

CLINICO-ETIOLOGICAL PROFILE OF YOUNG STROKE AND CORRELATION OF PATIENT'S OUTCOME WITH RADIOLOGICAL FEATURES: A SINGLE CENTER EXPERIENCEM. Shaheen¹, R. S. Maniram², K. K. Kaware³, T. N. Dubey⁴**HOW TO CITE THIS ARTICLE:**

M. Shaheen, R. S. Maniram, K. K. Kaware, T. N. Dubey. "Clinico-Etiological Profile of Young Stroke and Correlation of Patient's Outcome with Radiological Features: A Single Center Experience". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 55, July 09; Page: 9613-9622, DOI: 10.14260/jemds/2015/1388

ABSTRACT: BACKGROUND: Stroke is one of the most important cause of high morbidity and mortality all over the world. Stroke in the young is particularly tragic because of its potential to create a long-term burden on the victims, their families, and the community. **OBJECTIVE:** To study the etiology, risk factor, clinical presentation and radiological profile of young stroke and correlate radiological profile with prognosis and outcome in young stroke patients. **SETTINGS AND DESIGN:** A prospective observational, clinical study. **MATERIALS AND METHODS:** Patient diagnosed to have stroke in young individuals between 15 and 45 years of age, admitted in Department of Medicine, Hamidia Hospital, Gandhi Medical College, Bhopal, were included in study. **RESULTS:** A total of 100 patients, 58 males (58%) and 42 females (41%) who were diagnosed to have stroke were included in the study. Mean age of the study group was 31.92±8.59 years and that of male and female were 29.67±9.51 and 33.65±7.63 respectively. Majority of strokes (24%) overall occurred between the ages of 36-40 years. 60 patients had ischemic stroke. Overall mortality in our study group was 23 percent. About 16 percent of hemorrhagic stroke were died in hospital. Among infarct most of deaths were due to cortical infarct. Atherosclerosis was emerged as main aetiological factor in 23 percent of patient in study. **CONCLUSION:** This was one of few studies done in young stroke in central India. This study helps to understand better the etiological profile of young stroke with emphasis on radiological features.

KEYWORDS: Stroke, Infarct, Young.

INTRODUCTION: Stroke is one of the most important cause of high morbidity and mortality all over the world. Stroke has been defined by World Health Organisation (WHO) as rapidly developing clinical signs of focal, at times global disturbance of cerebral function lasting for more than 24 hours or leading to death with no apparent cause other than vascular origin.¹

Data from major Indian hospitals show 24-35% of stroke in young of all neurological admissions. Although various studies on stroke in young included subjects from second to fourth or fifth decade, in general, stroke in young includes subjects falling in the age group of 15-45 years.

The aetiology may vary with different age groups, but most of the risk factors are common to all age groups. Still, certain factors are more common in the young. Several studies have been analysed the risk factors of stroke in young, but considering its impact on the younger generation, it needs more studies for identification and modification of risk factors.

METHODS: It was a prospective observational clinical study at one of the major Centre of central India. The aim of the study was to study the aetiology, risk factors and clinical presentation of young

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stroke patients and to assess the correlation of radiological features, if any with prognosis and outcome in young stroke patients.

All patients of age 15-45 years with abrupt onset of focal or global neurological deficit attributable to vascular cause and persist for more than 24 hours were included in the study. Patients with neurological deficit from head injury were excluded.

All patients who fulfilled the inclusion and exclusion criteria were included in this study. A proforma was prepared which included detailed history, clinical examination and requisite investigation. The outcome was reassessed on follow up at 3 months.

History included all symptoms pertaining to stroke in detail with emphasis on all the risk factors attributable to the stroke in young. A detailed clinical examination was done and neurological deficits were identified. Relevant investigations like haemoglobin, total white cell count, ESR, urine routine and microscopy, blood glucose, blood urea, serum creatinine, blood VDRL, HIV, serum lipid profile, coagulation profile, ANA, CRP, ESR, RA factor, Sickling test, Homocysteine, chest X ray, CT scan head, electrocardiogram, carotid Doppler and 2D ECHO were done for all patients. MR venogram and angiography, CSF examination was done in patients depending on the clinical need.

