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Original Research Article

An observational study from a new tertiary care hospital in North Odisha: clinical and etiological profile of acute ischemic stroke patients

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ABSTRACT

Background: Worldwide, cerebrovascular accidents (stroke) are the second leading cause of death and the third leading cause of disability. According to WHO estimation, by 2050 nearly 80% of stroke cases may occur in low and middle-income countries like China and India. It is critical that we understand the etiology causing the stroke so that appropriate treatment can be initiated in a timely fashion. Furthermore, understanding the risk factors associated with stroke is important before primary and secondary preventive measures can be prescribed to the patient.
Methods: This observational study was carried out amongst 481 acute ischemic stroke patients that fulfils the inclusion and exclusion criteria and admitted in medicine ward of Pandit Raghunath Murmu Medical College and Hospital, Baripada, Dist. Mayurbhanj, Odisha, India from June 2018 to January 2019.
Results: In our study, 481(60.43%) patients had ischemic stroke and 315 (39.57%) patients had hemorrhagic stroke. The incidence of stroke is maximum in 51-70 years of age group which comprises of 59.46% of total patients. The average age + SD were 61.4±13.1 in our study. The most common risk factor was hypertension with 69.85% followed by dyslipidemia 51.77%. Most common clinical presentation was hemiplegia (72.35%) followed by speech involvement (59.46%). Most common site of infarct was parietal (22.25%), followed by periventricular (12.68%).
Conclusions: Most of the patients had ischemic stroke as compared to hemorrhagic stroke. It was more common in males. The study contributes to understanding of demographic characteristics, risk factors, and stroke subtypes in acute ischemic stroke. The importance of various risk factors among ischemic stroke subtypes should be stressed for prompt preventive strategies and treatment.

Keywords: Hemiplegia, Ischemic stroke, North Odisha, Risk factors

INTRODUCTION

Worldwide, cerebrovascular accidents (stroke) are the second leading cause of death and the third leading cause of disability.[1] Stroke, the sudden death of some brain cells due to lack of oxygen when the blood flow to the brain is lost by blockage or rupture of an artery to the brain, is also a leading cause of dementia and depression.[2] Globally, 70% of strokes and 87% of both stroke-related deaths and disability-adjusted life years occur in low- and middle-income countries.[3-5] Over the last four decades, the stroke incidence in low- and middle-income countries has more than doubled. During these decades stroke incidence has declined by 42% in high-income countries.3 On average, stroke occurs 15 years earlier in - and causes more deaths of - people living in low- and middle-income countries, when compared to those in high-income countries.[2] Strokes mainly affect individuals

at the peak of their productive life. Despite its enormous impact on countries' socio-economic development, this growing crisis has received very little attention to date.

Furthermore, as most guidelines are based on high-income country data, uncertainty remains regarding best management of stroke of unknown type in low- and middle-income countries. For example, in low- and middle-income countries, 34% of strokes (versus 9% in high-income countries) are of haemorrhagic subtype and up to 84% of stroke patients in low- and middle-income countries (versus 16% in high income countries) die within three years of diagnosis.[2]

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.[6] Almost two thirds of the global burden of acute ischemic stroke is in developing countries.[7]

With the advancing life expectancy of people in developing countries, the importance of ischemic stroke will grow as a worldwide problem.[8] Unfortunately, it has been explained that the neurologic symptoms do not accurately reflect the presence or absence of infarction, and the severity of symptoms does not indicate the cause of the ischemia.[9] Therefore, it is critical that we understand the etiology causing the stroke so that appropriate treatment can be initiated in a timely fashion. Furthermore, understanding the risk factors associated with stroke is important before primary and secondary preventive measures can be prescribed to the patient.

Ischemic strokes account for 50-85% of all strokes worldwide.[10] Stroke case - fatality defined as the proportion of events that are fatal within 28 days post stroke averages 30%.[11] Stroke is also a leading cause of disability in adults. Among the stroke survivor each year, 30% requires assistance with activities of daily living, 20% requires assistance with ambulation, and 16% requires institutional care leading to serious long-term physical and mental disabilities among survivors.[12]

According to the World Health Organization (WHO), stroke is a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal, and at times global (applied to patients in deep coma and those with subarachnoid hemorrhage), loss of cerebral function, with symptoms lasting more than 24 hrs or leading to death, with no apparent cause other than that of vascular origin. Stroke was found to be the second leading cause of death and was predominant at age above 60 years, simultaneously the fifth leading cause of death among age group of 15-59 years old.[13] Stroke is the second leading cause of death worldwide; causing 6.2 million deaths in 2015.[14] Stroke claims a life every 6 seconds. From 2000-2008, the overall stroke incidence rates in low to medium income countries exceeded that of incidence rates seen in high income countries by 20%. According to WHO estimation, by 2050 nearly 80% of stroke cases may occur in low and middle-income countries like China and India.[15]

METHODS

This observational study was carried out amongst 481 acute ischemic stroke patients that fulfils the inclusion and exclusion criteria and admitted in medicine ward of Pandit Raghunath Murmu Medical College and Hospital, Baripada, Dist. Mayurbhanj, Odisha, India from June 2018 to January 2019.

