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## A Study On Etiological, Clinical Profile And Outcome Of Patients With Posterior Circulation Stroke.

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### ABSTRACT

Posterior circulation strokes represent approximately 20% of all ischemic strokes. In contrast to the anterior circulation, several differences in presenting symptoms, clinical evaluation, diagnostic testing, and management strategy exist presenting a challenge to the treating physician. To determine clinico-radiological profile of patients presenting with posterior circulation stroke. This study was conducted during the period of January 2021 to December 2021. All patients admitted with clinical features suggestive of stroke were taken. All were subjected to CT scan brain and MRI Scan brain with MR Angiography (stroke protocol). Patients with evidence of posterior circulation stroke in clinical features & imaging were taken up for the study. Major risk factors attributed to posterior circulation stroke were Hypertension, Hyperlipidemia, Smoking, Diabetes mellitus, coronary artery disease. Giddiness, weakness, nausea, vertigo were the most common symptoms at presentation. Most patients had involvement of cerebellum, cranial nerves, spinomotor system involvement. Distal territory which includes midbrain, thalamus, occipital and temporal lobes was more commonly involved. Posterior Cerebral Artery involvement was more common in our study. At discharge, 40% of the patients were having slight to moderately severe disability in Modified Rankin Scale.

**Keywords:** posterior circulation, stroke, basilar artery, vertebral artery, stroke management.

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## INTRODUCTION

In India, Stroke is the leading cause of mortality due to neurological diseases. 7.4% of total deaths in past 30 yrs was due to stroke. According to a latest report, cardiovascular, cerebrovascular disease prevalence has increased over 50% in past 30 yrs. According to ISA, 17 million people suffer a stroke every year of which 6 million people die; 5 million people are disabled permanently [1]. Among all the patients admitted for neurological cause, 50% of patients are admitted for stroke. Out of this, 25% are due to ischemic stroke. Out of all ischemic stroke, 23% are due to vertebrobasilar stroke [2]. Brainstem stroke constitute half of vertebrobasilar stroke. 20-60% of these patients have poor outcome. 8-15% of PCS are due to basilar artery occlusion which has a mortality of more than 90%. Posterior circulation comprises mainly of paired vertebral artery, basilar artery, paired posterior cerebral artery and their branches [3]. Even though only 1/5<sup>th</sup> of total brain is supplied by above vessels, they supply strategically significant structures responsible for consciousness, motor activity, autonomic control of respiratory, cardiovascular-Thalamus, subthalamus, hippocampus, cerebellum, brainstem, medial temporal structures [4]. Presentation of PCS range from subtle, attenuating symptoms of VBI to severe, life threatening basilar/vertebral artery occlusion-causing locked in syndrome [5]. Prominent risk factors contributing to PCS similar to stroke are hypertension, AF, DM, systemic diseases, etc. Large artery atherosclerosis, penetrating artery disease was previously thought as the main contributor of PCS, but recently cardiac remobilisation causing about 20-50% of strokes has been found. Most studies focused only on ACS [6]. In Indian population especially in the southern states, there were only a smaller number of studies on PCS. Thus, this study was conducted to determine etiological, clinical profile, outcome of patients with PCS, so that we can help the medical community in early identification, appropriate management of PCS patients and also implement appropriate preventive strategies [7].

## MATERIALS AND METHODS

This study was conducted during the period of January 2021 To December 2021. All patients admitted with clinical features suggestive of stroke were taken. All were subjected to CT scan brain and MRI Scan brain with MR Angiography (stroke protocol). Patients with evidence of posterior circulation stroke in clinical features & imaging were taken up for the study.

### Inclusion criteria

- All patients with clinical features suggestive of brainstem stroke.
- Adult patients more than 18 years of age.
- Evaluated within 7 days from the onset of last symptoms.
- All patients should have CT Brain, MRI brain with MRA done within 7 days of stroke.
- MRI brain showing infarcts and haemorrhages within the posterior circulation territory.
- Patients willing to come for regular follow up visits for clinical outcome assessment.

