

**Original research article****Study on clinico radiological pattern of posterior circulatory stroke****<sup>1</sup>Dr. Y. Gangadharam, <sup>2</sup>Dr. C Subba Rambabu, <sup>3</sup>Dr. Rakesh Koppolu, <sup>4</sup>Dr. Shaik Sharmila**<sup>1,4</sup>Associate Professor, Department of General Medicine, ACSR Govt. Medical College & GGH, Nellore, Andhra Pradesh, India<sup>2,3</sup>Assistant Professor, Department of General Medicine, ACSR Govt. Medical College & GGH, Nellore, Andhra Pradesh, India**Corresponding Author:**

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**Abstract****Aim:** To study on clinic radiological pattern of posterior circulatory stroke.**Methodology:** It was a Hospital based prospective analytical study. A period of one year from the date of approval by institutional scientific and ethical committees. Taken from Department of General Medicine, ACSR Medical College, Nellore. The study includes Patients who are fulfilling the inclusion and exclusion criteria. 50 Inclusion Criteria Patients who had signs and symptoms of posterior circulation stroke.**Results:** The mean age of our study population is 60.54 years. In our study of 50 patients with PCS, 64% of patients were male and 36% were female, showing male predominance in our study. In our study of 50 patients, Hypertension was the major risk factor which was present in 35 patients (70%) of our study population, followed by Diabetes in 24 (48%) patients, Alcoholism (38%), hyperlipidaemia (38%), Smoking (36%), and coronary artery disease (24%). In our study population, Altered sensorium was the most common symptom (46%) followed by Giddiness (34%), Vomiting (22%) and Headache (6%). In our study population, Motor weakness was the most common sign (34%) followed by Seizures (20%), Visual field defects (10%) and Cerebellar signs (4%). In our study population, 84% of the patients had Ischemic stroke and 16% of patients had Haemorrhagic stroke.**Conclusion:** The study concluded that, the most common site of involvement in posterior circulation ischemic stroke in our study was Cerebellar infarct followed by multiple site infarcts, Brainstem infarct and pontine infarct. The most common radiological finding among Haemorrhagic stroke in our study population was Cerebellar, Occipital, and pontine haemorrhage in 2 patients and brainstem haemorrhage in one patient. One patient had multiple site haemorrhage.**Keywords:** Ischemic stroke, haemorrhage, cerebellar infarct, dyslipidemia**Introduction**

Stroke is a complex neurological syndrome causing focal neurological deficits either by means of vascular aetiology-thrombus, embolic or haemorrhagic or by means of inflammatory and non-inflammatory vasculitis or because of haematological disorders i.e., coagulopathy. The clinical presentation of stroke is highly variable because of the composite anatomy of the brain and its vasculature. Ischemic cerebrovascular disease encompasses a broad spectrum of clinical events based on the type and duration of the neurological symptoms, the area of the brain affected, the involved artery, and the presumed cause <sup>[1]</sup>.

Stroke is a primary cause of death and disability worldwide, and post-stroke treatment has a substantial financial impact. According to studies, the total toll of stroke has remained high despite declining age-standardised mortality rates and prevalence over time. It is anticipated that the burden of stroke will continue to rise until effective stroke prevention strategies are more widely adopted as populations age and low-income and middle-income countries undergo the epidemiological transition from infectious to non-communicable diseases as the predominant cause of morbidity <sup>[2]</sup>.

10 to 15 percent of all strokes are caused by problems with the posterior circulation. The region is nourished by two vertebral arteries, one basilar artery, and two posterior cerebral arteries and contains the brainstem, cerebellum, occipital lobes, and thalamus. The symptoms of posterior circulation ischaemia can range from varying brainstem symptoms brought on by sporadic insufficiency to a variety of syndromes such lateral medullary syndrome, medial medullary syndrome, locked in syndrome, and top of basilar syndrome <sup>[3]</sup>.

