



Original Research Article

An observational study of clinico-etiological profile of Posterior circulation stroke patients in a new tertiary care hospital in North Odisha

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Abstract

Background: *Posterior circulation stroke is less common than stroke involving the anterior circulation. Posterior circulation stroke accounts for approximately 20% of all strokes with varied clinical presentation, which differ from strokes in anterior circulation, with reference to etiology, clinical features, and prognosis. Early diagnosis of stroke is essential so that appropriate preventive therapies may be instituted.*

Materials & Methods: *This observational study was carried out among 80 posterior stroke patients from June 2018 to Jan 2019 of all new patients admitted with stroke in Pandit Raghunath Murmu Medical College & Hospital, Baripada, Mayurbhanj, Odisha, India.*

Results: *The total number of posterior circulation stroke patient was 80, 10.05% of 796 total stroke patients, posterior circulation ischemic stroke in 12.68% of cases out of 481 ischemic stroke patients in our study. In our study, 76.25% patients had ischemic stroke and 23.75% patients had hemorrhagic stroke. Average age of patient in hemorrhagic stroke was 57.9 years and average age of patient in ischemic stroke was 61.0 years. Hypertension (72.50%) was the most common associated risk factor followed by dyslipidemia (48.75%) followed by tobacco chewing (32.50%). Motor involvement (72.5%) was commonest clinical feature among posterior circulation stroke followed by speech involvement (58.75%) and altered sensorium (48.75%).*

Conclusions: *There are very few studies on clinical profile and outcome in PCS we would need more studies solely on PCS elucidating particularly the causes and predictors of outcomes to help establish an appropriate management strategy for PCS.*

Keywords: *Cerebrovascular stroke, Ischemic stroke, Hemorrhagic stroke, Risk factors, Hypertension, Diabetes.*

Introduction

Cerebrovascular accidents have been known since ancient times because of the characteristic clinical picture they produce. Hippocrates (470-370 B.C) described stroke as “APOPLEXY” which means astonishment. Leonicensis described syphilitic hemiplegia in 1477. In 1911 Margulies first reviewed the topic of brain stem infarction and described clinical examples of basilar territory syndromes. In 1932 Pines and Gilinsky published detailed report that included serial section of brain stem in a patient with thrombosis of basilar artery. 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 (Hatano, 1976). 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^[1]. Stroke is the second leading cause of death worldwide, causing 6.2 million deaths in 2015^[2]. 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^[3].

Posterior circulation stroke (PCS) accounts for 20% of all strokes with high mortality and morbidity.^[4] The area includes brain stem, cerebellum, occipital lobe and thalamus, and is supplied by vertebral arteries, the basilar artery, and the two posterior cerebral arteries.^[5,6] This is the only vascular region in the body where two arteries unite to form a large arterial trunk that again divides in two major branches. These arteries, through penetrating and short circumferential branches, supply the brain stem,

thalamus, cerebellum, occipital, and medial temporal lobes.^[7] Posterior circulation stroke can have diverse presentations that differ from strokes in anterior circulation in relation to etiology, clinical features, and prognosis. Posterior circulation stroke can present with vertigo, ataxia, vomiting, headache, cranial nerve abnormalities, bilateral long tract neurological sign, “locked in” syndrome or impaired consciousness, and complex ocular signs or cortical blindness. The intracranial portion of posterior circulation is much more prone to atherosclerosis as compared to anterior circulation.

Stroke research and clinical trials have focused mainly on anterior circulation stroke (ACS). Since clinical characteristics, mechanisms, and outcomes of posterior circulation stroke (PCS) have been reported different from ACS, more PCS studies are required.

Following Kubic and Adams original study in 1946, a clinic-pathological study on total basilar arteries occlusion, PCS have traditionally been considered to have high morbidity and mortality.^[4] Although few studies revealed low mortality rate among patients with vertebra basilar territory infarcts.^[8,9] However, with the publication of data from the New England Medical Centre – Posterior Circulation registry (NEMC-PCR), the risk factors and outcome in PCS have been better delineated.^[10] We would need more studies solely on PCS elucidating particularly the causes and predictors of outcomes to help establish an appropriate management strategy for PCS.

Methods

This observational study was carried out amongst 80 posterior stroke patients from 796 stroke patients that fulfilled 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 Jan 2019. 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

- All posterior stroke patients above 18 years of age and having CT confirmed diagnosis of stroke.

