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Original Research Article

STROKE SURVEILLANCE "DEVELOPMENT OF HOSPITAL BASED STROKE REGISTRY IN GOVERNMENT MEDICAL COLLEGE, THRISSUR"

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Abstract

Background: Stroke is an important cause of death and disability. Stroke surveillance and stroke registry helps to identify the burden of stroke and its subtypes, time of arrival, risk factors and allocation of health services like imaging and decision making on treatment plan since definitive medical management including IV thrombolysis and Interventions are evolving. This study aims to study the proportion of stroke patients who arrive within window period of 4.5hrs for Intravenous thrombolysis, and also to study the subtypes, risk factors, time taken for imaging etc. **Materials and Methods:** The registry was conducted as prospective observational study. All patients admitted with new onset stroke in medicine ward and medicine ICU who satisfied inclusion and exclusion criteria were enrolled in this study by consecutive sampling for a period of one year. Participants were interviewed and data entered in a pre-structured proforma. Data entered in Excel sheet and statistically analyzed using Epi info software. **Result:** 342 patients enrolled in the study. Mean age 59.21 ±14.76with age range of 23 to 85. Males 73% and females 27%.Regarding stroke subtypes Infarct 56% Intracranial bleed 37% Sub Arachnoid Hemorrhage 4% Venous Infarct 3%. Only 11% got admitted to the hospital within 4.5hours of window period. Average time taken for admission was 8.9 hrs. Average time taken for imaging after admission was 2.68 hrs. Nearly one third were moderate stroke category as per NIHSS score (31%). Hypertension was the most common risk factor 61% followed by Diabetes 36% and Smoking 32%. **Conclusion:** Our registry revealed the need for increasing awareness among general public regarding stroke symptoms and early hospitalization in a center with facility for thrombolysis. It also highlights the need for making arrangements for early imaging and for setting up a stroke unit where definitive treatment and supportive care can be made available for the patients with this disabling illness. Our registry paved the way for starting IV thrombolysis in our Institution.

INTRODUCTION

Stroke is an important cause of death and disability, adding to the burden of communicable diseases. Most stroke survivors continue to live with disabilities, and long-term care is largely undertaken by family members, which impoverishes their families.[1,2] A proper registry on stroke will help us to assess the real magnitude of the disease and to analyze the types of strokes and risk factors. Through this registry, we will determine the proportion of patients admitted with stroke, their subtypes, and the degree of neurological deficit using the NIHSS Score (National Institute of Health Stroke Scale). We will also find out the proportion of stroke patients who will arrive within the thrombolytic window period, as IV thrombolysis within 4.5 hours of onset is the only treatment currently approved for ischemic stroke treatment1[1] for which patients should reach the hospital much earlier. IV thrombolysis rate in acute stroke cases is low even in established stroke centers due to various reasons like the high cost of drugs, late arrival, delay in imaging, etc. By knowing this data we can

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improve our thrombolytic rates. Well-conducted stroke surveillance (with accurate and complete registers) provides essential data that can be used to enhance and appropriate the allocation of health resources for this disabling condition.

Review of Literature

WHO defines stroke as "A focal (or at times global) neurological impairment of sudden onset, and lasting more than 24 hours (or leading to death), and of presumed vascular origin".[3]

The Indian Council of Medical Research (ICMR) estimates indicated that amongst the non-communicable diseases (NCDs), stroke contributes to 41 percent of deaths and 72 percent of disability-adjusted life years (DALYS).[4] The economic loss due to heart disease, stroke, and diabetes between the years 2006 to 2015 is estimated to be approximately 9 billion international dollar loss of national income in India.[5] The age of onset of stroke in developing countries is believed to be younger when compared to developed countries.[6] Worldwide statistics say the prevalence of stroke was 33 million, with 16.9 million people having a first stroke in 2010.[7] The incidence of stroke in India in 2016 was 119-145/100000 and the Prevalence is 0.09 to 0.42%.[8] Trivandrum stroke registry gives an incidence of 135 stroke cases in urban and 138 stroke cases in rural areas per 100,000 population,[9] The lifetime risk of developing stroke is one in five for women and one in six for men and increases with advancing age.[10]

