption exceeding 14 standard drinks per week or 4 drinks per day were considered as alcoholics, according to the definition by National Institute on Alcohol Abuse and Alcoholism (NIAAA). Similar findings had been reported from studies conducted in western world and in India [8-10]. In this study, hypertension was the most common risk factor of acute ischemic stroke in young adults. Similar finding had been observed in the studies by a group of Indian authors [11-12]. In this study, 48% of the acute ischemic stroke patients had dyslipidemia which may be attributed to the increasing trends of sedentary lifestyle, smoking, diet pattern and excess alcohol intake and was higher compared to Tan K S, et al. [12]. Smoking is a known risk factor for ischemic stroke. The prevalence of smoking in the present study was 44% which was higher compared to the previous studies [12-13]. Alcohol is another important contributing risk factor in the development of ischemic stroke. The current study had 32% patients with a history of excess alcohol intake which was higher compared to the previous studies [12-13]. The current study noticed a prevalence rate of 20% diabetic patients which was higher compared to the previous Indian studies [11,13]. The most common clinical presentation in the current study was motor weakness (94%) either in the form of hemiparesis or hemiplegia whereas Omkar Prasad Baidya, et al. [13] in their study reported 84% patients with motor weakness. In comparison to Omkar Prasad Baidya, et al. [13] who had noticed 12% patients with facial palsy, the current study noticed facial palsy in 88% patients in whom 86% had UMN type of facial palsy and 1(2%) had LMN type of facial palsy.

Out of 50 young ischemic stroke patients in the present study, 62% patients had stroke of other determined etiology followed by cardio embolism which was seen in 16%. Large artery atherosclerosis was seen in 8%. 10% patients had stroke of undetermined etiology

with two or more causes and 4% patients had small vessel occlusion. In comparison, Putaala, et al. [14] in their study on 1008 stroke in young patients aged 15-49 years from Finland, reported stroke of undetermined etiology in 33% patients and stroke of other determined etiology in 26%. Cardioembolism was found in 19.6%, small artery occlusive disease in 13.8% and large artery atherosclerosis was seen in 7.5% patients in their study.

In the current study, out of 62% patients with stroke of other determined etiology, hypercoagulable disorders were predominantly seen in 94% patients and 3% had infectious vasculitis (corpus callosal infarction due to neurocysticercosis). 3% had right internal carotid artery dissection whereas Dash, et al. [11] a retrospective study which includes of 440 patients, observed that stroke of other determined etiology in 17.3% patients which was the second common etiology of young onset ischemic stroke in their study. Of those 17.3% patients with stroke of other determined etiology, dissection was predominantly seen in 51.3%, hyperhomocystinemia in 9.2%, infectious arteritis in 9.2% and 30.2% includes all other etiologies like reversible cerebral vasoconstriction syndrome, migraine and plasmacytoma related strokes, elevated lipoprotein A, moyo moyo disease, cancer, chronic idiopathic thrombocytic thrombocytopenia.

Of all the 94% patients with hypercoagulable disorders, hyperhomocystinemia (55%) was predominantly seen followed by Protein S deficiency, Protein C deficiency and antithrombin III deficiency in 21%, 14% and 7% patients respectively. Antiphospholipid antibody (APLA) was positive in 3% and in comparison Putaala, et al. [14] in their study reported stroke of other determined etiology [n=262 (26%) patients] as the second common etiology in their study, noticed hypercoagulable disorders in less than 18% patients. Increased incidence of hyperhomocystinemia probably due to higher incidence of smoking, alcoholism in our study. Dietary pattern may also a contributory factor for this finding.

Omkar Prasad Baidya, et al. [13] in their study reported that infarcts on the left side (52%) of the brain are predominant than right side (48%) whereas in the current study, infarcts are more on the right side (60%) than the left side (40%). Anterior circulation infarcts (86%) were predominantly noticed in the present study which was similar to the findings in Omkar Prasad Baidya, et al. [13] (70%) and Putaala, et al. [14,15] (52.8%).

In the current study, of all the 50 patients, most of the patients had good functional outcome after 3 months of discharge and only very slight number of patients had poor outcome.

An NIHSS score of 0-5 was noticed in 90% patients after 3 months of discharge whom had only mild neurological deficits and is able to manage their daily living activities on their own.