Although anterior circulation stroke (ACS) and posterior circulation stroke (PCS) share many risk factors, pathogenic mechanisms, and aetiologies, there are anatomical and physiological differences between the vascular beds that may have an impact on pathogenic processes in ways that are currently

unknown. Uncertainty over the impact and possible therapeutic implications of such changes has been exacerbated by difficulty in clinical diagnosis, older imaging modalities with limited sensitivity for posterior circulation ischemia and varied diagnostic criteria between investigations<sup>[4]</sup>. Because there has been so few research regarding the epidemiological prevalence of posterior circulation strokes in India, there are only a limited number of hospital statistics available for these cases. Hence, we have decided to study the clinical and radiological profile of posterior circulation stroke, as there are very few studies available in literature.

### Aim and Objectives

#### Aim

To study on clinic radiological pattern of posterior circulatory stroke.

#### Objectives

To describe the various clinical patterns of posterior circulation stroke.

To analyse various risk factors for stroke in these patients.

### Materials and Methods

#### Study design

Hospital based prospective analytical study.

#### Study period

A period of one year from the date of approval by institutional scientific and ethical committees.

#### Study setting

Department of General Medicine, ACSR Medical College, Nellore

**Study subjects:** Patients who are fulfilling the below mentioned inclusion and exclusion criteria.

**Sample size:** 50 Inclusion Criteria Patients who had signs and symptoms of posterior circulation stroke.

#### Exclusion criteria

- Patients with ontological features of vestibular and labyrinthine inflammatory disorders.
- Patients with sub arachnoids hemorrhage, extra dural or subdural hemorrhage.

### Results

**Table 1:** Distribution of Age among study population

		N	%
Age Distribution	40-50 years	11	22.0%
	50-60 years	16	32.0%
	60-70 years	13	26.0%
	>70 years	10	20.0%

In our study group of 50 patients, majority of the patients with Posterior circulation stroke were of age 50-60 years (32%), followed by 60-70 years (26%), 40-50 years (22%) and >70 years (20%). The mean age of the study population is 60.54 years.

**Table 2:** Distribution of sex among study population

		N	%
Sex		50	50.0%
	Female	18	18.0%
	Male	32	32.0%
	Total	100	100.0%

In our study of 50 patients with PCS, 64% of patients were male and 36% were females showing male predominance in our study.

**Table 3:** Distribution of risk factors among study population

	Risk Factors	
	N	%
Hypertension	35	74.5%
Diabetes Mellitus	24	51.1%
Coronary Artery Disease	12	25.0%
Alcoholism	19	45.2%
Smoking	18	41.9%
Hyperlipidaemia	19	41.3%
Oral anticoagulant use	2	4.1%
Embolism from heart	2	4.1%

In our study of 50 patients, Hypertension was the major risk factor which was present in 35 patients of our study population, followed by Diabetes in 24 patients.

19 patients were alcoholics, 18 patients were smokers among our study population.

Coronary artery disease was present in 12 patients, 19 patients had hyperlipidaemia, 2 patients had embolism and 2 patients were on oral anticoagulants.

**Table 4:** Distribution of symptoms among study population

	Symptoms	
	N	%
Headache	3	6.0%
Vomiting	11	22.0%
Giddiness	17	34.0%
Altered Sensorium	23	46.0%

In our study population, Altered sensorium was the most common symptom (46%) followed by Giddiness (34%), Vomiting (22%) and Headache (6%).

**Table 5:** Distribution of clinical findings among study population

	Clinical Findings	
	N	%
Visual field defect	5	10.0%
Seizures	10	20.0%
Motor Weakness	17	34.0%
Cerebellar signs	2	4.0%

In our study population, Motor weakness was the most common symptom (34%) followed by Seizures (20%), Visual field defects (10%) and Cerebellar signs (4%).