A stroke registry will help us to generate reliable data on the proportion of stroke patients admitted to our institution and various subtypes of stroke. By using the WHO STEP 1 protocol of WHO STEPS STROKE surveillance manual,[12] which is used for hospital-based registry of fatal and non-fatal stroke events we will develop a hospital-based stroke registry that can be utilized for the allocation of health resources for stroke care. It will also provide an opportunity to assess the feasibility of IV thrombolysis in ischemic stroke as it's the only recommended treatment available for stroke.[11] Data will be collected on how many patients can arrive at our institution within the window period of 4.5 hours. This will also help us to set up a stroke unit to provide comprehensive stroke care for our patients. ICMR is also running a national stroke registry and it's high time a stroke registry should be set up in our institution.

Objectives

1. To estimate the proportion of stroke patients who present within the lytic window of 4.5hrs after the onset
2. To study the types and demographic profile of stroke cases
3. To analyze stroke, severity, and risk factors
4. To estimate the time taken for imaging in Stroke

MATERIALS AND METHODS

Study setup: Department of General Medicine, GMC, Thrissur. This study was approved by the Institutional ethics committee

All patients admitted with new onset stroke in the medicine ward and medicine ICU who satisfy inclusion and exclusion criteria were enrolled in this study by consecutive sampling. Their neurological deficit was quantified using the NIHSS Score. These patients were evaluated with CT Brain and were categorized as ischemic stroke, hemorrhagic stroke, venous infarct, or subarachnoid hemorrhage. Their demographic data (age, sex, social status BPL/APL,) was collected and risk factors and comorbidities were documented. The time taken to arrive at the hospital after symptom onset was recorded. Time taken for Imaging (CT scan) was also noted. Details were taken from case records and interviews of patients /bystanders which were entered in a pre-structured proforma.

Information Collected

- Window period arrival (within 4.5 hours of symptom onset) for ischemic stroke
- Time of first brain imaging
- Subtypes of stroke
- NIHSS Score (National Institute of Health Stroke Scale) for Neurological deficit at admission
- Vascular risk factors

Inclusion Criteria

All patients admitted with stroke in our hospital medical wards and medical ICU.

Exclusion Criteria

- Hypoglycemia
- Intra cerebral space-occupying lesions
- Todd's palsy
- Metabolic encephalopathy
- Transient ischemic attack (TIA),
- Subdural hemorrhage.
- Epidural hemorrhage.
- Poisoning.
- Symptoms caused by trauma.
- Coma of systemic vascular origin like:
  - o Shock.
  - o Stokes - Adams syndrome.
  - o Hypertensive encephalopathy
- Not willing to give consent

Duration of study: One year from the date of ethical clearance.

Place of study: Medicine wards and Medical ICU of Thrissur Medical College

Type of Study: Cross-sectional observational study

Data analysis: Data was entered in Excel sheet and analysis was done using EPI Info version 7. Qualitative data was expressed as percentage and quantitative data were expressed as mean and standard deviation. Difference between two groups was analyzed using students t test or ANOVA. P value less than 0.05 was considered significant.

Expected Outcome

This registry will help us to have an idea on the proportion of stroke patients admitted in our institution. Information on various risk factors and types of stroke will be collected and analyzed which will help us to set up a stroke unit to give better care for stroke patients. This registry will also help us to know the feasibility of IV thrombolysis in our ischemic stroke patients as it's the only recommended treatment currently available for the same.

The main outcomes from this Study include:

- Identifying number of ischemic stroke patients arriving in window period of IV thrombolysis
- To study stroke subtypes and its severity
- Health facility resources allocated to stroke patients
- Risk factor exposure.

