

## Original Article

### Clinical Profile of Posterior Circulation Stroke: A Prospective Study at Dhaka Medical College Hospital

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#### Abstract

Studies regarding clinical characteristics of stroke involving the posterior circulation territory of the brain in Bangladesh are rare although large number of patients were found in hospital admission and with a high morbidity and mortality. Study for better understanding of the clinical features, risk factors and aetiologies of posterior circulation stroke (PCS) may be very helpful for early diagnosis, treatment, and also for setting primary and secondary prevention strategies. The objective of the study was to identify clinical features and short-term outcome of PCS. Adult patients admitted in Dhaka Medical College Hospital with clinical features consistent with posterior circulation stroke involving brain stem or, cerebellum or thalamus or occipital area and confirmed by computer tomography (CT) scan of brain were the cases as respondents. Few cases were needed MRI of brain to confirm diagnosis. This was a hospital based prospective observational study with descriptive and analytical component. Sample was selected from the study population by purposive type of non-probability sampling technique. Sample size was 30. A semi-structured questionnaire was prepared containing patients' profile as well as stroke patients' reporting form which included all the essential information regarding clinical profile of PCS as

well as short term outcome. Analysis was done using Statistical Package for the Social Sciences (SPSS) software. Thirty consecutive cases of strokes involving posterior circulation territory were included in the study according to inclusion and exclusion criteria. Male female ratio was 1.7:1. Most of the patients in both sexes were affected after the age of 50 years. Hemorrhagic PCS was significantly higher than ischaemic PCS. Among hemorrhagic PCS common symptoms were decreased level of consciousness and motor disturbances. Most common clinical sign in ischemic PCS is impaired consciousness which was present in 55.6% of the total ischemic PCS cases. Whereas this sign was present in all the cases of hemorrhagic PCS (100%). Like presenting symptoms, most of the clinical signs were also more common in hemorrhagic PCS. But few clinical signs were more common in ischemic strokes, such as cranial nerve involvement and nystagmus. Commonest predisposing factors were tobacco abuse, hypertension and dyslipidemia. Mortality was higher in hemorrhagic PCS than ischemic PCS within 7 days of follow up.

**Keywords:** Posterior circulation stroke, stroke subtypes, risk factors.

#### INTRODUCTION

The World Health Organization (WHO) defines stroke as 'rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin.<sup>1</sup> The National Institute of Neurological Disorders and Stroke (NINDS) applies the term stroke to "any one or all of a group of disorders including cerebral infarction, intra-cerebral haemorrhage or subarachnoid haemorrhage.<sup>2</sup>

Stroke is a common medical emergency with an annual incidence of between 180 and 300 per 100 000. The incidence rises steeply with age, and in many developing countries, the incidence is rising because of the adoption of less healthy lifestyles.<sup>3</sup> About one-fifth of patients with an acute stroke will die within a month of the event, and at least half of those who survive will be left with physical disability.<sup>3</sup>

Posterior circulation strokes (PCS) account for 10 to 15%<sup>4</sup> of all strokes. The area includes brainstem, cerebellum, occipital lobes and thalamus and is supplied by 2 vertebral arteries, 1 basilar artery and 2 posterior cerebral arteries.<sup>5</sup> Posterior circulation ischemia ranges from fluctuating

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brainstem symptom caused by intermittent insufficiency to many syndromes like lateral medullary, medial medullary, locked in to top of basilar syndrome.<sup>6</sup> Dizziness, vertigo, headache, vomiting, double vision, loss of vision, ataxia, numbness and weakness involving both sides of the body are frequent symptoms and limb weakness, gait and limb ataxia, oculomotor palsies and or pharyngeal dysfunction are most common signs of vertebra-basilar insufficiency.<sup>7</sup> Cerebellar, pontine and other brainstem ischemia/hemorrhage are more common in posterior circulation strokes(PCS).<sup>8</sup>

There is no known study regarding clinical characteristics of stroke involving the posterior circulation territory of the brain in Bangladesh although it consists of significant number of hospital admission and having a high morbidity and mortality rate. A better understanding of the clinical features, risk factors and etiologies of PCS will be very effective for early diagnosis and treatment, and also for setting primary and secondary prevention strategies.

This study aims to identify most commonly encountered symptoms, signs, and risk factors as well as short term outcome of PCS.

## MATERIAL AND METHODS

This was a hospital based prospective observational study with descriptive and analytical component. This study was done in the Department of Medicine & Neurology, Dhaka Medical College Hospital, Dhaka since 1<sup>st</sup> July, 2016 to 31<sup>st</sup> December, 2016). Total 30 consecutive cases were taken as study sample.

### Inclusion criteria

1. Adult patients admitted in medicine and neurology ward.
2. Admitted within 72 hours of the onset of symptoms.
3. Posterior circulation strokes confirmed by CT scan of brain and/ or MRI of brain.

### Exclusion criteria

1. CT scan of brain showing stroke involving anterior circulation.
2. Head injury.
3. Not agreed to take part in the study.

A semi-structured questionnaire was prepared after pre-testing consisting of patients' profile as well as stroke patients' reporting form which included all the essential information regarding clinical profile of posterior circulation stroke.

Detailed clinical history and physical examination data was recorded for each individual patient in a predesigned

case-record form (CRF). All relevant investigation reports were also been used for data collection.

## RESULTS

During the study period the total number of strokes were 1200 and percentage of posterior circulation stroke was 2.5 % of all strokes. Stroke was more common in the middle aged and elderly. Hemorrhagic posterior circulation strokes (PCS) were more common (66.7%) than ischemic PCS (33.3%). And males were three times more commonly affected than female. About 66 % cases were of more than 50 years of age.