**Table 6:** Distribution of Cardiovascular findings among study population

		N	%
<b>Normal</b>		<b>38</b>	<b>76.0%</b>
2D Echo changes	AWMI	2	4.0%
	L VH	8	16.0%
	RHD	2	4.0%
Normal		39	78.0%
Doppler changes	Carotid stenosis	7	14.0%
	Vertebral stenosis	4	8.0%
Normal		48	96.0%
Atrial Fibrillation	Atrial Fibrillation	2	4.0%

**Table 7:** Distribution of type of stroke among study population

		N	%
Ischemic Stroke		42	84.0%
Type of Stroke	Haemorrhagic Stroke	8	16.0%
Total		50	100.0%

In our study population, 84% of the patients had Ischemic stroke and 16% of patients had Haemorrhagic stroke.

**Table 8:** Distribution of radiological findings in Ischemic stroke

		Radiological finding in Ischemic Stroke	
		N	%
	Brainstem Infarct	7	16.7%
	Cerebellar Infarct	21	50.0%
Radiological Findings			
	Multiple Infarct	9	21.4%
	Pontine Infarct	5	11.9%
	Total	42	100.0%

The most common site of involvement in posterior circulation ischemic stroke in our study was Cerebellar infarct followed by multiple site infarcts, Brainstem infarct and pontine infarct.

**Table 9:** Distribution of radiological findings in Haemorrhagic stroke

		Radiological findings in Haemorrhagic Stroke	
		N	%
Radiological Findings	Brainstem Haemorrhage	1	12.5%
	Cerebellar haemorrhage	2	25.0%
	Multiple Haemorrhage	1	12.5%
	Occipital haemorrhage	2	25.0%
	Pontine haemorrhage	2	25.0%
	Total	8	100.0%

The most common radiological finding among Haemorrhagic stroke in our study population was Cerebellar, Occipital, and pontine haemorrhage in 2 patients and brainstem haemorrhage in one patient. One patient had multiple site haemorrhage.

## Discussion

Developing countries like India are facing a double burden of communicable and non-communicable diseases. Stroke is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke ranges from 84- 262/100,000 in rural and 334-424/ 100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies<sup>3</sup>. There is also a wide variation in case fatality rates with the highest being 42% in Kolkata. As a first step, the government of India has started the national programme for prevention and control of cancer, diabetes, cardiovascular diseases and stroke (NPCDCS) <sup>[3]</sup>.

Cerebrovascular accidents have severe consequences for patients and their families. As predominant CVA are in the anterior circulation most studies concentrate on them. The clinical features, risk factors, short-and long-term outcomes of posterior circulation CVA (PCS) are not very well documented in India. The clinical features of PCS can be non-specific and differ from that of ACS, leading to miss- diagnosis, causing delay in initiation of treatment and increased rate of complications.

In the current study, we assessed the risk factors of posterior circulatory stroke, clinical profile among the patients and radiological findings among the patients.

## Age

In this study, the youngest patient was 41 years and the oldest was 89 years old. The mean age of patients with PCS in our study was  $60.54 \pm 11.87$  years. It closely resembled Wen-Dan Tao *et al.* <sup>[5]</sup>, Quan Tao Zeng *et al.* <sup>[6]</sup>, Bibhu P. study which showed 62.95, 62.50 and 61 years respectively.

Rawat *et al.* <sup>[7]</sup> maximum patients were in the age group 41-70 years with the mean age for males 56.52 years and for females 59.82 years, with a median age of 56.5 years. Sundar *et al.* study <sup>[8]</sup> in a tertiary care hospital found the maximum number of patients in the age group of 40-55 years, which was comparable to our study.

- It also correlates with study done by Aiyar *et al.* <sup>[9]</sup>, Pinhero *et al.* <sup>[11]</sup> and R P Eapen *et al.* <sup>[17]</sup> who found the incidence of stroke is more common in males than females.

## Prevalance of PCS

10-15% of all strokes are caused by posterior circulation strokes, and 80% of these strokes are ischemic. According to the majority of previous research, ischemic strokes account for 80% of all strokes, and 20% of ischemic strokes include the posterior circulation. The relative prevalence of posterior circulation stroke was found to be 26.7 percent in the Lausanne Stroke Registry and 26% in the Besancon Stroke Registry, respectively. According to the Hallym Stroke Registry (HSR), posterior circulation stroke was the cause of 39.8% of all ischemic strokes <sup>[11]</sup>.