RESULTS

A total number of 342 patients were enrolled in the study. Of which 73% (n=248) were males and 27% (94) were females. Age distribution of study group: young48(14.04%) Middle193(56.43%) Geriatric 101(29.53%).Mean age59.21 with standard deviation of 14.76 and range 23 to 85. 89% of study population had their first stroke and 11% had recurrent stroke. 31% of the cases were referred and 69% had direct admission. 54% were from rural population 73% were of BPL category of income. 56%(n=192) had infarct, 37% (n=126) had intracranial bleed, 4% (n=15) had subarachnoid hemorrhage, 3%(n=9) had venous infarct. Only 11% (n=38) arrived within the window period of 4.5hrs. Mean time delay of presentation was 8.92 hrs with standard deviation of 7.73 with range of 0.5 hrs to 26 hrs. Regarding stroke severity24%(n=82) had mild stroke 31%(n=107) had moderate stroke, 26% (n=89) had moderately severe stroke and 19% (n=64) had severe stroke as per NIHSS scale. Time taken for CT brain<1hour 38(12.5%),1 to 2 hrs162(53.3%),2 to 3 hrs70(23%),3 to 4 hrs34(11.2%). Mean time delay for CT after admission was 2.68 hrs with standard deviation of 1.27 and range from 0.5hrs to 6 hrs. Hypertension n= 208(60.81%) and Diabetes n=122(35.67%) were most common risk factors in the study group.
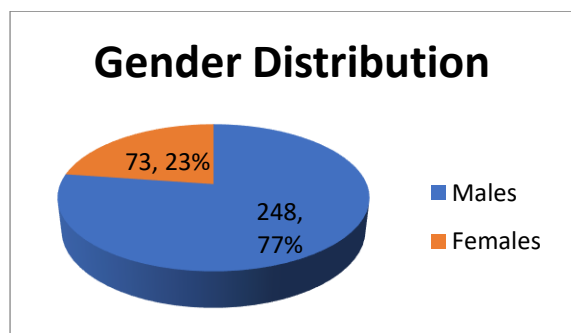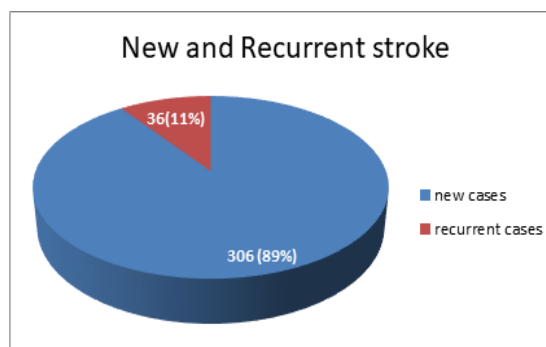