### Exclusion criteria

- Patients of <18 or >80 years of age.
- Patients seen after 7 days of onset of neurological symptoms.
- Transient ischaemic attacks.
- Patients with severe metabolic disturbances complicating the stroke.
- Patients having evidence of infarcts in other areas i.e., territory of anterior circulation, border zone infarcts, venous infarcts, head injury, tumors.
- Patients unable to come for follow up periodically at stipulated time.

Patient's details regarding age, sex, risk factors like hypertension, diabetes mellitus, atrial fibrillation, ischemic heart disease, hypercholesterolemia, smoking, past H/O TIA were recorded. The onset of symptoms and signs were recorded. CT Brain, MRI brain with MRA and DWI was done in all patients. We subdivided the posterior circulation territories into regions – proximal, middle and distal. The intracranial vertebral artery joins at the ponto-medullary junction to form the basilar artery. The territory supplied by

intra cranial vertebral arteries includes the medulla and cerebellum supplied by the posterior inferior cerebellar artery. This region is designated as proximal intracranial posterior circulation territory. The basilar artery bifurcates at the ponto- mesencephalic junction. The territory supplied by basilar artery including the pons and portion of the cerebellum supplied by AICA branches is designated as middle intracranial posterior circulation territory. The portion of the posterior circulation supplied by the distal basilar artery, superior cerebellar artery, posterior cerebral artery and its penetrating branches is referred to as distal intracranial posterior circulation territory. The distal territory includes the mid brain, thalamus, SCA supplied cerebellum, occipital and temporal lobe regions.

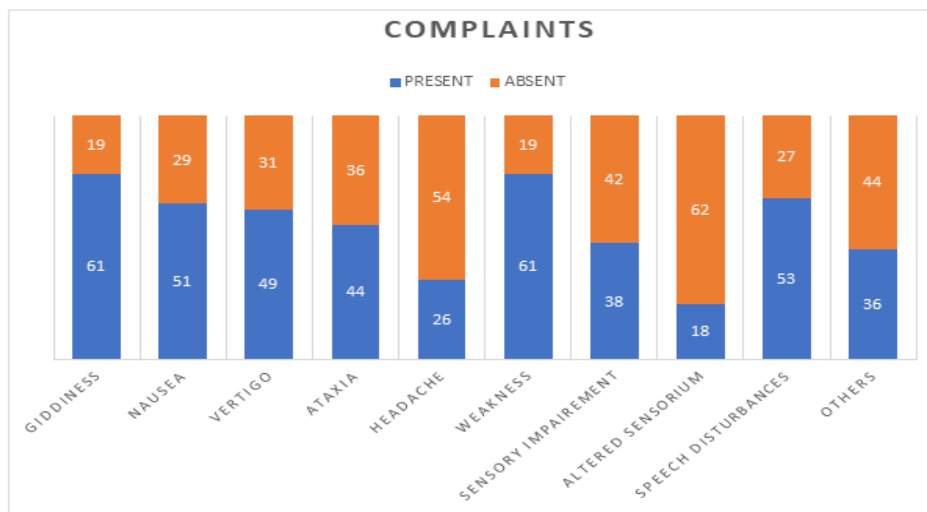
**RESULTS**

**Table :1 Age Distribution**

Age In Years	No Of Patients	Percentage
< 40	5	6%
41-50	13	16%
51-60	34	43%
61-70	21	26%
> 70	7	9%

Of the 80 patients admitted in this study , 43 % were above the age of 50 years, 35% above the age of 60 years while 22 % were below 50 years. Youngest patient in the study was 35 years old while the eldest was 82 years old.

