



STROKE IN YOUNG; A STUDY ON CLINICAL PROFILE AND DIVERSE PRESENTATION IN A TERTIARY CARE HOSPITAL

General Medicine

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ABSTRACT

BACKGROUND: Stroke in a young person can be devastating as the patients are at their most productive age, thus causing marked long term socio-economic consequences and high public health impact due to associated indirect costs. In this study, all young patients of stroke meeting the criteria reporting to a tertiary care hospital in a metropolitan city were studied for various clinical presentations and outcome under standard protocol to combat deadly disease.

OBJECTIVE: To study the various clinical presentations in patients of stroke in age group 15-49 years.

MATERIALS AND METHODS: A Prospective observational study was conducted on 144 patients presented to a tertiary care hospital during study period studying the clinical presentations, management and outcome. Data were analysed using Statistical Programme for Social Sciences (SPSS).

RESULTS: Incidence of ischemic strokes was 68.7%, while 13.2% patients were of haemorrhagic strokes and 18.1% patients were of cerebral venous thrombosis (CVT). As per TOAST criteria for ischemic stroke subtypes, 47.5% were large artery strokes, 27.3% were small artery strokes and 3.0% were cardio-embolic strokes. Among haemorrhagic strokes lobar bleeds were most common (47.1%). Mean age of patients was least in CVT and most in haemorrhagic strokes. The most common presentation in Ischemic and haemorrhagic strokes was hemiplegia while CVT presented as headache in 92.3% cases. The mean systolic and diastolic blood pressures were higher in case of haemorrhagic as compared to ischemic strokes. At presentation Mean NIHSS for Ischemic strokes was 7.09 & mRS score 2.67; which was 2.61 (minimum 0, maximum 9) and 1.13 (minimum 0, maximum 4) respectively at review. In haemorrhagic strokes - at presentation mean NIHSS was 8.74 & mRS score 3.58; while at review 3.18 and 1.24 respectively. Mean NIHSS in CVT at presentation was 3.64 & mRS score 2.27; at review 0.29. **CONCLUSION:** Ischemic strokes had highest incidence as compared to haemorrhagic strokes and CVT. However, CVT was more prevalent in younger age group. Majority of the patients had good functional recovery at review. CVT had the best functional outcome. Stroke in young still needs to be studied in detail to combat this deadly and disabling disease.

KEYWORDS

Stroke, Central Venous Thrombosis, Young, Clinical feature

INTRODUCTION

Stroke is a leading cause of disability and death worldwide and more importantly poses a major health problem when it affects young patients. Stroke and Ischaemic heart disease are the world's biggest killers, accounting for a combined 15 million deaths in 2015. These diseases have remained the leading causes of death globally in the last 15 years¹. Up to 80% of all strokes are ischemic, out of this 10-20% have been reported to occur in young individuals.² According to WHO, stroke had caused over 6 million deaths worldwide in 2015 with two-thirds of these deaths occurring in less developed countries. In India, during the last decade, the crude prevalence rates of stroke was between 136 and 220 per 1,00,000 population.^{3,6}

In past, studies pertaining to stroke epidemiology have mostly been conducted among the developed nations. However, the future burden of stroke is likely to increase in developing countries because of increasing prevalence of hypertension, fast-changing lifestyle and population restructuring.⁷

Stroke incidence rises steeply with age; therefore, stroke in younger

people is less common. However, stroke in a young person can be devastating as these patients are at their most productive age - the stroke among them may thus cause marked long term socio-economic consequences and has a high public health impact due to associated indirect costs.² Etiology of stroke is extremely diverse in the young in whom large-artery atherosclerosis or atrial fibrillation are rare, which are common in elderly.² Efficient acute treatment and prevention of stroke in the young adult increases number of quality-weighted life years much more than in elderly patients.² Despite being important, stroke in the young has long been understudied and needs to be emphasized upon by well-designed and conducted studies.^{8,9,10}

In this study all patients of stroke meeting the criteria in the age group of 15-49 years reporting to a tertiary care hospital in a metropolitan city were recruited. The patients were studied for various clinical presentations, thoroughly examined and fully investigated under standard protocol. The TOAST criteria were used to subclassify ischemic strokes¹¹ and outcome was reviewed using National Institute of Health Stroke Scale (NIHSS) Score and modified Rankin Scale (mRS) Score.

