

## ETIOLOGY AND CLINICAL FEATURES OF STROKE IN YOUNG

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### ABSTRACT

**Background:** Cerebrovascular disease is the most common life threatening neurological disease and is a concern in young patients especially in developing countries. This study aims to identify aetiology, risk factors, clinical presentation and radiological profile of patients presented with stroke between the ages of 15-45 years.

**Materials and methods:** 50 patients (29 males and 21 females) were included in the study. Detailed history taking and clinical examination were done and neurological deficits were identified.

**Results:** The sex ratio was 1.3:1 (M: F). the mean age was 36.58+/-6.73 years and that of male and female patients were 38.79+/-4.77 and 33.9+/-8.05 years respectively. Decreased consciousness 34% [90%CI (22.98-45.02%)], VIIth cranial nerve involvement 54% [90%CI (42.41-65.59%)] and hemiparesis 60% [90%CI (48.60-71.40%)] were the clinical features seen.

**Conclusion:** This was one of the few studies done about strokes in young in rural populations in our country. The majority of the age distribution of stroke in this study was between the ages of 41-45 years. Among clinical features 7<sup>th</sup> cranial nerve palsy and motor deficit were prominent. Diagnostic challenges are to be expected when evaluating these patients.

**Keywords:** Hypertension, Stroke, Young.

### INTRODUCTION

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. As will be outlined below, some causes of stroke are more frequent in adults under 45 years of age compared to more aged populations [1]. 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. Hence, this paper is based on a review of population-based studies on stroke incidence that have included subgroup analyses for patients under 45 years of age, as well as smaller community-based studies and case-series specifically examining the incidence and etiology of stroke in the young. Individual studies and reviews were found by performing a medline search (1948-present) using the search terms "young stroke," "ischaemic stroke and young," "ischemic stroke and young," "haemorrhagic stroke and young," "hemorrhagic stroke and young," as well as "epidemiology and young stroke" and "etiology and young stroke." We also collected papers

by examining the references cited in these articles and selecting those pertaining to the epidemiology of young stroke. Finally, we examined prevalence in large population registries that provided subgroup analyses for patients younger than 45 years of age. These were identified using the search terms “epidemiology and stroke” and “population-based studies and stroke.” Again, references were examined to identify other stroke registries, which were examined with regard to prevalence among young patients under age 45. Differences in methods of reporting the incidence of young stroke make it difficult to draw geographical comparisons. While the majority of population-based studies report rates for all stroke combined (ischaemic and haemorrhagic, including subarachnoid haemorrhage), a few report rates for ischaemic stroke alone. Furthermore, referral bias needs to be considered when hospital-based registries as opposed to community-based studies are used to examine the relative proportion of young stroke, as is often the case in developing countries. Moreover, incidence has been examined at different time points over several decades and incidence rates may change overtime. Finally, where authors have reported incidence rates by age decile, it is apparent that even within the “young stroke” category, incidence increases sharply with age, particularly among the 34 to 44 year old age group [2–12].

## MATERIALS AND METHODS

A Prospective descriptive and clinical study was conducted in Patients diagnosed to have stroke in young admitted in in the department of medicine from May 2011 to September 2013 and fulfilled the inclusion and exclusion criteria. The sample size was restricted to 50 cases. Inclusion Criteria includes patients age 15 - 45 years, Patients with abrupt onset of focal or global neurological deficit attributable to vascular cause and persist for more than 24 hours. Head injury was an exclusion criteria. A Proforma was prepared which included detailed history, clinical examination and requisite investigations available in our hospital. History includes 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. Chi square test, Fisher Exact test and 90% Confidence Interval had been used to find the significant association.

## RESULTS

A total of fifty patients, 29(59%) males and 21(42%) females diagnosed to have stroke were included in the study. Our study found that mean age of the study group was 36.58+/- 6.73 years and that of male and female patients was 38.79+/-4.77 and 33.90+/- 8.05 years respectively. The majority of strokes occurred between the ages of 41-45 years at 18% and 41.37% of male were also in the same age group, and in females it was 28.57%.