The total number of posterior circulation stroke patient was 80, 10.05% of 796 total stroke patients which

was in concurrence with previous studies conducted by Jones *et al.* [12] (17%) and Richard *et al.* [13] (14.8%).

#### Frequency of hypertension in stroke patients

In our study hypertension was present in 74.5% of posterior circulation stroke. Hypertension is found to be the most common risk factor associated with stroke. This result correlates with Benerjee TK *et al.* [14] study which was conducted on urban population in Calcutta which showed systemic hypertension emerged as single most important risk factor.

#### Diabetes mellitus among stroke patients

According to the current study out of 50 patients, 24(51.1%) of stroke patients have diabetes.

On comparison to NI Khan study [15] 36% had diabetes, 35% had diabetes in P N Sylaja study [16], our study has more diabetic patients and less diabetic patients compared to Sridharan study [17] which had 50% diabetes.

The increase in diabetic population in our study reflected the general increase in the incidence of diabetes in the Southeast Asia. Indeed, the relative risk of stroke of all ages was 1.8 for diabetic men and 3.0 for diabetic women (Shinton and Beever, 1989, Burchfield *et al.* 1994) [18].

It is showing different According to Guy Van Melle *et al.* diabetes mellitus was seen in 12.6% of patients [19].

#### Smoking among study patients

Our study showed that 41.9% (18 patients) were found to be smokers among posterior circulation stroke. Our study showed similar results with Mohammed El-Sherif *et al.* Wen-Dan Tao *et al.* in PCS showing 40%, 39.7% respectively.

Smoking was present in 35% of patients in Caplan *et al.* study which is in close similarity to our study. 47.3% of patients in Uma *et al.* study had smoking history which also in line with our study.

In a study by Kavitha Rawath *et al.* 5% of the patients had tobacco addiction however in this study smoking was not highlighted.

26.1% patients in our study had a history of alcohol consumption among patients with Posterior circulation stroke.

Our study correlates with Wen-Dan Tao *et al.* Quan tao Zeng *et al.* in PCS patients. However these studies also compared PCS with ACS. ACS had more number of alcoholics compared to PCA might be secondary to more number ACS patients in the study and there are less studies on alcohol intake in acute ischemic stroke.

The present study has high alcohol consumption (23.7%) patients compared with Bansal study 74 which had 15% of alcohol intake patients and is low when compared with the study by Naik M, Rauniyar R.K., Sharma U.K. *et al.* who found the history of alcohol intake in 30.5% of stroke patients. For cerebral infarction, chronic heavy drinking and acute intoxication have been associated with an increased risk among young adults.

#### Other risk factors

41.3% of patients with PCS in our study had hyperlipidaemia. Dyslipidaemia was more likely to occur in diabetic populations, which was crucial in the development of AIS. Many diabetics have insulin resistance (IR), which changed the metabolism of lipids and lipoproteins. The decline in HDL availability for involvement in reverse cholesterol transport may have ultimately contributed to atherogenicity in acute ischemic stroke through the altering of a number of signalling pathways. Management of lipids was crucial in the prevention of acute stroke associated to DM, along with glucose control. In individuals without DM, dyslipidaemia, which was found in the study by Luo Y *et al.* as a major risk factor for POCI, also plays a significant role in glucose management [20].

#### Clinical presentation

In our study population of 50 patients with Posterior circulation stroke, Altered sensorium was the most common symptom (46%) followed by Giddiness (34%), Vomiting (22%) and Headache (6%).