OBJECTIVES

To study the various clinical presentations in patients of stroke in age group 15-49 years.

MATERIALS AND METHODS

Study population: Patients of stroke between ages 15-49 years, who reported to Outpatient Neurology Services or admitted to a tertiary care hospital in a metropolitan city in Eastern part of India.

Sample size: The proposed sample size to be studied was based on average incidence of 16% of stroke in young adults in India, calculated by arithmetic mean of various studies taken into account in workshop on stroke surveillance in India organized by Indian Council of Medical Research (ICMR), New Delhi and supported by WHO.¹² Considering alpha error of 5% and error value of 8% on either side, a sample size of 81 was computed. It was proposed to study 100 patients of young stroke meeting eligibility criteria mentioned below. However, 144 patients presented to study hospital, during study period and were included in the study.

Sample design: Prospective observational study

Study period: 31 May 2010 to 30 June 2013

Inclusion criteria: Patients with first ever stroke (ischemic/hemorrhagic/cerebral venous thrombosis) in age group 15-49 years. Ischemic strokes included stroke subtypes as per TOAST criteria. Five major categories of the TOAST classification are as follows:

- 1) Large-artery atherosclerosis (LAA), including large-artery thrombosis and artery-to-artery embolism;
- 2) Cardio embolism (CE);
- 3) Small artery occlusion (SAO);
- 4) Stroke of other determined cause (OC);
- 5) Stroke of undetermined cause (UND).

Exclusion criteria:

- (i) Stroke patients < 15 years and > 49 years of age.
- (ii) Recurrent strokes
- (iii) Transient Ischemic Attack

Study protocol: All cases underwent detailed history taking, clinical examination, baseline and specific investigations including specific radiological investigations like Computed tomography (CT), Magnetic resonance imaging (MRI) brain, Magnetic resonance angiography (MRA) brain and neck, Magnetic resonance venography (MRV) scan, Color doppler flow intensimetry and Two dimensional echocardiography, vasculitis and prothrombotic workup. Outcome was reviewed on follow up using National Institute of Health Stroke Scale (NIHSS) Score and modified Rankin Scale (mRS) Score.

Analysis of data: All raw data collected on proforma were entered into a Microsoft Excel Spreadsheet and analysed using standard statistical software, Statistical Programme for Social Sciences (SPSS) 15.0 for Microsoft Windows (SPSS Inc.Chicago, IL, USA), Continuous numerical data was described as means, standard deviations, medians, minimum, maximum and standard error of mean. Further, mean was compared across 3 groups by ANNOVA test, distributions were compared using Pearson's Chi Square Test. Two-sided values of P < 0.05 were considered statistically significant.

RESULTS

Stroke types and subtypes

In our study out of 144 patients 99 (68.7%) patients were of ischemic strokes, 19 (13.2%) patients were of hemorrhagic strokes and 26 (18.1%) patients were of cerebral venous thrombosis (CVT). (Figure 1) Out of ischemic group, 65 (65.7%) strokes were in anterior circulation, 18 (18.2%) strokes were in posterior circulation. Sixteen (16.1%) involved both anterior and posterior circulations.

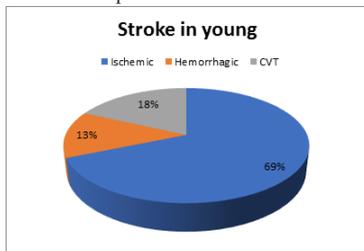


Figure 1: Subtypes of Stroke

As per TOAST criteria for ischemic stroke subtypes, 47 (47.5%) were large artery strokes, 27 (27.3%) were small artery strokes and 3 (3.0%) were cardio-embolic strokes, while 18 (18.2%) belonged to other determined categories (16 had prothrombotic states out of which 4 had normal MRI and 6 had migraine, 1 patient had SLE and malignancy each). There were 4 cases belonging to stroke of undetermined category.

Nineteen cases (13.2%) were hemorrhagic strokes out of which 8 (47.1%) were lobar bleeds 7 (41.2%) basal ganglia bleeds and 2 (11.8%) were cerebellar bleeds. There was no case with thalamic bleed.