Findings of brain computerized tomography (CT) scan performed within one week of the onset of stroke were used for classification of the type of stroke. Cerebral infarction was diagnosed based on typical CT scan findings of infarct or a normal CT scan when it was performed within two days of the onset of stroke, or the presence of a potential source of cerebral emboli such as the heart or carotid artery relevant to the side of the stroke. Patients with cerebral infarction were further classified into lacunar infarct (defined as infarct measuring up to 1.5 cm on CT scan of the brain) and non-lacunar infarct (defined as infarct measuring >1.5 cm on CT scan of the brain). Intracerebral haemorrhage (ICH) or subarachnoid haemorrhage (SAH) was diagnosed based on clinical and CT scan findings. Where none of these criteria were fulfilled, the cause was classified as unspecified type of stroke.

The case sheets of the patients were retrieved from the medical records department of the hospital and relevant data extracted and analyzed. We have only CT scan machine in hospital, for MRI we have to send patients to higher centers.

Inclusion criteria

- Subjects aged older than 15 years.
- The diagnosis of acute ischemic stroke based on clinical evaluation and imaging (computed tomography [CT]-head).

Exclusion criteria

- Patient below 15 years of age.
- Patient having ICH and SAH.
- All hemorrhagic stroke patients who have posttraumatic, drug-induced (e.g., anticoagulant-induced), and those with bleeding diathesis-related etiologies.
- ICSOL.
- Patients with stroke-like conditions due to systemic diseases such as infection.

All the patients' fulfilling the definition of acute stroke were subjected to CT scan head (plain). Findings of brain

computerized tomography (CT) scan performed within one week of the onset of stroke were used for classification of the type of stroke. All the patients were assessed clinically through detailed history and clinical examination. From the history, various demographic variables were collected including age, sex, history of transient ischemic attack/stroke, hypertension, diabetes mellitus, heart disease and addiction. Routine hematological and biochemical tests including Hb, serum urea, serum creatinine, blood sugar, and lipid profile were done.

For this study, hypertension was defined as blood pressure recording of more than 140/90 mmHg on three separate occasions on 3 different days. Patients who are already on antihypertensive medications were also taken as hypertensive. Dyslipidemia was defined as serum triglycerides higher than 150 mg/dl, low-density lipoprotein cholesterol more than 100 mg/dl and high density lipoprotein cholesterol <50 mg/dl in females and <40 mg/dl in males. In addition, history of smoking, tobacco chewing, and alcohol intake was enquired and noted. Diabetic patients were diagnosed as per the American Diabetic Association guidelines. Patients on antidiabetic medications were also classified as diabetics.

Statistical analysis

All the data were fed on excel spreadsheet, and statistical analyses were made using SPSS version 21.0 software. Results were expressed in average + SD, frequencies and percentages.

RESULTS

During the study period, out of 796 acute stroke patients admitted in medicine ward of P.R.M.M.C.H., Baripada, we included 481 cases of acute ischemic stroke patients in our study that fulfills inclusion and exclusion criteria. All the cases were studied for the clinical presentation, risk factors, neurological presentation, and pattern of area of brain affected as per CT scan findings.

Table: 1 Type of index stroke.

Type of stroke	Number of patients	%
Ischemic	481	60.43%
Haemorrhagic	315	39.57%
Total	796	100%

Table 1 shows 481 (60.43%) patients had ischemic stroke and 315 (39.57%) patients had hemorrhagic stroke. In CT scan, we found lacunar infarct in 48 (9.98%) cases and wedge-shaped infarct in 29 (6.03%) cases with ischemic stroke.

Table 2 shows that the incidence of stroke is maximum in 51-70 years of age group which comprises of 59.46% of total patients. 12.06% patients were of age ≤45 years. In our study, the youngest patient was 18years old and oldest was 98 years old. The average age±SD were 61.4±13.1 in our study.