Figure 1: Gender Distribution

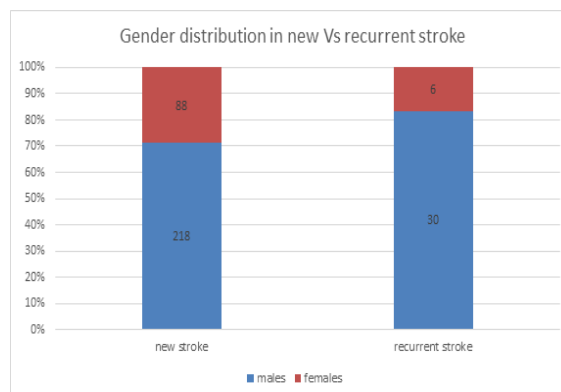**Figure 2: New and Recurrent Stroke**

Figure 3: Gender Distribution New and Recurrent Stroke

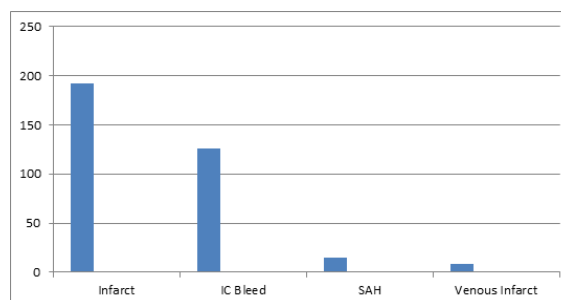**Figure 4: Stroke Types**
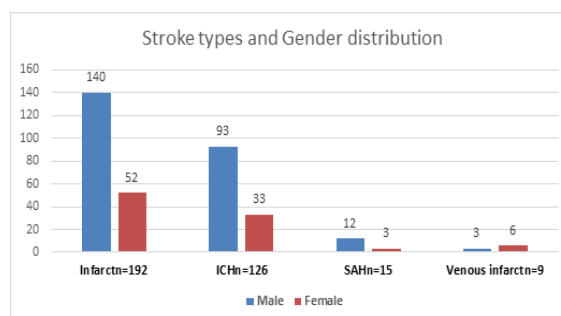
Figure 5: Stroke Types and Gender Distribution

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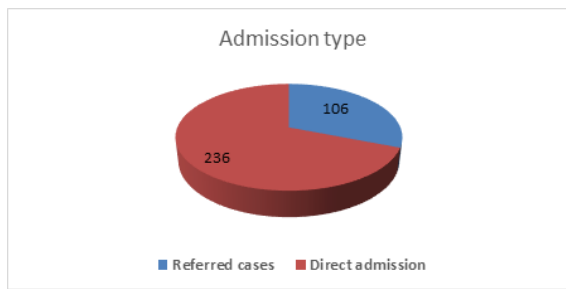ISSN (O): 2687-5365; ISSN (P): 2753-6556
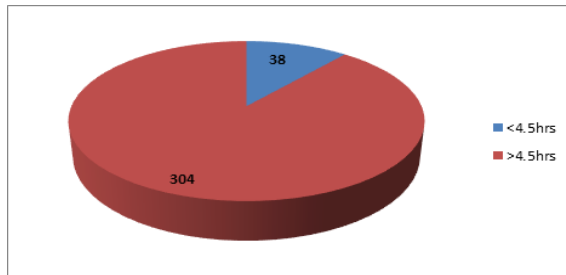
Figure 6: Admission type

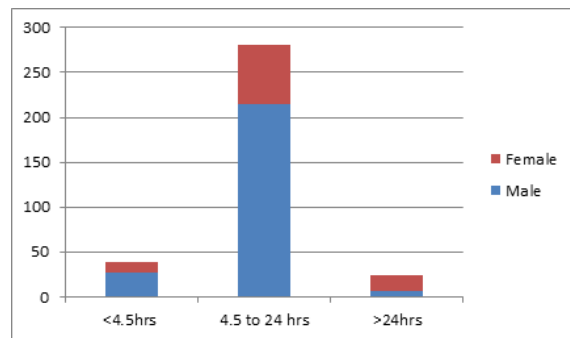**Figure 7: Number of cases arriving in window period (n=342)**

Figure 8: Time delay of hospital arrival
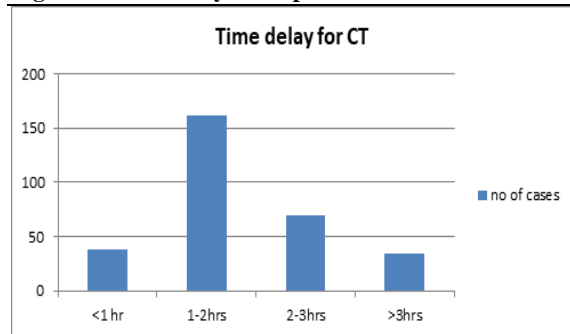
Figure 9: Time Delay for CT Brain

Table 1: Demographic Data of study sample n=342.