Patient profile

Age:

Table 1: Age wise distribution of Stroke in young

		Descriptives							
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
AGE	CVT	26	32.54	7.112	1.395	29.67	35.41	22	45
	Hemorrhagic	19	41.00	6.725	1.543	37.76	44.24	24	48
	Ischemic	99	40.08	6.382	.641	38.81	41.35	22	49
	Total	144	38.84	7.166	.597	37.66	40.02	22	49
Hb(gm/dl)	CVT	26	14.254	1.6226	.3182	13.598	14.909	8.4	17.0
	Hemorrhagic	19	12.863	1.9394	.4449	11.928	13.798	8.2	16.0
	Ischemic	99	13.743	1.7697	.1779	13.390	14.096	8.0	18.2
	Total	144	13.719	1.7972	.1498	13.423	14.015	8.0	18.2

Sex: Hemorrhagic stroke was seen in 26.3% females whereas 7.1% females were in ischemic stroke group and 3.8% females were in CVT group.(Figure 2)

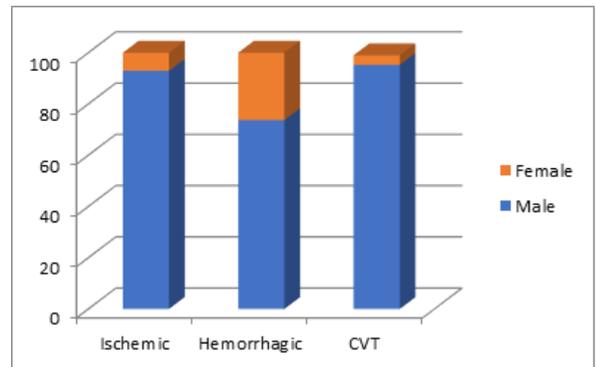


Fig 2: Gender distribution of stroke patients

Symptomatology: Ischemic strokes presented as hemiplegia in 83 (83.8.3%) cases, which was the most common presentation amongst them 68 (68.7%) cases had associated facial weakness, speech difficulty occurred in 66 (66.7%) cases, vomiting was present in 21 (21.2%) cases and six (6.1%) cases had seizure at onset. (Table 2)

Hemorrhagic strokes presented as hemiplegia in 14 (73.7%) cases along with associated facial weakness in 13 (68.4%) cases; vomiting was found in 11 (57.9%) cases, 10 (52.6%) cases had headache and nine (47.4%) cases had altered sensorium at presentation, while 3 (15.7%) cases had seizure at onset. (Table 2)

CVT presented as headache in 24 (92.3%) cases, which was the commonest presentation followed by vomiting which was present in 17 (65.44%) cases and 11 (42.3%) cases had seizure at presentation; 6 (23.1%) had hemiplegia at presentation. (Table 2)

Table 2 : Common symptoms at initial presentation

	Ischemic strokes	Hemorrhagic strokes	CVT
Hemiplegia	83.8%	73.7%	23.1%
Dysarthria	66.7%	52.1%	19.2%
Vomiting	21.2%	57.9%	65.4%
Seizure	6.1%	15.7%	42.3%
Headache	49.5%	52.6%	92.3%

Table 3: Blood Pressure among various sub types

	Ischemic strokes	Hemorrhagic strokes	CVT	Test Used independent Sample t test		
				Mean ± Std. Deviation	Mean ± Std. Deviation	Mean ± Std. Deviation
Systolic blood pressure	134.44 ± 21.67	156.42 ± 21.93	126.81 ± 10.83	<0.001	0.085	<0.001
Diastolic blood pressure	86.83 ± 13.04	95.47 ± 14.27	80.38 ± 10.46	0.010	0.022	<0.001

Blood pressure: The mean systolic and diastolic blood pressures were higher in case of hemorrhagic strokes (156.42 ± 21.93 mm of Hg and 95.47±14.27 mm of Hg) as compared to ischemic strokes (134.44 ± 21.67 mm of Hg and 86.83 ± 13.04 mm of Hg) and CVT (126.81 ± 10.83 mm of Hg and 80.38 ± 10.46 mm of Hg). This is statistically significant with p values <0.001 and 0.010 for systolic blood pressures and diastolic blood pressures respectively for comparison between ischemic strokes and hemorrhagic strokes using t test, while for comparison between CVT and hemorrhagic strokes p value is <0.001 for both systolic and diastolic blood pressures. (Table 3)