Exclusion Criteria

- Patient below 18 years of age.
- Patients having anterior circulation stroke.
- Patients CT reports not showing confirmed diagnosis.
- Coagulation disorders, AV malformations, 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 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 \pm SD, frequencies and percentages.

Results

The total number of posterior circulation stroke patient was 80 (10.05%) of 796 total stroke patients. The total number of patients included was 80 comprising of 59 male patients and 21 female patients. Peak incidence of posterior circulation stroke was above 60 years of age comprising 53.75%. Median age in patients with posterior circulation stroke was 63.2 years. Gender distribution (table 2) in posterior circulation stroke showed male was 63.75% with female 36.25% with male predominance.

Table: -1 Age distribution of patients as per stroke type

AGE DISTRIBUTION OF PATIENTS AS PER STROKE TYPE						
AGE GROUP	ISCHEMIC STROKE		HEMORRHAGIC STROKE		TOTAL	
	NUMBER OF CASES	%	NUMBER OF CASES	%	NUMBER OF CASES	%
15-30	1	1.64	0	0.00	1	1.25
31-45	4	6.56	2	10.53	6	7.50
46-60	22	36.07	8	42.11	30	37.50
61-75	23	37.70	7	36.84	30	37.50
>76	11	18.03	2	10.53	13	16.25
TOTAL	61	100	19	100	80	100

Youngest patient in the study group was 28 years old. Oldest patient in the study group was 88 years old.

Average age in the study group was 63.2 ± 12.1 years.

Table: -2 Gender wise frequency of different types of strokes

GENDER WISE FREQUENCY OF DIFFERENT TYPES OF STROKES						
GENDER	ISCHEMIC STROKE		HEMORRHAGIC STROKE		TOTAL	
	NUMBER OF CASES	%	NUMBER OF CASES	%	NUMBER OF CASES	%
MALE	37	60.66	14	73.68	51	63.75
FEMALE	24	39.34	5	26.32	29	36.25
TOTAL	61	100	19	100	80	100

In both types of strokes there was male predominance.

Table: -3 Type of index stroke

TYPE OF INDEX STROKE		
TYPE OF STROKE	NUMBER OF CASES	%
ISCHEMIC	61	76.25
HEMORRHAGIC	19	23.75
TOTAL	80	100

Ischemic stroke was seen in 61 (76.25%) patients and hemorrhagic stroke was seen in 19 (23.75%) patients.

Table: -4 Mean age of patients as per gender and stroke type

MEAN AGE OF PATIENTS AS PER GENDER AND STROKE TYPE				
GENDER	ISCHEMIC STROKE		HEMORRHAGIC STROKE	
	NUMBER OF CASES	MEAN AGE (YRS+SD)	NUMBER OF CASES	MEAN AGE (YRS+SD)
MALE	37	61.3 ± 13.9	14	58.8 ± 13.1
FEMALE	24	60.6 ± 12.2	5	56.7 ± 14.3
TOTAL	61	61.0 ± 13.3	19	57.9 ± 13.6

Average age of patient in hemorrhagic stroke was 57.9 years and average age of patient in ischemic stroke was 61.0 years.

Table: -5 Quantitative parameters of patients included in study

QUANTITATIVE PARAMETERS OF PATIENTS INCLUDED IN STUDY	
PARAMETERS	MEAN ± SD
AGE	63.2 ± 12.1
SYSTOLIC BP	153 ± 33.2
DIASTOLIC BP	91.3 ± 18.2
HAEMOGLOBIN	11.9 ± 2.2
TOTAL CHOLESTEROL	176.2 ± 33.1
TRIGLYCERIDE	123.3 ± 50.4
HDL	55.4 ± 10.7
LDL	102.3 ± 25.9
SERUM UREA	42.4 ± 23.4
SERUM CREATININE	1.3 ± 0.6

Table: -6 Risk factors for posterior stroke patients

RISK FACCTORS FOR STROKE PATIENTS OUR STUDY	PRESENT STUDY		RATNAVALI et al	CAPLANI et al	UMA et al	KORA et al	RAWAT KJ et al
	FREQUENCY	%	%	%	%	%	%
HYPERTENSION	58	72.50	23	61	35.5	37	60.5
DIABETES	7	8.75	20	25	21	5	28
DYSLIPIDEMIA	39	48.75	-	25	44.4	10	55.26
ALCOHOL	11	13.75	-	-	-	-	-
TOBACCO	26	32.50	25	35	11.8	52	13
CKD/ RENAL DYSFUNCTION	16	20.00	-	-	-	-	-
PAST HISTORY OF CVA	7	8.75	-	-	-	-	-

Hypertension (72.50%) was the most common associated risk factor followed by dyslipidemia (48.75%) followed by tobacco chewing (32.50%).