After 3 months of follow up, 92% had good functional outcome with an mRS score of 0-2 and only 8% patients had poor outcome (mRS 3-6) in whom severe disability (mRS 5) was noticed in one patient and death (mRS 6) during the hospital stay was noticed in one patient. The outcome is predominantly determined by the severity of stroke, quality of care provided, rehabilitative measures and risk factor reduction. Hence the outcome may vary between the countries and within the countries and even within same institute/hospital over the time.

## Conclusion

Incidence of acute ischemic stroke is on rise in young adults and the risk factors are more diverse compared to elder ones. Most common clinical presentation is hemiplegia among the young onset acute ischemic stroke patients. Hypertension is most common risk factor and Stroke of other determined etiology is the most common etiology with middle cerebral arterial circulation been commonly involved and most patients had good functional outcome Thus, the knowledge of the risk factors, clinical presentation and radiological profile of acute ischemic stroke in young patients can help in prevention, better understanding and taking therapeutic decision in management of the disease in this age group. However, the study is limited by small sample size as it is conducted over limited period of time, hence further studies on large sample size can be encouraged.

There were no sources of funding for the conduction of our study.

We thank the faculty and staff members of department of neurology for collecting the data and the patients for their cooperation.

## References

- Smith WS, English JD, Johnson SC. Cerebrovascular Diseases. In: Favei AS, Bravndal E, Kasper DL, Hsutor SL, Longo DL, Joneson J, et al. editors. Harrison's principles of internal medicine. 17th ed. USA: McGraw Hills; 2008; 2513-35.
- Bonita R, Mendis S, Truelsen T, Bogousslavsky J, Toole J, Yatsu F. The global stroke initiative. *Lancet Neurol.* 2004; 3: 391-393.
- Kaul S, Bandaru VC, Suvarna A, Boddu DB. Stroke burden and risk factors in developing countries with special reference to India. *J Indian Med Assoc.* 2009; 107: 358-370.
- Nagaraja D, Gururaj G, Girish N, Panda S, Roy AK, Sarma GR, et al. Feasibility study of stroke surveillance: data from Bangalore, India. *Indian J Med Res.* 2009; 130: 396-403.
- Nencini P, Inzitari D, Baruffi MC, Fratiglioni L, Gagliardi R, Benvenuti L, et al. Incidence of stroke in young adults in Florence, Italy. *Stroke.* 1988; 19: 977-998.
- Adams HPJ, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, et al. Classification of subtype of acute ischemic stroke: definitions for use in a multicenter clinical trial. *Stroke.* 1993; 24: 35-41.
- George MG, Tong X, Kuklina EV, Kuklina EV, Labarthe DR. Trends in stroke hospitalizations and associated risk factors among children and young adults, 1995-2008. *Ann Neurol.* 2011; 70: 713-721.
- Ji R, Schwamm LH, Pervez MA, Singhal AB. Ischemic stroke and transient ischemic attack in young adults: risk factors, diagnostic yield, neuroimaging, and thrombolysis. *JAMA Neurol.* 2013; 70: 51-57.
- 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; 10:107-112.
- Lipska K, Sylaja PN, Sarma PS, Thankappan KR, Kutty VR, Vasam RS, et al. Risk factors for acute ischaemic stroke in young adults in South India. *J Neurol Neurosurg Psychiatry.* 2007; 78: 959-963.
- Dash D, Bhashin A, Pandit AK, Tripathi M, Bhatia R, Prasad K, et al. Risk Factors and Etiologies of Ischemic Strokes in Young Patients: A Tertiary Hospital Study in North India. *J Stroke.* 2014; 16: 173-177.
- Tan KS, Navarro JC, Wong KS, Huang YN, Chiu HC, Pongvarin N, et al. Clinical profile, risk factors and aetiology of young ischaemic stroke patients in Asia: A prospective, multicentre, observational, hospital- based study in eight cities. *Neurology Asia.* 2014; 19: 117-127.
- Prasad BO, Sunita T, Kausar U. Acute ischemic stroke in young adults-a hospital based study in North India. *International Journal of Biomedical Research.* 2015; 6: 113-117.
- Putala J, Metso AJ, Metso TM, Konkola N, Kraemer Y, Haapaniemi E, et al. Analysis of 1008 consecutive patients aged 15 to 49 with first ever ischemic stroke: the Helsinki young stroke registry. *Stroke.* 2009; 40: 1195-1203.
- Putala J, Strbian D, Mustanoja S, Haapaniemi E, Kaste M, Tatlisumak T. Functional outcome in young adult ischemic stroke: impact of lipoproteins. *Acta Neurol Scand.* 2013; 127: 61-69.