The results were analysed to assess the aetiology, risk factors, and the pattern of clinical and radiological profile. The consent was taken from the attendant's preferably first degree who accompanied the patient. Chi square test, Fischer test and 90% confidence interval had been used to find the significance between various factors. The statistical software SPSS 15.0 strata were used for all the calculations.

RESULTS: A total of 100 patients, 58 males (58%) and 42 females (41%) who were diagnosed to have stroke were included in the study. Mean age of the study group was 31.92 ± 8.59 years and that of male and female were 29.67 ± 9.51 and 33.65 ± 7.63 respectively. Majority of strokes (24%) overall occurred between the ages of 36-40 years. Majority of strokes (28.6%) in females were in age group of 21-25 years.

Most common cranial nerve affected was facial nerve (UMN type palsy) in 28% cases. Motor deficit was present in all cases – Hemiparesis (86%), Hemiplegia (12%) and monoparesis (2%).

36% of all patients were smokers and among ischaemic and hemorrhagic stroke, percentages of smokers were 35.1% and 38.4% respectively. Alcohol consumption was seen in 30% cases. 27.02% of ischaemic and 38.4% of hemorrhagic stroke patients were alcoholic. Among ischaemic strokes 13.5% had HTN and 18.9% had CAD (Table 1). Whereas same parameters in hemorrhagic strokes were 84.6% and 5.38% respectively.

Risk Factors	Type of stroke		P value
	ICH (n=26)	Ischemic (n=74)	
Smoking			
Absent	16 (61.5%)	48 (64.8%)	<0.05
Present	10 (38.4%)	26 (35.1%)	
Alcohol			
Absent	16 (61.5%)	54 (72.9%)	0.713
Present	10 (38.4%)	20 (27.02%)	
BMI			
Underweight	6 (23.07%)	17 (22.9%)	0.07
Normal	20 (76.9%)	46 (62.1%)	0.292
Overweight	0	11 (14.8%)	0.317
Diabetes Mellitus			
Absent	22 (84.6%)	54 (72.9%)	0.257
Present	4 (15.38%)	20 (27.02%)	
Hypertension			
Absent	4 (15.38%)	64 (86.4%)	<0.001
Present	22 (84.6%)	10 (13.5%)	
CAD			
Absent	22 (84.6%)	60 (81.08%)	0.662
Present	4 (15.38%)	14 (18.9%)	
TIA			
Absent	26 (100%)	72 (97.3%)	.005
Present	-	2 (2.7%)	
Family history			
Absent	26 (100%)	72 (97.3%)	>0.05
Present	-	2 (2.7%)	
OCP			
Absent	24 (92.3%)	72 (97.3%)	0.317
Present	2 (7.6%)	2 (2.7%)	

Table 1: Risk factors associated with type of stroke

LDL and HDL were abnormal in 60% and 72% of patients. Ischemic strokes had abnormal LDL and HDL in 62.1% and 75.6% of the patients respectively. Among hemorrhagic strokes, LDL and HDL was seen to be abnormal in 53.8% and 61.5% of patients respectively.

Atherosclerosis was the etiological cause of stroke in 23% of patients. CVT was seen in 14% of patients all of them were females in the postpartum period. TBM and RHD were seen in 16% and 18% respectively (Table -2). Atherosclerosis was the most common cause of stroke in males (32.7%) followed by RHD, TBM and hypertension. Whereas in females, the most common cause was CVT (33.3%) followed by RHD, TBM and atherosclerosis. Interestingly, vasculitis was more commonly seen in females constituting 9.5% strokes as compared to males (1.7%) (Table 3).