**Graph 1: Complications**



**Table 2: Occipital Function – Face Recognition Involvement**

Occipital Involvement	No Of Patients	Percentage
Present	14	17%
Absent	66	83%

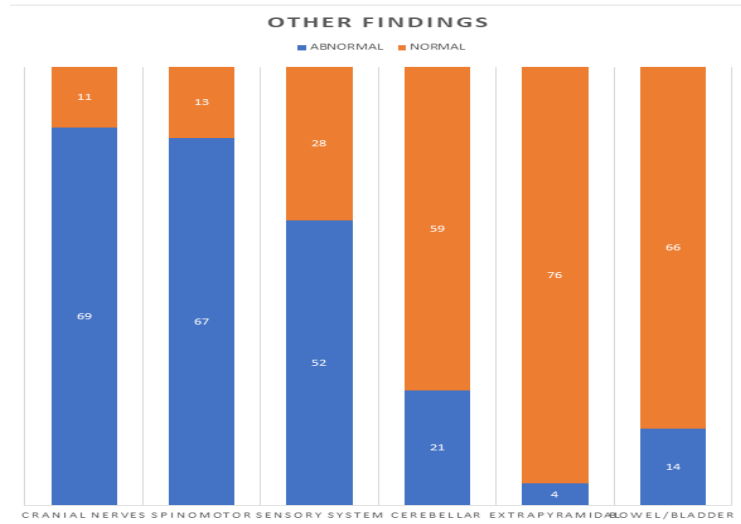
**Table 3: Occipital Function – Vision Involvement**

Occipital-Vision	No Of Patients	Percentage
Present	34	42%
Absent	46	58%

**Table 4: Temporal - Memory Involvement**

Temporal - Memory	No Of Patients	Percentage
Present	14	17%
Absent	66	83%

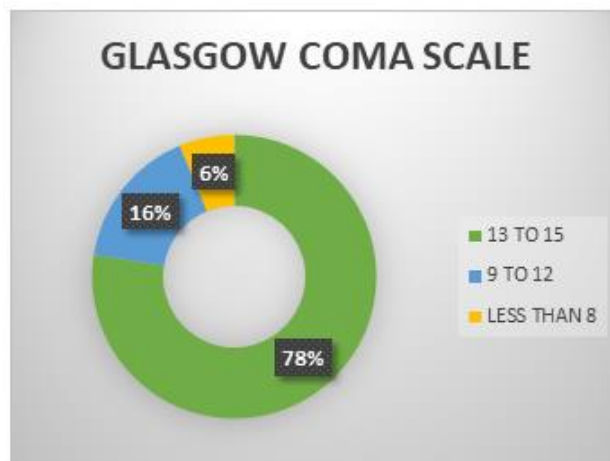
**Graph 2: Other Findings**



**Table 5: Risk Factors**

Risk Factors	PRESENT	ABSENT
Hypertension	50	30
Diabetes	43	37
Coronary Artery Disease	14	66
Valvular Heart Disease	5	75
Atrial Fibrillation	2	78
Covid 19	6	74
Smoking	26	54
Family H/O	7	73
Hypercholesterolemia	23	57
Others	4	76

**Graph 3: Glasgow Coma Scale**



**Table 6: Markers Of Atherosclerosis Amongstudy Population**

Markers Of Atherosclerosis	No Of Patients	Percentage
Present	21	26%
Absent	59	74%

**Table 7: Territory Involved**

Territory Involved	No Of Patients	Percentage
Distal	45	56%
Middle	9	11%
Proximal	12	15%
Multiple	14	18%

The location of infarcts were categorized based on the NEMC posterior circulation registry into proximal , middle and distal intracranial arteries. Both clinical features and imaging were used to find the location. Most patients 56% had distal territory involvement in this study. Isolated proximal and middle territories constituted about 15% ,11% of the patients. 18% of the patients in total had more than one territory involvement.