Outcome

Ischemic strokes - At presentation mean NIHSS was 7.09 (minimum 0, maximum 19) & mRS score 2.67 (minimum 0, maximum 6); at review 2.61 (minimum 0, maximum 9) and 1.13 (minimum 0, maximum 4) respectively. (Table 4)

Hemorrhagic strokes - At presentation mean NIHSS was 8.74 (minimum 0, maximum 17) & mRS score 3.58 (minimum 1, maximum 5); at review 3.18 (minimum 0, maximum 10) and 1.24 (minimum 0, maximum 3) respectively. (Table 4)

CVT - At presentation mean NIHSS was 3.64 (minimum 0, maximum 16) & mRS score 2.27 (minimum 1 maximum 6); at review 0.29 (minimum 0, maximum 4) and 0.08 (minimum 0, maximum 1) respectively. (Table 4)

Table 4: Outcome: NIHSS and mRS score

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
NIHSS at admission	CVT	25	3.64	4.112	.822	1.94	5.34	0	16
	Hemorrhagic strokes	19	8.74	5.404	1.240	6.13	11.34	0	17
	Ischemic strokes	98	7.09	4.167	.421	6.26	7.93	0	19
	Total	142	6.70	4.569	.383	5.95	7.46	0	19
NIHSS at review	CVT	24	.29	.999	.204	-.13	.71	0	4
	Hemorrhagic	17	3.18	2.811	.682	1.73	4.62	0	10
	Ischemic	96	2.61	2.049	.209	2.20	3.03	0	9
	Total	137	2.28	2.215	.189	1.90	2.65	0	10
mRS at admission	CVT	26	2.27	1.687	.331	1.59	2.95	1	6
	Hemorrhagic strokes	19	3.58	1.261	.289	2.97	4.19	1	5
	Ischemic strokes	99	2.67	1.262	.127	2.42	2.92	0	6
	Total	144	2.72	1.388	.116	2.49	2.94	0	6
mRS at review	CVT	24	.08	.282	.058	-.04	.20	0	1
	Hemorrhagic strokes	17	1.24	1.147	.278	.65	1.83	0	3
	Ischemic strokes	96	1.13	1.008	.103	.92	1.33	0	4
	Total	137	.96	1.021	.087	.78	1.13	0	4

*NIHSS is National Institute of Health Stroke Scale Score

**mRS is modified Rankin Scale

DISCUSSION

A significant proportion of strokes occurs in the young adult population and can be particularly devastating as it befalls in productive year of their lives. The 'mix' of causes, the proportion of cases with 'no cause' and the outcome of stroke in young vary from one series to the other. While some of the variations may be real, the majority is probably explained by the referral bias, differences in admission policy, the pattern or availability of emergency services, investigation intensity and use of diagnostic criteria. All these factors may change with time as more causes are discovered, etiology becomes better defined, and new technologies become more readily available. Thus, no two series are strictly comparable.¹³

Despite its importance, stroke in the young has long been understudied and current data originate mostly from small patient series.^{8,9,10} Data

from several studies indicate that 21-48% of strokes in the young are caused by atherosclerotic large artery occlusive disease, 10-33% are due to non atherosclerotic large artery occlusive disease (dissections have comprised 10-20% in some studies), 13-35% are caused by cardio-embolism, 3-18% by small artery disease, 8-15% by prothrombotic states and 4-15% by miscellaneous causes.¹³

The most common symptom of a stroke, occurring in 90% of the patients, is sudden weakness or numbness of the face, arm, or leg, most often on one side of the body¹⁴, which was also observed in our study. Other symptoms include confusion, difficulty in speaking or understanding speech, difficulty in seeing with one or both eyes, difficulty in walking, dizziness, loss of balance or coordination, severe headache with no known cause, fainting or unconsciousness. In our study facial weakness and speech disturbance were commonest

presentation after hemiplegia in ischaemic and haemorrhagic type, but headache was commonest presentation in CVT, similar presentation was observed in a recent study in Ahmedabad.¹⁵

This study is a male dominated study, unlike previous studies on strokes in young patients which only showed a male preponderance.² This study showed higher ratio of male:female (10:1) as compared to previous study done by Putaala et al,² which showed a male: female ratio of 1.7:1, a ratio of 1.8:1 in another study by Razzaq et al¹⁶ and ratio of 4.1:1 in study by Vaidya et al¹⁵. There were a greater proportion of females in hemorrhagic group as compared to ischemic stroke group and CVT. This study also found that CVT was more prevalent in younger age group as compared to ischemic and hemorrhagic strokes.