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Causes	Number (n=100)	%	90% CI
Atherosclerosis	23	23.0%	13.24-32.76
Hypertension	20	20.0%	11.16-28.84
RHD	18	18.0%	4.95-31.05
TBM	16	16.0%	6.33-25.67
CVT	14	14.0%	10.78-17.22
Vasculitis	5	5.0%	1.61-8.39
Bleed- undetermined	2	2.0%	0.5-3.5
Infarct - undetermined	2	2.0%	0.5-3.5

Table 2: Etiology of stroke

Causes	Male (n=58)	Female (n=42)
Atherosclerosis	19 (32.7%)	04 (9.5%)
Hypertension	12 (20.7%)	8(19.0%)
CVT	-	14 (33.3%)
TBM	10 (17.2%)	06 (14.2%)
RHD	12 (20.7%)	06 (14.2%)
Vasculitis	1 (1.7%)	4 (9.5%)
Bleed- undetermined	2 (3.4%)	-
Infarct - undetermined	2 (3.4%)	-

Table 3: Etiology of stroke according to gender

Vasculitic markers like CRP, ANA, RA factor and ESR were more commonly elevated in females as compared to males. CRP was elevated in around 21% females and only 5.1% of males, RA factor was positive in 14.28% of females as compared to 3.4% males. ANA was positive in 11.9% females whereas only 1 male was ANA positive. (Table- 4)

Vasculitis Markers	Male (n=58)	Female (n=42)	Combined (n=100)
CRP (>0.6mg/dl)	3 (5.1%)	9 (21.4%)	12 (12%)
ANA	1 (1.7%)	5 (11.9%)	6 (6.0%)
RA Factor	2 (3.4%)	6 (14.28%)	8 (8.0%)
ESR (>30mm/hr)	06 (10.34%)	15 (35.7%)	21 (21.0%)

Table 4: Vasculitis markers in study population

Majority of the patients had normal serum homocysteine levels. 7 patients had mild elevations whereas 3 patients had severely elevated serum homocysteine levels. (Table- 5)

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S. Homocysteine levels	No. of Patients (n=100)
<15µmol/L	87 (87.0%)
15-30 µmol/L	7 (7.0%)
30-100 µmol/L	3 (3.0%)
>100 µmol/L	3 (3.0%)

Table 5: Serum homocysteine levels in study population

Carotid intima media thickness was more than 0.80mm in 27% patients overall. CIMT values >0.80 mm were found in 19 (25.64%) patients of ischaemic stroke and 8 patients (30.7%) of hemorrhagic stroke patients. (Table -6)

Type of Stroke	Number	CIMT thickness	P value
ICH N=26	8 (30.7%)	>0.80mm	0.08
	18 (69.2%)	<0.80mm	
Ischemic (including CVT) N=74	19 (25.64%)	>0.80mm	0.06
	55 (74.35%)	<0.80mm	
Overall N=100	27 (27%)	>0.80mm	0.015
	73 (73%)	<0.80mm	

Table 6: Carotid intima media thickness in study population

CT scan showed 60% of patients had arterial infarcts. Hemorrhage was seen in 26% whereas CVT was seen in 14% patients. Amongst ischaemic stroke, Rt MCA territory was more commonly involved than Left MCA territory (46.7% vs 13.3%). Lacunar infarcts constituted 29.9% cases of ischaemic stroke while brainstem and cerebellar involvement were found in 6.6% and 3.34% cases respectively. Among 14 patients of CVT, 9 patients (64.28%) had thrombosis of superior sagittal sinus followed by lateral sinus (21.4%) and straight sinus (14.2%). In the hemorrhagic stroke, lobar hemorrhage was found in 10 (38.46%) patients. Incidence of basal ganglia/IC capsule and brainstem involvement was high affecting 6 (23.07%) and 5 (19.23%) patients respectively. Intraventricular bleed was seen in 1 patient and SAH occurred in 3 patients. (Table -7)