Variable	Frequency n (%)
Gender	
Male	248(73%)
Female	94(27%)
Rural/Urban	
Rural	185(54%)
Urban	157(46%)
Financial Status	
BPL	248(73%)
APL	94(27%)
Referred	
Yes	106(31%0
No	236 (69%)
First /Recurrent Stroke	
First stroke	304(89%0
Recurrent Stroke	38(11%)

Table 2: Gender distribution number and (%)

Males	248(72.52)
Females	94(27.48)
Total	342

Table 3: New and recurrent stroke number (%)

New cases	306(89%)
Recurrent cases	36(11%)
Total	342

Table 4: New and recurrent strokes and gender distribution in number and(%)

New strokes	306(89.47)	Recurrent strokes	36(10.53)
Males	218(71)	Males	30(83.33)
Females	88(29)	Females	6(16.67)

Table 5: Stroke types

Stroke type	N(%)
Infarct	192 (56%)
Intracranial bleed	126(37%)
Sub arachnoid hemorrhage	15(4.4%)
Venous Infarct	9(2.6%)

Table 6: Stroke types and Gender distribution in number and(%)

Type	Male	Female	Total
Infarct	140(72.92)	52(27.08)	192(57%)
Intracranial bleed	93(73.81)	33(26.19)	126 (36%)
Sub arachnoid hemorrhage	12(80)	3(20)	15(4%)
Venous infarct	3(33.33)	6(66.67)	9(3%)

Table 7: Referred cases Vs Direct admission

Admission type	N(%)
Referred cases	106(31%)
Direct admission	236(69%)
Total	342

Table 8: Gender wise distribution of referred and direct admission in number and(%)

Admission type	Male	Female	Total
Referred cases	68(64.14)	38(35.85)	106
Direct admission	165(69.91)	71(30.09)	236

Table 9: Time delay of presentation to hospital

Time in hours	Male	Female	Total
<4.5 hours	27	11	38(11.11%)
4.5 -24 hours	214	66	280(81.87%)
>24hours	7	17	24(7.02%)
Total	248	94	342

Table 10: Cases arriving within lytic window of 4.5 hrs Stroke subtypes and gender

Stroke type	Male	Female	Total
Ischemic	17	7	24(63.15)
IC bleed	8	2	10(26.32)
SAH	3	1	4(10.53)
Venous infarct	0	0	0
Total	28	10	38

Table 11: Stroke classification based on severity (NIHSS score)

Severity (NIHSS Score)	Male	Female	Total
Mild(1-4)	56	26	82(23.97)
Moderate(5-15)	83	24	107(31.28)
Moderate –Severe(16-20)	68	21	89(26.03)
Severe(>20)	41	23	64(18.72)
Total	248	94	342

Table 12: Severity of ischemic stroke cases presenting within lytic window(4.5 hours)

Severity (NIHSS Score)	Male	Female	Total
Mild(1-4)	4	2	6
Moderate(5-15)	5	4	9
Moderate –Severe(16-20)	5	3	8
Severe(>20)	3	2	5
Total	17	11	38

Table 13: Time delay for CT brain

Duration	No of cases(%)
<1hour	38(12.5%)
1 to 2 hrs	162(53.3%)
2 to 3 hrs	70(23%)
>3 hrs	34(11.2%)

Table 14: Age distribution of stroke cases

Age group	Male	Female	Total
young	34	14	48(14.04)
Middle	134	59	193(56.43)
Geriatric	80	21	101(29.53)
Total	248	94	342

Table 15: Risk factors of stroke cases

Hypertension	208(60.81)
Diabetes	122(35.67)
Coronary artery disease	52(15.20)
Dyslipidemia	58(16.96)

Nonvalvular Atrial fibrillation	6(1.75)
Valvular heart disease	2(0.58)
TIA	26(7.60)
Smoking	104(30.41)
Multiple risk factors	143(42)

DISCUSSION

As per this registry, 342 stroke cases were admitted in the study period with a mean age of 59.21 ±14.76with age range of 23 to 85. In our study 73% (n=248) were males and 27% (n=94) were females suggesting more than two-thirds of patients are males to be affected with this debilitating disease most of them are breadwinners of the family. A similar study done by PN Sylaja et al on Ischemic stroke profile risk factors and outcomes in India also showed a similar mean age of 58.3±14.7 years, and males were affected more (67%).[13] Around two-thirds of the study group were males aged less than 60 years and this may have financial implications for the family. Similarly, a lesser number of females may also be due to a cultural bias with males seeking medical care early and frequently. The rural n=185(54%) and urban n=157 (46%) differences were insignificant as our institution draws a fairly equal number of patients from both areas. 73% of the study population belonged to the BPL category which may explain the delay in arrival time to seek health care. 89% of the study group n=306 had a first stroke.