In this study, highest incidence of ischemic strokes (69%) was found as compared to hemorrhagic strokes (13.2%) and CVT (18.1%), which is corroborated by previous studies from Asia and other parts of the world.^{2,15,17,18,19,20}

As per TOAST criteria for ischemic stroke and subtypes, majority were large artery strokes (47.5%) which was similar to studies previously done.^{12,13} However, this is contrary to a study from South Asia which showed 12.6% had large artery strokes²¹ and a decade old Baltimore Washington study found only 3.8% of large artery strokes.²² The possibility that some of these large artery strokes in this study could have been due to arterial dissection could not be confirmed or ruled out in absence of use of conventional angiography.

This study showed 27.3% cases of small artery strokes as compared to study done by Putaala et al which showed an incidence of 13.8% of small artery strokes.² Another study on Southeast Asians living in UK found 7% had lacunar strokes.²¹

The percentage of other determined etiology was 18.2% in this study as compared to 25.7% in study done by Putaala et al², whereas study on Southeast Asian living in UK showed an incidence of 11.2%.²¹ Six (6.1%) patients in this study had migrainous stroke as compared to 1.4% in Baltimore Washington study⁴⁶ and 1-2% as per WHO.²³ However, a case series from Rome found 26% cases of migraine in young ischemic stroke patients.²⁴

This study showed 3% of cardio-embolic strokes which is lower as compared to incidence of cardio-embolism found in previous studies.^{2,13,22,25,26} It was not supported by a recent study from Pakistan on stroke in young patients which showed 20% cases of cardio-embolic strokes.²⁶

Amongst hemorrhagic strokes majority were lobar bleeds followed by putaminal bleeds which was also found in the study by Ruiz-Sandoval et al, who found 55% of hemorrhagic strokes were lobar bleeds of all the patients of ICH²⁷, which is contrary to study by Vaidya et al in which ventricular haemorrhage was most common.¹⁵ This study found higher incidence of hemorrhagic strokes in females as compared to ischemic strokes and CVT.

In this study we found that the clinical presentations of stroke in young were similar to strokes in elder age group and this reflected the anatomical distribution of brain damage. Most common presentation was hemiplegia in case of ischemic and hemorrhagic strokes while headache was the most common presentation in case of CVT as supported by study conducted in South Asia by Razzaq et al.¹⁶

In this study, we observed that statistically significant higher level of systolic and diastolic blood pressures at presentation were found in cases of ischemic and hemorrhagic strokes as compared to CVT.

In our study, we observed that statistically significant lower value of hemoglobin levels were found in hemorrhagic strokes as compared to ischemic strokes and CVT. Previous studies also showed that anemia was significant risk factor for stroke in young.¹²

Higher values of hemoglobin were associated with CVT as compared to ischemic and hemorrhagic strokes which is corroborated by previous data that found polycythemia as a known risk factor for CVT.²⁸

In our study, we observed that hemorrhagic strokes were more disabling at presentation (mean NIHSS 8.74 and mean mRS 3.18) and

majority of the patients had good functional recovery at review. CVT had best outcome (mean NIHSS 0.29 and mean mRS 0.08) supported by previous studies done in different parts of the world.^{29,30,31}

CONCLUSIONS

This study was a male dominated study due to the referral bias in a tertiary care service hospital. Ischemic strokes had highest incidence as compared to hemorrhagic strokes and CVT. However, CVT was more prevalent in younger age group. As per TOAST criteria, majority were large artery strokes amongst the ischemic strokes followed by small artery and other/undetermined etiologies. Hemorrhagic strokes were proportionately more common in females. Statistically significant higher level of systolic and diastolic blood pressures at presentation were found in cases of ischemic and hemorrhagic strokes as compared to CVT. Hypertension and lower levels of hemoglobin were associated with hemorrhagic strokes whereas higher levels of hemoglobin were associated with CVT. Majority of the patients had good functional recovery at review. CVT had the best functional outcome. Stroke in young still needs to be studied in detail to combat this deadly and disabling disease.

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