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Type of stroke	Location	N	%	90% CI
Ischemic	Right MCA territory	28	46.67%	40.58-55.42
	Left MCA territory	08	13.3%	7.48-23.72
	Right Lacunar infarcts	14	23.3%	15.61-30.99
	Left Lacunar infarcts	4	6.6%	3.74-9.46
	Cerebellar	2	3.34%	1.42-5.26
	Brainstem	4	6.6%	3.74-9.46
Venous thrombosis	Superior sagittal sinus	09	64.28%	55.43-77.90
	Lateral sinus	3	21.4%	13.61-29.19
	Straight sinus	2	14.2%	6.22-22.18
Hemorrhagic	Lobar	10	38.46%	30.55-45.37
	Basal ganglia/IC	6	23.07%	21.33-26.7
	Intraventricular	1	03.84%	2.89-4.84
	Thalamus	2	7.69%	7.91-8.47
	Brainstem	5	19.23%	18.91-20.47
	SAH	3	11.53%	10.86-12.2

Table 7: Most common location of stroke

Overall mortality in our study group was 23% out of which 17 patients had in hospital mortality and 6 patients died by 3 months of follow up. Most common cause of in-hospital mortality was hemorrhagic stroke with 4 deaths followed closely by atherosclerotic ischemic stroke, TBM and CVT with 3 deaths each. By 3 month follow up, 2 patients each of ischemic and hemorrhagic stroke and 1 patient each of CVT and TBM also died. Interestingly, mortality rates in RHD was very low (2 deaths) suggesting a comparatively better prognosis. (Table -8)

Etiology	N	In-hospital Mortality	Mortality at 3 months
Atherosclerotic Ischemic stroke	19	3 (15.78%%)	2 (10.5%)
TBM	16	3 (18.75%)	1 (6.25%)
RHD	18	2 (11.11%)	0
Vasculitic stroke	5	1 (20.0%)	0
Hemorrhagic stroke	26	04 (15.38%)	2 (7.69%)
CVT	14	3 (21.42%)	1 (7.14%)
Undetermined infarcts	2	1 (50%)	0
Total	100	17 (17%)	6 (6%)

Table 8: Association of etiology and in-hospital mortality and at 3 months follow up

None of the patients died with small infarct size (<1.5cm.4 patients (15.4%) with medium size infarct (1.5-3cm) were dead whereas mortality was reported in 9 (42.9%) patients with large size

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infarct. Most of deaths (11) were due to cortical infarcts. 2 out of 4 brainstem infarct died suggestive of poor prognosis in patients with brainstem involvement. No mortality was reported in subcortical and cerebellar infarcts (Table- 9). Among CVT patients, 3 patients died with superior sagittal sinus thrombosis and one with lateral sinus thrombosis. Patients with large volume hemorrhage >30ml had high mortality (5 out of 19 patients). 1 patient each died with lobar, thalamic and basal ganglia bleed. Surprisingly, despite poor prognosis, 3 out of 5 brainstem hemorrhagic stroke survived probably due to small size of bleed. (Table 10).

Radiological Variable	Dead (%)	Survivors (%)	P value
Infarct size			
Small	0	13 (100)	0.04
Medium	4 (15.4%)	22 (84.6%)	
Large	9 (42.9%)	12 (57.1%)	
Location			
Cortical	11 (30.6%)	25 (69.4%)	0.046
Subcortical	0	18 (100%)	
Cerebellar	0	2 (100%)	
Brainstem	2 (50%)	2 (50%)	

Table 9: Association of radiological variables with overall mortality in ischemic stroke

Radiological Variable	Dead (%)	Survivors (%)	P value
Hemorrhage size			
<30ml	1 (7.7%)	12 (92.3%)	0.02
>30ml	5 (26.4%)	14 (73.6%)	
Location			
Lobar	1 (10%)	9 (90%)	0.04
Basal ganglia/IC	1 (16.67%)	5 (83.33%)	
Intraventricular	0(0%)	1 (100%)	
Thalamus	1 (50%)	1 (50%)	
Brainstem	2(40%)	3(60%)	
SAH	1 (33.3%)	2 (66.7%)	

Table 10: Association of radiological variables with overall mortality n hemorrhagic stroke

CIMT was significantly correlated to mortality in ischemic stroke ($p=0.02$). Out of 16 ischemic stroke with CIMT >0.80mm, 9 died whereas only 4 patients died with CIMT <0.80mm (out of 44 patients).