Vertigo was reported in 56.25 percent of the studies by Mehnidratra *et al.* and Patrick *et al.* and in 30 percent of the studies by Patrick *et al.* Vertigo occurred 30 percent of the time in our research. The incidence was 36% in the NEMC-PCSR. In this investigation, it was discovered that middle and multiple territory involvement were more frequently linked to vertigo. Vertigo was seen at the outset in every patient with a middle territory infarct and in 72% of individuals with multiple territory involvement. The involvement of the vestibular nucleus and its connections in the pontine area may be responsible for the vertigo in the middle territory infarct. In this investigation, altered sensorium was seen in 22% of patients, and distal region involvement was associated with a higher prevalence.

According to a research by Katragadda M. K. *et al.* the majority of our patients' symptoms at the time of stroke were giddiness and vomiting. Eight patients experienced seizures, six patients had abnormal

sensorium at onset and 22 patients had headaches. Homonymous hemianopia, temporal lobe signs, cerebellar signs, motor weakness, sensory problems, cranial nerve neuropathy, and others clinical aspects that varied depending on the region involved were also present, and the majority of them were a mix of symptoms.

Different clinical manifestations of posterior circulation stroke are possible. Vertigo was the most prevalent clinical finding in Sneha Kumar Jha's study, being reported by 63.3 percent of patients. The vestibular nucleus or its connections are involved in vertigo in posterior circulation stroke. The lateral medullary syndrome and cerebellar stroke frequently present with vertigo, particularly when the PICA and AICA territories are involved. Vertigo frequently involves additional cranial nerves and/or lengthy tracts because of the large density of nuclei and tracts in the brain stem. It has been said that vertebro-basilar illness nearly seldom results in solitary bouts of vertigo lasting more than three weeks.

A study by Patrick *et al.* found that the most common clinical presentation was cranial nerve involvement was 64%, followed by altered sensorium (47%).

### Site of Involvement

In our study population, 84% of the patients had Ischemic stroke and 16% of patients had Haemorrhagic stroke.

The most common site of involvement in posterior circulation ischemic stroke in our study was Cerebellar infarct followed by multiple site infarcts, Brainstem infarct and pontine infarct.

The most common radiological finding among Haemorrhagic stroke in our study population was Cerebellar, Occipital, and pontine haemorrhage in 2 patients and brainstem haemorrhage in one patient. One patient had multiple site haemorrhage.

According to a research by Sneha Kumar Jha *et al.* cerebellar involvement accounted for 10% of all isolated sites of infarct in posterior circulation strokes, followed by occipital lobe involvement (8.3%) and pons involvement (5%), which were less often implicated. The cerebellum was the most often occurring single location of bleeding in posterior circulation strokes (5 percent). In this investigation, distal vascular territory involvement was most often recorded, occurring in 40% of patients, followed by proximal location (33.3%) and numerous vascular sites (21.7%). The middle intracranial area was only involved in 5% of cases.

The NEMC-PCR reported distal infarction as the most common location (40.9%). Although in comparison to the NEMC registry<sup>[21]</sup>.

In their study, Mahnidratta *et al.* discovered that 10% of patients had a documented cardioembolic cause and that 76 percent of patients had major artery disease. In the NEMC-PCR, 32% of patients had large artery disease, and 40% of patients had embolic causes, including 24% from cardiac sources. Because intracranial big artery atherosclerosis occurs more frequently in Asians than in Whites, there was a higher prevalence of large artery involvement in the research.

Cardioembolism affected 5.2 percent of patients in the Hallym Stroke Registry, and big artery disease was the most common subtype of stroke (50 percent).

14 In our study, there was just 1 patient with atrial fibrillation. The intermediate territory (36.5%), followed by the distal, proximal, and multiple territory, was the site of infarcts with the highest frequency in the Hallym Stroke Registry. These discrepancies in infarct sites might have been caused by various stroke etiologies.

Distal infarction was likewise identified by the NEMC-PCR as the most typical site (40.9 percent). Even so, our data showed a decreased incidence in the central intracranial site when compared to the NEMC registry.