Regarding stroke types, 56% n=192 had an ischemic stroke, 37% n=126 had a hemorrhagic stroke, and SAH and venous infarct together account for the remaining 7%. A review article by Jayaraj Pandian et al shows that ischemic and hemorrhagic stroke prevalence is variable in India with infarcts ranging from 46.5 to 84.8% and hemorrhage ranging from 11.5–35%.[14,15] Our registry shows a higher proportion of hemorrhagic stroke reflecting the variability found in the above article regarding stroke subtypes. Around 11% of the study group had recurrent stroke which highlights the need for education of patients on discharge for drug continuation and risk factor control. A study done by Mathew et al from Karnataka showed 21% recurrent stroke.[16] The high health awareness and literacy rate of Kerala may explain the low number of recurrent strokes in our study.

One important factor that decides the time of arrival is whether direct admission or referred case and 69 % of cases in our registry were directly admitted indicating nearly two-thirds of patients reporting to tertiary care centers directly showing a lack of stroke-ready hospitals at lower-level centers.

In our registry 88% n= 304 presented outside the window period of 4.5 hrs and 11% n= 38 reported to the hospital within 4.5hrs of the thrombolytic window period out of which 63 % n= 24 had ischemic stroke. The mean time delay of the presentation was 8.92 hours with Range from 30 minutes to 24 hours. Similar results are observed in the study conducted by Edakkatil et al in south India which shows that only 15% could arrive within 4.5 hours. 7 This indicates the necessity of increasing stroke awareness and treatment options among the public.

Moderate (31%) and Moderately severe (26%) strokes as per NIHSS Score combined formed 57% of the study population and since these are the indicated patients for stroke thrombolysis their arrival within the window period of 4.5 hours could reduce mortality and morbidity. Out of the 38 patients who arrived in the window period 17(45%) were in the moderate and moderately severe group and were eligible for thrombolysis.

Regarding Imaging, the Mean delay for CT brain was 2.68 hours with a standard deviation of 1.25 and range from 30 minutes to 6 hours. As per AHA ASA guidelines time to CT must be less than 20 minutes.[18] Hence our study highlights the need for providing a green channel for brain imaging in acute stroke cases to prevent time delay.

Hypertension 60% Diabetes 35%and Smoking 30% were the most common risk factors and 42% had multiple risk factors. A study done by Raadha et al in South India also shows the same pattern with hypertension and diabetes as the common risk factors for stroke.[19]

CONCLUSION

From our study of the Stroke Registry, we conclude that stroke is common in males and affects the bread-winning age group more. More than half of the study group had Ischemic stroke. Nearly half of the study group had a moderate and moderately severe stroke and are also the eligible group for thrombolysis if they arrive in the window period There is a huge time delay in people seeking medical care in acute stroke which results in delayed diagnosis and treatment. There is a large time gap for brain imaging that needs to be addressed. Hypertension and Diabetes were the most common risk factors. Our Registry provided insights regarding admission patterns stroke types, time delay in arrival and time for imaging, common risk factors, and stroke severity among our study group. Based on this study protocols were made for Imaging and Thrombolysis in stroke patients. Stroke thrombolysis was initiated in our institution and slowly the number of lysed patients has increased over the years due to social awareness activities and better resource allocation based on the results of this registry.

Limitations

This is a registry of cross-sectional observation types and hence did not have a comparison group to

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find the significance of variables. Data on stroke thrombolysis was not available as it was not started in our Institution during the study period.