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CIMT	Dead (%)	Survivors (%)	P value
Ischemic stroke			
<0.80mm	4	40	0.02
>0.80mm	9	7	
Hemorrhagic stroke			
<0.80mm	3	15	0.07
>0.80mm	3	5	
CVT			
<0.80mm	0	14	NS
>0.80mm	-	-	

Table 11: Association of carotid intima thickness with overall mortality in study population

DISCUSSION: Sex ratio in our study was 1.3:1 (male: female). Mehndiratta MM et al² showed a ratio of 1:0.8 in North India whereas Zunni et al³ demonstrated a similar ratio of 1.2:1 in Africa. The mean age of all patients in our study was 31.92 years, a study in north India by Mehndiratta MM et al⁹ showed a similar mean age of 31.97 years.

In the Bansal et al study,⁴ hemiparesis was observed in 79.2%, aphasia in 30.4%, altered sensorium in 57.2% and seizures in 28.6%. Whereas in Dalal study,⁵ 18% patients had seizures, 51% were in altered sensorium, motor deficit was present in 82.7% and 22% had cranial nerve involvement. These abnormalities concurred with present study.

Atherosclerosis had emerged as the main etiological factor in 23% of the patients in our study. Atherosclerosis was considered based on the criteria similar to Adams et al⁶ when the patient had 2 or more risk factors for atherosclerosis in the absence of identifiable causes. Bevan et al⁷ showed atherosclerosis to be etiology in 31% of total cases. In a case control study at NIMHANS by Dakshinamurthy,⁸ India, it was found that 50% of stroke in young could be attributed to atherosclerosis.

CVT was seen in 14 patients (14%). This does not concur with the study by Venkatraman et al⁹ where incidence was 4.3%, but Toubin¹⁰ found CVT in 9% of 182 consecutive autopsies. Tubercular meningitis comprised of 16% of cases which is higher in comparison to Mehndiratta MM et al.⁹ RHD leading to cardio embolic stroke comprised 18% of the cases in our study. In a study by Mehndiratta et al,⁹ the incidence was 30%. Bansalet al² showed an incidence of 16%.

In our study most of the stroke patients had normal homocysteine levels with mild elevations seen in 7% patients. Hankey GJ et al¹¹ suggested that elevated homocysteine level in blood is present in <5% of general hospital and as many as in 50% of patients with stroke. Similarly Anand K et al¹² found total homocysteine level above 15 mol/L as independent risk factors.

BO Kristensen et al¹³ concluded that case fatality rate at 30 day was 5.7% whereas S. Dinesh Nayak¹⁴ showed that fatality rate is 1%, 3.4% mortality rate was observed by H. Naess et al¹⁵ while Dalal PM et al⁶ study showed case fatality of 29.8% at 28 days. In our study 23 patients died out of which 17 had in hospital mortality and 6 were found to be dead by 3 months of follow up. Most common cause of mortality in our study was hemorrhagic stroke followed closely by atherosclerotic ischemic stroke. In our study, we also correlated radiological profile with the mortality rate and

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found some important results. In ischemic stroke, mortality rates depended on ischemic size with no deaths in patients with infarct size <1.5cm and 9 deaths in patients with infarct size >3cm. Mortality also depended on site of stroke with majority of deaths occurring in cortical infarcts as compared to subcortical and cerebellar infarcts.

In hemorrhagic stroke, majority of deaths were seen with haemorrhage volume >30ml. There was no significant relation between site of haemorrhage and death, though patients with brainstem haemorrhage had much higher propensity to die as compared to other sites.

In other studies, like Rozenthal et al¹⁶ hemorrhagic stroke mortality was significantly related with haemorrhage size and similar results were seen in study by H. Naeset al.¹⁵

CONCLUSION: This was one of the few studies done in stroke in young population of 15-45 years in central India. This study helps to understand better the etiological profile of such patients and also emphasises on the importance of the radiological features.

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