Table 3 shows out of 481 ischemic stroke patients 287 (59.67%) were males and 194 (40.335%) were females. The male to female ratio was 1.48:1. From above observation it can be concluded that incidence of stroke is more common in male sex.

Table: 2 Frequencies and percentage of cases according to age group.

Age group	Number of cases	%
<20	2	0.42
21-30	10	2.08
31-40	25	5.20
41-50	68	14.14
51-60	137	28.48
61-70	149	30.98
71-80	68	13.51
81-90	137	4.37
>91	4	0.83
Total	481	100

Table 3: Gender wise distribution of stroke patients.

Gender	Number of cases	%
Male	287	59.67
Female	194	40.33
Total	481	100

Table 4: Laterality of ischemic stroke.

Laterality	Number of cases	%
Right	103	21.41
Left	108	22.45
Bilateral	63	13.10
Undetermined	207	43.04
Total	481	100.00

Table 4 shows overall index stroke was on the left side in 108 (22.45%) patients and it was on the right side in 103 (21.41%) patients. 63 (13.10%) patients also had bilateral stroke, out of which 66 (24.09%) patients had ischemic stroke compared to 19 (6.03%) patients with haemorrhagic stroke. The laterality was undetermined in 207 (43.04%) cases.

Table 5 shows anterior circulation (44.28%) was the most common territory involved in the brain.

Table 6 shows the quantitative parameters of the ischemic stroke patients. The average age±SD were 61.4±13.1 years in our study. The average age±SD were 61.7±13.7 among male and 60.9±12.3 among female patients in our study. Mean systolic blood pressure was 146.9±72.5 mm

Hg and mean diastolic blood pressure was 87.0±14.8 mm Hg.

Table 5: Site of lesion.

Site	Number of cases	%
ACS	213	44.28
PCS	30	6.24
ACS+PCS	31	6.44
Undetermined	207	43.04
Total	481	100.00

Table 6: Quantitative parameters of patients included in study.

Parameters	Mean±SD
Age	61.4±13.1
Age (male)	61.7±13.7
Age (female)	60.9±12.3
Systolic bp	146.9±72.5
Diastolic bp	87.0±14.8
Haemoglobin	11.4±4.4
Total cholesterol	173.2±35.7
Triglyceride	128.5±47.2
HDL	54.0±11.2
LDL	96.8±24.4
Serum urea	38.2±24.2
Serum creatinine	1.3±0.7

Table 7: Risk factors for stroke patients.

Risk features	Frequency	%
Hypertension	336	69.85
Diabetes	57	11.85
Htn and diabetes	46	9.56
Dyslipidemia	249	51.77
Anemia	128	26.61
Alcohol	67	13.93
Tobacco/ smoking	140	29.11
CKD/ renal dysfunction	105	21.83
RHD/ valvular heart disease	2	0.42
CAD	1	0.21
DCM	2	0.42
Atrial fibrilation	3	0.62
Past history of CVA	52	10.81

Table 7 shows that the most common risk factor was hypertension with 69.85% followed by dyslipidemia 51.77%, tobacco chewing/ smoking 29.11%, anemia 26.61%, renal dysfunction 21.83%, alcohol 13.93%, diabetes 11.85% and H/O of previous cerebrovascular accident 10.81%.

Table 8 shows that most common clinical presentation was hemiplegia (72.35%) followed by speech involvement (59.46%), altered sensorium (45.11%), UMN facial palsy (32.02%), convulsion (14.55%) and giddiness (12.89%).

Table 8: Clinical features of stroke patients.

Predominant presenting clinical feature	frequency	%
Lt hemiplegia	158	32.85
Rt hemiplegia	190	39.50
Hemiplegia	348	72.35
Speech involvement	286	59.46
Umn facial palsy	154	32.02
Fascio brachial palsy	4	0.83
Altered sensorium	217	45.11
Convulsion	70	14.55
Instability of gait	8	1.66
Sensory impairment	5	1.04
Headache	18	3.74
Vomiting	20	4.16
Giddiness	62	12.89
Coma	15	3.12
Visual impairment	6	1.25

Table 9: Topographic distribution of cerebral infarction.