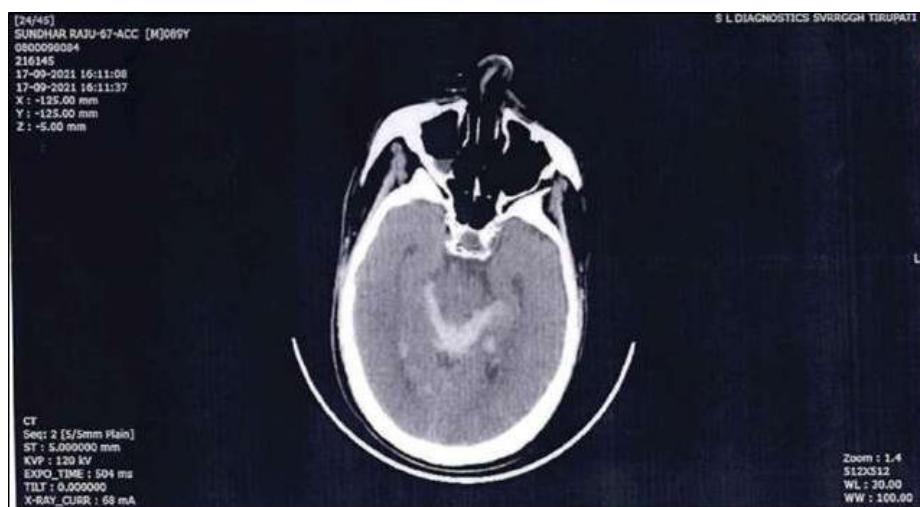
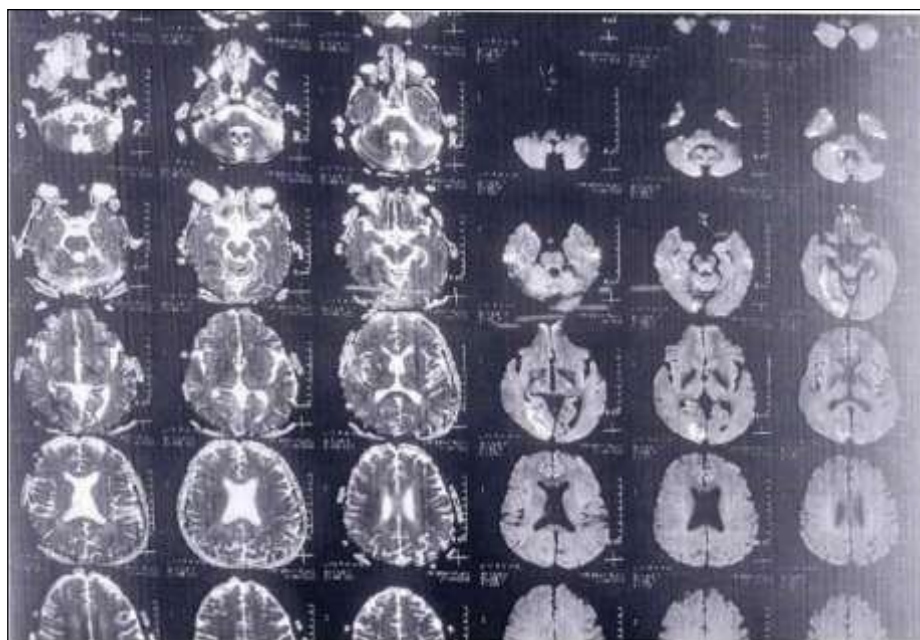


Fig 1: CT Brain reveals brain stem haemorrhage



**Fig 2:** MRI Brain reveals cerebellar infarct

### Conclusion

- The most common site of involvement in posterior circulation ischemic stroke in our study was Cerebellar infarct followed by multiple site infarcts, Brainstem infarct and pontine infarct.
- The most common radiological finding among Haemorrhagic stroke in our study population was Cerebellar, Occipital and pontine haemorrhage in 2 patients and brainstem haemorrhage in one patient. One patient had multiple site haemorrhage.

**Conflict of interest:** None.

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