CKD/ renal dysfunction were also associated in 20% cases in our study.

Table: -7 Clinical features of posterior stroke patients

CLINICAL FEATURES OF STROKE PATIENTS							
PREDOMINANT PRESENTING CLINICAL FEATURE	PRESENTING	FREQUENCY (ISCHEMIC)		FREQUENCY (HEMORRHAGE)		FREQUENCY (TOTAL)	
		FREQUENCY	%	FREQUENCY	%	FREQUENCY	%
HEMIPLEGIA/ INVOLVEMENT	MOTOR	44	72.13	14	73.68	58	72.50
SPEECH INVOLVEMENT		34	55.74	13	68.42	47	58.75
UMN FACIAL PALS		13	21.31	4	21.05	17	21.25
ALTERED SENSORIUM		26	42.62	13	68.42	39	48.75
CONVULSION		8	13.11	1	5.26	9	11.25
INSTABILITY OF GAIT/ ATAXIA		7	11.48	3	15.79	10	12.50
HEADACHE		2	3.28	2	10.53	4	5.00
VOMITING		4	6.56	1	5.26	5	6.25
GIDDINESS		15	24.59	7	36.84	22	27.50
COMA		4	6.56	4	21.05	8	10.00
VISUAL IMPAIRMENT		6	9.84	0	0.00	6	7.50

Giddiness (27.5%) was the commonest symptom among posterior circulation stroke.

Motor involvement (72.5%) was commonest clinical feature among posterior circulation stroke followed by speech involvement and altered sensorium.

Coma was more common in hemorrhagic posterior stroke (21.05%). Coma was more commonly present in patients involving Infratentorial region (7cases) (87.5%) consisting of cerebellum, pons and brainstem.

Table: -8 Topographic distributions of cerebral hemorrhage and cerebral infarction

ALTERED AREAS OF BRAIN ON CT SCAN	TOPOGRAPHIC DISTRIBUTION OF CEREBRAL HEMORRHAGE		TOPOGRAPHIC DISTRIBUTION OF CEREBRAL INFARCTION	
	FREQUENCY	%	FREQUENCY	%
OCCIPITAL	6	31.58	47	77.05
PONS	1	5.26	2	3.28
BRAINSTEM	3	15.79	1	1.64
CEREBELLAR	9	47.37	13	21.31

Most common site of infarct in posterior circulation stroke was occipital lobe (77.05%) followed by cerebellum (21.31%). Most common

site of bleed in posterior circulation stroke was cerebellum (47.37%) followed by occipital lobe (31.58%).

Discussion

Posterior circulation strokes comprise 10-15% of all strokes, 80% of them being ischemic strokes. Most of the other studies have reported that 80% of strokes are ischemic and 20% of ischemic strokes involve the posterior circulation. The Lausanne Stroke Registry and the Besancon Stroke Registry revealed the relative prevalence of posterior circulation stroke to be 26.7% and 26%, respectively. Hallym Stroke Registry (HSR) showed that posterior circulation stroke was responsible for 39.8% of all ischemic strokes. In our study, the total number of posterior circulation stroke patient was 80, 10.05% of 796 total stroke patients which was comparable with other studies conducted by Jones et al^[11] (17%) and Richard et al^[12] (14.8%). We found posterior circulation ischemic stroke in 12.68% of cases out of 481 ischemic stroke patients in our study.

In this study, peak incidence of posterior circulation stroke was above 60 years of age comprising 53.75%, with median age of 63.2 years. New England Medical Centre Posterior Circulation Registry (NEMC-PCR) demonstrated that majority of patients with posterior circulation stroke were in age group ranging between 66-75 years.^[6] Stroke occurs in relatively younger people in developing countries. In present study only 13 patients (16.25%) were older than 75 years, while in NEMC-PCR 27.7% of patients were in age group ranging more than 75 years. Lower life expectancy in Indian population compared to the Western world (66.46 vs. 78.24 years) could be the explanation for this difference. In present study, gender distribution showed that male were 63.75% whereas female were 36.25%, with M:F ratio of 1.76:1. Published data from the Tufts New England Medical Centre posterior circulation stroke registry document showed that 58% of patients are male and 42% female.^[6,7] Incidence was more in males compared to females was in accordance with other studies like Ma. Cristina L et al^[13] study and R. B. Libman et al^[14] study. In our study, 76.25% patients had ischemic stroke and 23.75% patients had hemorrhagic

stroke. In a study by Uma Sundar, 77.6% patients had ischemic stroke and 22.4% patients had hemorrhagic stroke.^[15] In our study, average age of patient in hemorrhagic stroke was 57.9 years and average age of patient in ischemic stroke was 61.0 years.