**Table 8: VA Doppler Findings Among Study Population**

VA Doppler	No Of Patients	Percentage
Carotid Stenosis	3	4%
Athersclerotic Plaque	4	5%
Normal	73	91%

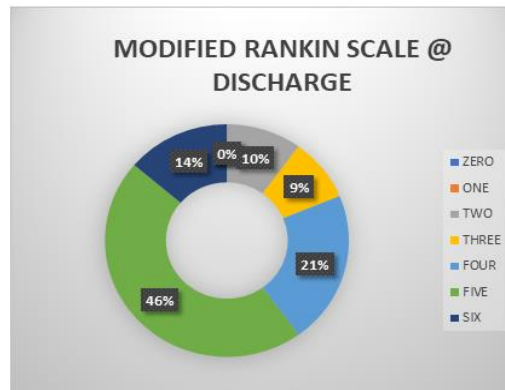
**Table 9: ECG Findings Among Study Population**

ECG	No Of Patients	Percentage
Normal	55	69%
AF	6	7%
LAE	3	4%
LBBB	3	4%
LVH	4	5%
OLD AWTMI	7	9%
OLD IWMI	2	2%

**Table 10: Echo Findings Among Study Population**

ECHO	No Of Patients	Percentage
Normal	55	69%
Concentric LVH	4	5%
DCM	3	4%
LVH/LAE	3	4%
Mitral Stenosis	5	6%
RHD	1	1%
Old AWTMI	7	9%
Old IWMI	2	2%

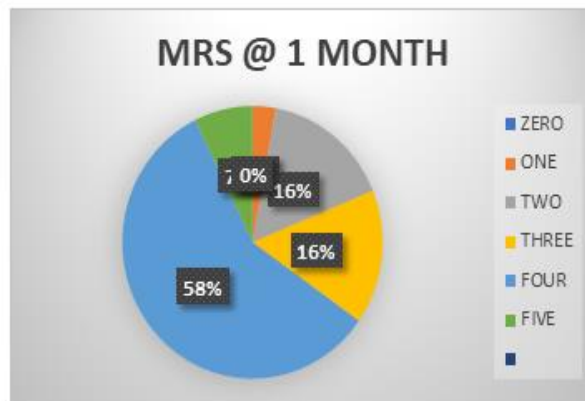
**Graph 4: Modified Rankin Score At Discharge**



**Table 11: Modified Rankin Scale At Discharge**

Mrs At Discharge	No Of Patients	Percentage
Zero	0	0%
One	0	0%
Two	8	10%
Three	7	9%
Four	17	21%
Five	37	46%
Six	11	14%

**Graph 5: Modified Rankin Score At One Month**



**DISCUSSION**

One fifth of all strokes are due to posterior circulation stroke, while they have more severity than their anterior counterparts due to involvement of the vital brainstem. They range in presentation from intermittent, mild Vertebrobasilar Insufficiency to life threatening Locked In Syndrome, Top of Basilar syndrome, Medial medullary syndrome and lateral medullary syndrome [8]. Males are more commonly affected than females with stroke while females have severe disease. In our study, there was 69% male patients, 31% female patients compared to New England Medical Centre – Posterior Circulation Stroke Registry (NEMC-PCSR) [63% men, 37% women] substantiating male predominance. Libman et al, Cristina et al observed similar findings while Smajlorie et al found similar incidence between both groups [9].

Patients more than 50 years of age are commonly affected with stroke. Literature shows stroke incidence increases with age. NEMC-PCSR had 60.5 years as the mean age while we had mean age of 62 in our study. 74% of patients were above the age of Fifty years in our study [10]. There was decreased incidence above 70 years of age in our study which may be due to sample size, many elderly might have

died before reaching our tertiary medical college hospital. Among the non-modifiable risk factors for stroke, Male sex, old age were confirmed in our study. Among the non-modifiable risk factors for stroke, Hypertension (62.5%) was the most common risk factor followed by diabetes (53.7%), smoking (20%) many patients with, hyperlipidemia (18%), cardiac illness (11%) [11].