Altered areas of brain on CT scan	Frequency	%
Frontal	33	6.86
Parietal	107	22.25
Temporal	30	6.24
Basal ganglia	43	8.94
Caudate nucleus	2	0.42
Centrum semiovale	3	0.62
Periventricular	61	12.68
Internal capsule	19	3.95
External capsule	13	2.70
Thalamus	10	2.08
Occipital	47	9.77
Pons	2	0.42
Brainstem	1	0.21
Cerebellar	13	2.70
Global cerebral cortical atrophy	84	17.46
Lacunar infarct	48	9.98
Normal	151	31.39

Table 9 shows CT scan was normal in 151 (31.39%) cases. Most common site of infarct was parietal (22.25%), followed by periventricular (12.68%), occipital lobe (9.77%), basal ganglia (8.94%), frontal lobe (6.86%) and temporal lobe (6.24%). Thus, findings were favoring middle cerebral artery territory involvement which is most commonly involved in thrombotic stroke. Lacunar infarct was found in 48 (9.98%) cases of acute ischemic stroke. Global cerebral cortical atrophy was found in 84 (17.46%) cases.

DISCUSSION

The incidence of stroke is maximum in 51-70 years of age group which comprises of 59.46% of total patients with mean age of 61.4±13.1 years, which was relatively younger than those seen in the Western studies. In the Indian subcontinent, stroke happens nearly a decade earlier than West and young strokes constitute about 20% of stroke population in India.[16,17] The incidence of stroke increases with age.

The gender distribution showed an M: F ratio of 1.48:1 in acute ischemic stroke patients. This gender difference possibly resulted from inherent social bias, in which female patients are less likely to be admitted to hospital compared to male patients. 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 tobacco chewing/ smoking and alcohol. Our study was comparable to other Indian studies on stroke patients where greater preponderance was seen among males.[16,18]

In our observation, we found, 481(60.43%) patients had ischemic stroke and 315 (39.57%) patients had hemorrhagic stroke. This is consistent with the reported proportion of ischemic stroke of 68% from community-based studies to 80% from hospital-based study.[19,20]

In our study, we found 12.06% patients were of age ≤45 years. Pardiwalla et al, reported the incidence of stroke in young to be 10%.[21]

In this study, hypertension was the most common risk factor of acute ischemic stroke in adults. Similar finding had been observed in the studies by a group of Indian authors.[22,23] Hypertension is the dominant predisposing factor for stroke and is strongly related to atherothrombotic brain infarction as well as intracranial hemorrhage. Epidemiologic studies have reported that hypertension is associated with an increased likelihood of subclinical or silent stroke, which in turn has been linked with increased risk of recurrent stroke.[24]

In this study, 51.77% of the acute ischemic stroke patients had dyslipidemia which may be attributed to the increasing trends of sedentary lifestyle, diet pattern, tobacco chewing, smoking, and excess alcohol intake and was higher compared to Tan K S, et al.[23] Smoking is a known risk factor for ischemic stroke. The prevalence of smoking in the present study was 29.11% which was compared to the previous studies.[23,25] Alcohol is another important contributing risk factor in the development of ischemic stroke. The current study had 13.93% patients with a history of excess alcohol intake which was higher compared to the previous studies.[23,25]

In our present study we found anemia in 26.61% cases which is more commonly associated with ischemic stroke patients which is correlated with Eapen et al, study 26 where anemia was found in 33% cases. In our present study we found renal dysfunction in 21.83% cases.

The most common clinical presentation in the current study was motor weakness (72.35%) either in the form of hemi paresis or hemiplegia whereas Omkar Prasad Baidya, et al.[25] in their study reported 84% patients with motor weakness. In comparison to Omkar Prasad Baidya, et al.[25] who had noticed 12% patients with facial palsy, the current study noticed facial palsy in 32.02% patients. Speech disturbance was noted in 59.46% cases. Unconsciousness at the onset was present in 45.11% patients. In the present study, only 14.55% cases had seizures. As reported by different authors, seizure is not a common finding in stroke patients.[27] In our study, we found normal CT scan in 151 (31.39%) cases. Most common site of infarct was parietal (22.25%), followed by periventricular (12.68%), occipital lobe (9.77%), basal ganglia (8.94%), frontal lobe (6.86%) and temporal lobe (6.24%). Thus, findings were favoring middle cerebral artery territory involvement which is most commonly involved in thrombotic stroke. Lacunar infarct was found in 48 (9.98%) cases of all acute ischemic strokes.

CONCLUSION

Most of the patients had ischemic stroke as compared to hemorrhagic stroke. It was more common in males. The study contributes to understanding of demographic characteristics, risk factors, and stroke subtypes in acute ischemic stroke. The importance of various risk factors among ischemic stroke subtypes should be stressed for prompt preventive strategies and treatment. Future studies surveying larger number of stroke patients in multiple centers are recommended.