Hypertension (72.50%) was the most common associated risk factor followed by dyslipidemia (48.75%) followed by tobacco chewing (32.50%). This was comparable with study by Caplan et al where hypertension was risk factor in 61% patients^[16] and Rawat K J et al where hypertension was risk factor in 60.5% patients.^[17] We found dyslipidemia in 48.75% patients which was comparable with Uma S. et al study where dyslipidemia was found in 44.4% patients as the most common risk factor.^[15] Tobacco use was associated in 32.50% cases in our study which was comparable to Caplan et al study (35%)^[9] and Ratnavali E et al study (25%)^[10]. Less common risk factors found in our study were diabetes (8.75%) which was comparable with Kora S A et al study (5%).^[18] CKD/ renal dysfunction were also associated in 20% cases in our study which could be explained due high prevalence of chronic kidney disease patients in the study area. Table 6 is showing Comparison of risk factors of various studies.

Motor involvement (72.5%) was commonest clinical feature among posterior circulation stroke followed by speech involvement (58.75%) and altered sensorium (48.75%). Kora et al^[18] study found most common presentation as motor disturbance and altered sensorium (63%) patients. Giddiness (27.5%) was the commonest symptom among posterior circulation stroke patients in our study. In posterior circulation stroke is due to the involvement of cerebellum or its connections. Vertigo in posterior circulation stroke is due to the involvement of vestibular nucleus or its connections. Vertigo is a predominant feature of lateral medullary syndrome and cerebellar stroke especially due to PICA and AICA territory involvement. Due to the high density of nuclei and tracts in the brain stem, vertigo is usually

accompanied by the involvement of other cranial nerves and or long tracts. It has been reported that isolated episodes of vertigo continuing for more than 3 weeks are almost never caused by vertebro-basilar disease.^[19] A study from China by Shi et al analyzed clinical characteristics in 216 patients with posterior circulation stroke found dizziness in 33.8% which were equally compared to our observations. The above-mentioned study also demonstrated a relatively higher percentage of patients with motor weakness (81.9%) as compared to our study (72.5%). The incidence of visual disturbance was 9.84% in present study compared to Patrick et al study^[20] (13%). In our study, coma was more common in hemorrhagic posterior stroke (21.05%). Coma was more commonly present in patients involving Infratentorial region (7cases) (87.5%) consisting of cerebellum, pons and brainstem in our study. Most common site of infarct in posterior circulation stroke was occipital lobe (77.05%) followed by cerebellum (21.31%). Other sites of involvement were pons and brain stem, which were less commonly involved in present study. Most common site of bleed in posterior circulation stroke was cerebellum (47.37%) followed by occipital lobe (31.58%). Incidence of Infratentorial strokes was 36.25% compared to other sites in the present study. The incidence of Infratentorial strokes was less compared to Bogousslavsky et al study^[21] (70%), this can be explained on the basis that in our study we used only CT scan to identify Infratentorial lesion which is a poor diagnostic tool compared to MRI scan.

Conclusions

This was an observational study done in a tertiary care hospital. Most common risk factor for posterior circulation stroke in our population was hypertension followed by dyslipidemia. The common site of involvement ischemic stroke in posterior circulation was occipital lobe followed by cerebellum. The common site of involvement hemorrhagic stroke in posterior circulation was

cerebellum followed by occipital lobe. Optimal treatment and prevention for diseases need knowledge about diseases' etiologies or mechanisms to be targeted at, unfortunately, stroke studies focused much more in ACS than PCS. There are very few studies on clinical profile and outcome in PCS we would need more studies solely on PCS elucidating particularly the causes and predictors of outcomes to help establish an appropriate management strategy for PCS.

Declarations

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Conflict of interest: None declared

Ethical approval: Not required

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