Table 1

## OBSERVATIONS AND RESULTS

AGE IN YEARS	Female		male		Total	
<b>15-20</b>	Frequency	%	Frequency	%	Frequency	%
	1	4.76	0	0	1	2
<b>21-25</b>	3	14.28	1	3.4	4	8
<b>26-30</b>	3	14.28	2	6.8	5	10
<b>31-35</b>	4	19.04	6	20.69	10	20
<b>36-40</b>	4	19.04	8	27.58	12	24
<b>41-45</b>	6	28.57	12	41.37	18	36
<b>Total</b>	<b>21</b>	<b>100</b>	<b>29</b>	<b>100</b>	<b>50</b>	<b>100</b>
<b>Mean +/- SD</b>	<b>33.90</b>	<b>+/- 8.05</b>	<b>38.79</b>	<b>+/- 4.77</b>	<b>36.58</b>	<b>+/- 6.73</b>

Table 2

## CLINICAL FEATURES OF STROKE

Clinical feature	Number (n=50)	%	Confidence interval(90%)
Seizures			
Absent	39	78	68.36-87.64
present	11	22	12.36-31.64
Consciousness			
Normal	33	66	54.98-77.02
Decreased	17	34	22.98-45.02
Speech			
Normal	21	42	30.52-53.48
Dysphasia	12	24	14.07-33.93
Not determined	17	34	22.98-45.02

Patients had a various clinical features in our study. 22 [90%CI (12.36-31.64%)] of the study population presented with seizures. Decrease in consciousness was seen in 34% [90%CI (22.98-45.02%)] of patients. 24% [90%CI (14.07-33.93%)] of patients had speech abnormalities. The most common cranial nerve affected was thefacial nerve in 54% [90 %CI (42.41-65.59%)], 2% [90%CI (1.26-5.26%)] of the patients had the oculomotor nerve affected and 2% [90%CI (1.26-5.26%)] of the study group had other cranial nerve palsies. Motor deficit was seen in all the

patients. Hemiparesis, hemiplegia and monoparesis were seen in 60% [90%CI (48.60-71.40%)], 17% [90%CI (22.98-45.02%)] and 6% [90%CI (0.48-11.52%)] of the study group respectively. Hemi sensory loss was seen in 6% [90%CI (0.48-11.52%)] of the studygroup. Only 2% [90%CI (1.26-5.26%)] of the patients had cerebellar deficit.

**Table 3: Etiology of stroke**

<b>Etiology</b>	<b>Number(n=50)</b>	<b>%</b>	<b>Confidence interval (90%)</b>
Atherosclerosis	20	40	28.6-51.4
Hypertension	13	26	15.8-36.2
RHD	8	16	7.47-24.53
CVT	5	10	3.02-16.98
TBM	2	4	-0.56-8.56
Undetermined	2	4	-0.56-8.56

Aetiologies were varied Atherosclerosis was seen in 40% [90%CI (28.6-51.4%)] of patients. Hypertension was seen in 26% (90% CI (15.8-36.2%)) Cortical Venous thrombosis in 10% [90%CI (3.02-16.98%)], out of whom 4 were women and one was a man. 2 were in post-partum state, 2 patients had Antiphospholipid antibody positive and the male patient had protein S deficiency. 8 cases of rheumatic heart disease were observed [90%CI (7.47-24.53%)]. Tubercular meningitis was seen in two patients (90%CI (-0.56-8.56%)) who were also HIV positive Two haemorrhagic strokes was undiagnosed [90%CI (-0.56-8.56%)].

## **DISCUSSION**

In this study, 60% of them are male and 40% of patients are female. The majority of strokes occurred between the ages of 41-45 years at 18% and 41.37% of male were also in the same age group, and in females it was 28.57%. This is a higher proportion than that reported by Bevan et al., who found that 4.9% of all strokes occurred in patients aged 18–44 in 1990,<sup>13</sup> and Kissela et al., who found that 6.4% of all strokes occurred in patients aged 20–44 in 2005.<sup>14</sup> However, this result is in line with a more recent study by Maaijwee et al., which showed that roughly 10% of strokes occurred in individuals under the age of 50 in 2014.<sup>15</sup> This increase in young stroke is also consistent with the results of Kissela et al., whose population-based stroke epidemiology study showed that stroke incidence in younger adults increased over time, most notably between 1999 and 2005.<sup>14</sup> It may be caused by the recent rise in the prevalence of vascular risk factors in young adults. The US National Health and Nutrition Examination Survey reported an increased

prevalence of diabetes, hypercholesterolemia, and obesity in young adults from 1988 to 2006.<sup>16</sup> A Korean epidemiologic study also showed an increased prevalence of obesity, lack of physical activity, high-risk alcohol consumption, and current smoking in young men aged 19–39 from 1998 to 2012.<sup>17</sup> We found that men outnumbered women among the young adults who experienced stroke in this study. Although gender disparities in the incidence of stroke are still inconsistent across studies, our findings are consistent with previous studies of stroke in young adult populations<sup>13, 18</sup>. The strongly deviated sex ratio may be attributed to different degrees of exposure to risk factors between genders.<sup>18</sup> Previous studies of health behaviours among young men have shown that men are more exposed than women to risk factors such as hypertension, cigarette smoking, alcohol consumption, and high salt intake.<sup>18</sup> Moreover, an increasing trend of obesity was shown in men aged 40 and under but not in women of the same age group from 1998 to 2009.<sup>19</sup>