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REFERENCES

1. Global Health Estimates. Geneva: World Health Organization; 2012. Available at: http://www.who.int/healthinfo/global_burden_disease/en/. Cited 2016 June 1.
2. Owolabi MO, Akarolo-Anthony S, Akinyemi R, Arnett D, Gebregziabher M, Jenkins C, et al.; Members of the H3Africa Consortium. The burden of stroke in Africa: a glance at the present and a glimpse into the future. Cardiovasc J Afr. 2015 Mar-Apr;26(2) Suppl 1:S27-38.
3. Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, et al. Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) and the GBD Stroke Experts Group. Global and regional burden of stroke during 1990-2010: findings from the Global Burden

of Disease Study 2010. Lancet. 2014 Jan 18;383(9913):245-54.
4. Feigin VL, Lawes CM, Bennett DA, Barker-Collo SL, Parag V. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. Lancet Neurol. 2009 Apr;8(4):355=69.
5. Strong K, Mathers C, Bonita R. Preventing stroke: saving lives around the world. Lancet Neurol. 2007 Feb;6(2):182-7.
6. Smith WS, English JD, Johnson SC. Cerebrovascular Diseases. In: Favei AS, Bravnald E, Kasper DL, Hsusor SL, Longo DL, Joneson J, et al. editors. Harrison's principles of internal medicine.17th Ed. USA: McGraw Hills; 2008:2513-2535.
7. Bonita R, Mendis S, Truelsen T, Bogousslavsky J, Toole J, Yatsu F. The global stroke initiative. Lancet Neurol. 2004;3:391-3.
8. Allen CM. Predicting the outcome of acute stroke: A prognostic score. J Neurol Neurosurg Psychiatry. 1984;47:475-80.
9. Caplan LR. Terms describing brain ischemia by tempo are no longer useful: A polemic (with apologies to Shakespeare). Surg Neurol. 1993;40:91-5.
10. Feigin VL, Lawes CM, Bennett DA, Barker-Collo SL, Parag V. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: A systematic review. Lancet Neurol. 2009;8:355-69.
11. Thorvaldsen P, Asplund K, Kuulasmaa K, Rajakangas AM, Schroll M. Stroke incidence, case fatality, and mortality in the WHO MONICA project. World Health Organization Monitoring Trends and Determinants in Cardiovascular Disease. Stroke. 1995;26:361-7.
12. Hankey GJ, Warlow CP. Treatment and secondary prevention of stroke: Evidence, costs, and effects on individuals and populations. Lancet. 1999;354:1457-63.
13. Stroke, World Heart Federation. The global burden of stroke. Available at: http://www.worldheartfederation.org/cardiovascular-health stroke. [Last updated on 2015 Jan 02, Last Assessed on 2015 Jul 01].
14. Fauci AS, Dennis L, Kasper L, Longo DL, Hauser SL, Jameson JL, et al. eds Harrison's Principles of Internal Medicine. 20th ed. United States of America, NY: McGrawHill; 2018:3068-3079.
15. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. J Stroke. 2013;15(3):128-34.
16. Anand K, Chowdhury D, Singh KB, Pandav CS, Kapoor SK. Estimation of mortality and morbidity due to strokes in India. Neuroepidemiol. 2001;20:208-11.
17. Bansal BC, Dhamija RK, Mittal S. Trends in clinico-epidemiological correlates of stroke in the community. J Indian Acad Clin Med. 1991;5:27-31.
18. 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.
19. Banerjee TK, Mukherjee CS, Sarkhel A. Stroke in the urban population of Calcutta – An epidemiological study. Neuroepidemiol. 2001;20:201-7.
20. Dalal PM. Burden of stroke: Indian perspective. Int J Stroke. 2006;1:164-6.
21. Pardiwalla FK, Yeolekar ME, Bakshi SK. Circadian rhythm in acute stroke. J Assoc Physicians India. 1993;41:203-4.
22. 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;16:173-7.
23. Tan KS, Navarro JC, Wong KS, Huang YN, Chiu HC, Poungvarin 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;19:117-27.
24. Prabhakaran S, Wright CB, Yoshita M, Delapaz R, Brown T, DeCarli C, et al. Prevalence and determinants of subclinical brain infarction: The Northern Manhattan study. Neurol. 2008;70:425-30.
25. Prasad BO, Sunita T, Kauser U. Acute ischemic stroke in young adults-a hospital based study in North India. Int J Biomed Research. 2015;6:113-7.
26. Eapen RP, Parikh JH, Patel NT. A study of clinical profile and risk factors of cerebrovascular stroke. Guj Med J. 2009;64(2):47-54.
27. Dhamija R, Kaintura A, Kumar M. Predictive factors for post stroke seizures. Epilepsia. 2007;48:81.

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