Clinical features commonly seen in patients in our study are giddiness (61%), weakness (61%), speech disturbances, sensory impairment, nausea, vomiting, ataxia, headache, altered sensorium, diplopia, visual field disturbances. We noted that those patients with middle territory involvement had vertigo which may be due to involvement of vestibular nucleus [12].

Patients with distal territory involvement had altered sensorium, seizures due to cortical involvement. Weakness was prominent in our study due to many patients with distal territory involvement. Of the examination findings, Cranial nerve involvement was more prominent in our study than spinomotor, sensory, cerebellar involvement, extrapyramidal symptoms, bowel and bladder involvement [13]. NEMC 30 day mortality was 3.6% while our study had 14% mortality. The main contributory factors to death were multiple territory involvement, low GCS at presentation, high blood pressure at presentation, respiratory complications, old age, multiple comorbidities. study, of the alive patients, around 34% had no or slight disability, While 59% had moderate to severe disability and 7% were bedridden [13].

There are a number of limitations in our study. Our study may not completely show the picture of posterior circulation stroke in our population but it will throw some light on the presentation, etiological factors, outcome of these patients and thereby planning effective preventive and management strategies for these patient population.

### CONCLUSION

Posterior circulation Strokes are different compared to the anterior circulation strokes due to their varied clinical presentation and insensitivity of CT brain to properly delineate posterior fossa pathology. Thus, adequate knowledge of posterior circulation stroke is essential for clinicians for early identification of these patients to provide optimal medical management and surgical measures when necessitated.

### REFERENCES

- [1] Brazis Paul W, Masdeu Jose C, Biller Jose. Localization in Clinical Neurology, 5th Edition, Chapter 21 - Vascular Syndromes of the Forebrain, Brainstem, and Cerebellum. Page 611-622.
- [2] Adams and Victor's Neurology. Chapter 34. Cerebrovascular Diseases 3. Harrison's principles of internal medicine, 18th edition.
- [3] Bogouslavsky J, Van Melle G, Regli F: The Lausanne Stroke Registry: Analysis of 1,000 consecutive patients with first stroke. Stroke 1988; 19:1083-1092.
- [4] Burger KM, Tuhim S, Naidich T: Brainstem vascular stroke anatomy. Neuroimaging Clin N Am 2005; 15:297-324.
- [5] Kumral E, Bayulkem G, Evyapan D: Clinical spectrum of pontine infarction. Clinical-MR correlations. J Neurol 2002; 249:1659-1670.
- [6] Kumral E, Bayulkem G, Akyol A, et al: Mesencephalic and associated posterior circulations infarcts. Stroke 2002; 33:2224-2231.
- [7] Martin PJ, Chang HM, Wityk R, et al: Midbrain infarction: Association and aetiologies in the New England Medical Center Posterior circulation Registry. J Neurol Neurosurg Psychiatry 1998; 64:392-95.
- [8] Kameda W, Kawanami T, Kurita K, et al: Lateral and medial medullary infarction: A comparative analysis of 214 patients. Stroke 2004; 35:694-699.
- [9] Bassetti C, Bogouslavsky J, Barth A, et al: Isolate infarcts of the pons. Neurology 46:165-175, 1996
- [10] Christopher Lewandowski, MD, Sunitha Santhakumar, MD, Posterior circulation stroke, FERNE.
- [11] Becker KJ: Vertebrobasilar ischemia. [Review] [107 refs]. New Horizons 1997; 5:305-315.
- [12] Caplan L: Posterior circulation ischemia: then, now, and tomorrow. The Thomas Willis Lecture-2000. Stroke 2000; 31:2011-2023.
- [13] Vuilleumier P, Bogouslavsky J, Regli F: Infarction of the lower brainstem. Clinical, aetiological and MRI-topographical correlations. Brain 1995; 118:1013-1025.