REFERENCES

1. Bonita R, Beaglehole R. Stroke prevention in poor countries. Time for action. Stroke. 2007;38:2871–2872.
2. Pandian JD, Srikanth V, Read SJ, Thrift AG. Poverty and stroke in India. A time to act. Stroke. 2007;38:3063–3069
3. Adams HP Jr, Adams R, Adams RJ, Brott T, Brott TF, del Zoppo GJ, Furlan et al. Guidelines for the early management of patients with ischemic stroke: A scientific statement from the Stroke Council of the American Stroke Association. Stroke 2003; 34:1056-83.
4. Indian Council for Medical Research. Stroke. in: Assessmentof the burden of non communicable diseases: Final project report. New Delhi: Indian Council of Medical Research;2004. p. 18-22.
5. World Health Organization. The economic impact of chronic diseases in preventing chronic diseases: a vital investment.World Health Organization, Geneva; 2005.
6. Hashmi M, Khan M, Wasay M. Growing burden of stroke in Pakistan: a review of progress and limitations. Int J Stroke. 2013 Oct;8(7):575-81
7. Heart Disease, Stroke and Research Statistics At-a-Glance ... https://www.heart.org/idc/groups/ahamah-public/@wcm/@sop/.../ucm_480086
8. Nijasri C Suwanwela .Stroke burden and stroke care system in Asia. Neurology India: 2016; Volume 64 | Issue : 7 | Page : 46-51.
9. Sapna E. Sridharan.Incidence, Types, Risk Factors, and Outcome of Stroke in a Developing Country The Trivandrum Stroke Registry. (Stroke. 2009;40:1212-1218.)
10. Seshadri S, Beiser A, Kelly-Hayes M, Kase CS, Au R, Kannel WB, et al. The lifetime risk of stroke: Estimates from the Framingham study. Stroke 2006;37:345-50.
11. Werner Hacke, M.D Markku Kaste, M.D. Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke, for the ECASS III Investigators N Engl J Med 2008; 359:1317-1329September 25, 2008DOI: 10.1056/NEJMoa0804656
12. World Health Organization. STEPwise approach to stroke surveillance. (STEPS; http://www.who.int/chp/steps/stroke)
13. Sylaja PN, Pandian JD, Kaul S, Srivastava MVP, Khurana D, Schwamm LH, Kesav P, Arora D, Pannu A, Thankachan TK, Singhal AB. Ischemic Stroke Profile, Risk Factors, and Outcomes in India: The Indo-US Collaborative Stroke Project. Stroke. 2018 Jan;49(1):219-222. doi: 10.1161/STROKEAHA.117.018700. Epub 2017 Nov 22. PMID: 29167386; PMCID: PMC5742046.
14. https://www.ninds.nih.gov/sites/default/files/documents/NIH-Stroke-Scale_updatedFeb2024_508.pdf
15. Pandian, Jeyaraj D. et al.The burden, risk factors and unique etiologies of stroke in South-East Asia Region (SEAR)The Lancet Regional Health - Southeast Asia, Volume 17, 100290
16. Mathew, Thomas; John, Saji K; Souza, Delon D; Nadig, Raghunandan; Badachi, Sagar; Sarma, GRK. Recurrent Ischemic Strokes: "Discontinuation of Antiplatelet Drugs Appears to be an Important Preventable Cause". Neurology India 69(6):p 1743-1746, Nov–Dec 2021. | DOI: 10.4103/0028-3886.333533
17. Edakkattil S, Abraham SV, Panattil NJ, Gafoor FA, Jacob L, Liu R. Prehospital Factors Associated with Delayed Hospital Arrival of Stroke Patients: A Regional Single-Center Study from India. Ann Indian Acad Neurol. 2024 Mar-Apr;27(2):165-171. doi: 10.4103/aian.aian_1091_23. Epub 2024 Apr 19. PMID: 38751933; PMCID: PMC11093158.
18. Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 Guidelines for the early management of patients with acute ischemic stroke: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2018;49(3):e46–e110. 10.1161/STR.0000000000000158
19. Raadha Am, Ramkumar S, Ananthi Sakthivel P, Shanmugam J. Risk Factors And Predictors Of Severity For Ischemic Stroke In The Rural South Indian Population. Asian J Pharm Clin Res [Internet]. 2023 Dec. 7 [cited 2025 Jan. 23];16(12):72-6.

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