This study further found that the initial severity of ischemic stroke in the younger group was milder compared with that of the older group, as reported in most previous studies.<sup>20,21</sup> Despite adjusting for baseline differences in stroke risk factors and other comorbidities, Huggins et al. also reported that young adults tend to have lower initial NIHSS.<sup>22</sup> However, the degree to which age-related variations in clinical outcomes point to differences in other factors, such as pathophysiology, comorbid conditions, or divergent responses to treatment, remains unclear.<sup>23</sup> Notably, no significant difference in initial hemorrhagic stroke severity was found between the age groups in this study. This finding is similar to that of Andersen et al., who found that age was not related to stroke severity at admission in hemorrhagic stroke patients.<sup>24</sup> It may be relevant that lesion size in patients with hemorrhagic stroke is generally larger than that of patients with ischemic stroke. Our findings are also consistent with most previous studies showing that hemorrhagic stroke occurred in a higher proportion of strokes in young adults (40–55%) compared with the total stroke population (15–20%)<sup>13</sup>. This difference in the proportions of stroke types may arise due to a different and wider etiological and risk factor spectrum in younger patients compared with older patients. Koivunen et al. also reported that ICH was far more often attributed to structural lesions, such as arteriovenous malformation and cavernous haemangioma, in younger patients than in older adult patients. Similarly, another previous study showed that 48% of normotensive patients who were 45 years of age or younger had angiography abnormalities, whereas hypertensive patients who were older than 45 years had no underlying vascular abnormalities.

### CONCLUSION

This was one of the few studies done about strokes in young in rural populations in our country. The majority of the age distribution of stroke in this study was between the ages of 41–45 years. Among clinical features 7<sup>th</sup> cranial nerve palsy and motor deficit were prominent. Diagnostic challenges are to be expected when evaluating these patients.

### REFERENCES

1. Sturm JW, Mackay M, Thrift AG. Stroke among women, ethnic groups, young adults and children. In: Fisher M, editor. *Handbook of Clinical Neurology*. Vol. 92. New York, NY, USA: Elsevier; 2009. [[PubMed](#)] [[Google Scholar](#)]

2. Bonita R, Broad JB, Beaglehole R. Changes in stroke incidence and case-fatality in Auckland, New Zealand, 1981-9. *Lancet*. 1993;342(8885):1470–1473. [[PubMed](#)] [[Google Scholar](#)]
3. Brown RD, Whisnant JP, Sicks JD, O'Fallon WM, Wiebers DO. Stroke incidence, prevalence, and survival: secular trends in Rochester, Minnesota, through 1989. *Stroke*. 1996;27(3):373–380. [[PubMed](#)] [[Google Scholar](#)]
4. Lauria G, Gentile M, Fassetta G, et al. Incidence and prognosis of stroke in the Belluno Province, Italy: first-year results of a community-based study. *Stroke*. 1995;26(10):1787–1793. [[PubMed](#)] [[Google Scholar](#)]
5. Vemmos KN, Bots ML, Tsibouris PK, et al. Stroke incidence and case fatality in southern Greece: the Arcadia stroke registry. *Stroke*. 1999;30(2):363–370. [[PubMed](#)] [[Google Scholar](#)]
6. Carolei A, Marini C, Di Napoli M, et al. High stroke incidence in the prospective community-based L'Aquila registry (1994–1998): First year's results. *Stroke*. 1997;28(12):2500–2506. [[PubMed](#)] [[Google Scholar](#)]
7. Kolominsky-Rabas PL, Sarti C, Heuschmann PU, et al. A prospective community-based study of stroke in Germany—the Erlangen Stroke Project (ESPro): incidence and case fatality at 1, 3, and 12 months. *Stroke*. 1998;29(12):2501–2506. [[PubMed](#)] [[Google Scholar](#)]
8. Thrift AG, Dewey HM, Macdonell RAL, McNeil JJ, Donnan GA. Incidence of the major stroke subtypes initial findings from the North East Melbourne Stroke Incidence Study (NEMESIS) *Stroke*. 2001;32(8):1732–1738. [[PubMed](#)] [[Google Scholar](#)]
9. Smadja D, Cabre P, May F, et al. ERMANCIA: epidemiology of stroke in Martinique, French West Indies: Part I: methodology, incidence, and 30-day case fatality rate. *Stroke*. 2001;32(12):2741–2747. [[PubMed](#)] [[Google Scholar](#)]
10. Syme PD, Byrne AW, Chen R, Devenny R, Forbes JF. Community-based stroke incidence in a Scottish population: the Scottish borders stroke study. *Stroke*. 2005;36(9):1837–1843. [[PubMed](#)] [[Google Scholar](#)]
11. Corbin DOC, Poddar V, Hennis A, et al. Incidence and case fatality rates of first-ever stroke in a Black Caribbean population: the Barbados register of strokes. *Stroke*. 2004;35(6):1254–1258. [[PubMed](#)] [[Google Scholar](#)]
12. Rothwell PM, Coull AJ, Giles MF, et al. Change in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire, UK from 1981 to 2004 (Oxford Vascular Study) *Lancet*. 2004;363(9425):1925–1933. [[PubMed](#)] [[Google Scholar](#)]
13. Bevan, H.; Sharma, K.; Bradley, W. Stroke in young adults. *Stroke* **1990**, *21*, 382–386. [[Google Scholar](#)] [[CrossRef](#)]
  
14. Kissela, B.M.; Khoury, J.C.; Alwell, K.; Moomaw, C.J.; Woo, D.; Adeoye, O.; Flaherty, M.L.; Khatri, P.; Ferioli, S.; La Rosa, F.D.L.R. Age at stroke: Temporal trends in stroke incidence in a large, biracial population. *Neurology* **2012**, *79*, 1781–1787. [[Google Scholar](#)] [[CrossRef](#)]
15. Maaijwee, N.A.; Rutten-Jacobs, L.C.; Schaapsmeeders, P.; van Dijk, E.J.; de Leeuw, F.E. Ischaemic stroke in young adults: Risk factors and long-term consequences. *Nat. Rev. Neurol.* **2014**, *10*, 315–325. [[Google Scholar](#)] [[CrossRef](#)]

16. Béjot, Y.; Daubail, B.; Jacquin, A.; Durier, J.; Osseby, G.-V.; Rouaud, O.; Giroud, M. Trends in the incidence of ischaemic stroke in young adults between 1985 and 2011: The dijon stroke registry. *J. Neurol. Neurosurg. Psychiatry* **2014**, *85*, 509–513. [[Google Scholar](#)] [[CrossRef](#)] [[PubMed](#)]
17. Béjot, Y.; Daubail, B.; Jacquin, A.; Durier, J.; Osseby, G.-V.; Rouaud, O.; Giroud, M. Trends in the incidence of ischaemic stroke in young adults between 1985 and 2011: The dijon stroke registry. *J. Neurol. Neurosurg. Psychiatry* **2014**, *85*, 509–513. [[Google Scholar](#)] [[CrossRef](#)] [[PubMed](#)]
18. Kwon, S.U.; Kim, J.S.; Lee, J.H.; Lee, M.C. Ischemic stroke in korean young adults. *Acta Neurol. Scand.* **2000**, *101*, 19–24. [[Google Scholar](#)] [[CrossRef](#)]
19. Kang, H.-T.; Shim, J.-Y.; Lee, H.-R.; Park, B.-J.; Linton, J.A.; Lee, Y.-J. Trends in prevalence of overweight and obesity in korean adults, 1998–2009: The korean national health and nutrition examination survey. *J. Epidemiol.* **2014**, JE20130017. [[Google Scholar](#)] [[CrossRef](#)]
20. Black-Schaffer, R.M.; Winston, C. Age and functional outcome after stroke. *Top. Stroke Rehabil.* **2004**, *11*, 23–32. [[Google Scholar](#)] [[CrossRef](#)]
21. Huggins, H.E.; Brady, M.; Emma, J.P.; Thaler, D.E.; Leung, L.Y. Differences in presenting symptoms of acute stroke among young and older adults. *J. Stroke Cerebrovasc. Dis.* **2020**, *29*, 104871. [[Google Scholar](#)] [[CrossRef](#)]
22. Fonarow, G.C.; Reeves, M.J.; Zhao, X.; Olson, D.M.; Smith, E.E.; Saver, J.L.; Schwamm, L.H. Age-related differences in characteristics, performance measures, treatment trends, and outcomes in patients with ischemic stroke. *Circulation* **2010**, *121*, 879–891. [[Google Scholar](#)] [[CrossRef](#)] [[PubMed](#)] [[Green Version](#)]
23. Andersen, K.K.; Olsen, T.S.; Dehlendorff, C.; Kammergaard, L.P. Hemorrhagic and ischemic strokes compared: Stroke severity, mortality, and risk factors. *Stroke* **2009**, *40*, 2068–2072.