Table I shows the frequency of clinical manifestations present at the time of admission to hospital. Most frequent manifestations were altered sensorium (55.6 %) and vertigo (55.6 %) in ischemic strokes; and in hemorrhagic strokes altered sensorium (100%), motor disturbances (76.2%) and headache (66.7 %) were commonly encountered symptoms.

**Table I: Symptoms in ischemic and hemorrhagic PCS**

| Manifestation          | Ischemic Stroke       |      | Hemorrhagic Stroke     |      |
|------------------------|-----------------------|------|------------------------|------|
|                        | No. of Patients (N=9) | %    | No. of Patients (N=21) | %    |
| Altered sensorium      | 5                     | 55.6 | 21                     | 100  |
| Vertigo                | 5                     | 55.6 | 13                     | 61.9 |
| Haedache               | 2                     | 22.2 | 14                     | 66.7 |
| Vomiting               | 2                     | 22.2 | 17                     | 81   |
| Ataxia                 | 1                     | 11.1 | 9                      | 42.9 |
| Speech disturbances    | 2                     | 22.2 | 13                     | 61.9 |
| Visual disturbances    | ...                   | ...  | 2                      | 9.6  |
| Blurring and blindness | ...                   | ...  | ...                    | ...  |
| Diplopia               | ...                   | ...  | 1                      | 4.8  |
| Motor disturbances     | 1                     | 11.1 | 16                     | 76.2 |
| Sensory disturbances   | 2                     | 22.2 | 5                      | 23.8 |
| Convulsion             | ...                   | ...  | 5                      | 23.8 |

Table II shows the most common neurological findings in ischemic stroke were impaired consciousness (55.6%), motor weakness (44.4%) and speech disturbances (44.4%). The next findings were cranial nerve involvement (33.3%) and nystagmus (33.3%). In hemorrhagic strokes all the patients had altered sensorium (100%); 76.2% had both speech disturbances and motor weakness and loss of orientation was present in 71.4% of cases.

**Table II Clinical signs in ischemic and hemorrhagic PCS**

| Features                  | Ischemic stroke       |      | Hemorrhagic stroke     |      |
|---------------------------|-----------------------|------|------------------------|------|
|                           | No. of Patients (N=9) | %    | No. of Patients (N=21) | %    |
| Consciousness impaired    | 5                     | 55.6 | 21                     | 100  |
| Orientation impairment    | 1                     | 11.1 | 15                     | 71.4 |
| Speech disturbances       | 4                     | 44.4 | 16                     | 76.2 |
| Memory impairment         | 2                     | 22.2 | 419                    |      |
| Cranial nerve involvement | 3                     | 33.3 | 29.6                   |      |
| Motor weakness            | 4                     | 44.4 | 16                     | 76.2 |
| Sensory disturbances      | 2                     | 22.2 | 628.6                  |      |
| Cerebellar signs          | 2                     | 22.2 | 838.1                  |      |
| Nystagmus                 | 3                     | 33.3 | 419                    |      |
| Meningeal irritation      | ...                   | ...  | ...                    | ...  |
| Fundal changes            | 2                     | 22.2 | 12                     | 57.1 |

Table III shows in ischemic stroke the commonest risk factors were tobacco abuse (44.4%) and dyslipidemia (44.4%).

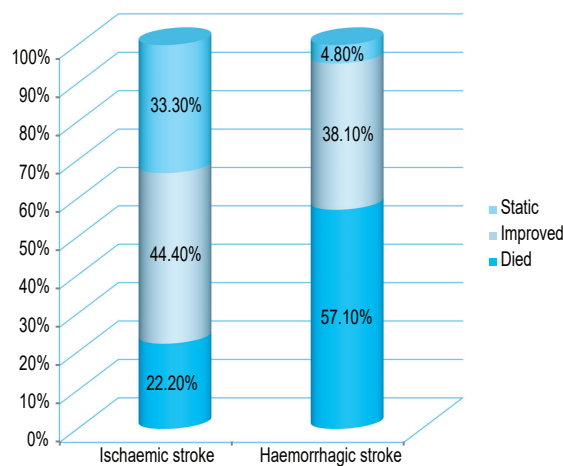
**Table III: Risk factors for Ischemic PCS**

| Name of factors        | Frequency (%) |
|------------------------|---------------|
| Tobacco abuse          | 44.4          |
| Dyslipidemia           | 44.4          |
| Carotid Artery Disease | 44.4          |
| IHD                    | 33.3          |
| Diabetes Melitus       | 22.2          |
| Alcohol                | 11.1          |

Table IV shows in the hemorrhagic strokes the commonest risk factor was hypertension (57.1%) and next to hypertension is diabetes mellitus (33.3%).

**Table IV: Risk factors for Hemorrhagic PCS**

| Name of factors   | Frequency (%) |
|-------------------|---------------|
| Hypertension      | 57.1          |
| Diabetes Mellitus | 33.3          |
| IHD               | 23.8          |
| Alcohol           | 19.0          |
| IHD               | 23.8          |



**Figure 1** Graphical representation of short-term outcome of ischemic and hemorrhagic PCS.

Figure 1, Mortality in ischemic stroke was 22.2% and in hemorrhagic stroke it was 57.1%. Improvement was seen in 44.4% of ischemic and 38.1% of hemorrhagic strokes within 7 days of follow up.

**DISCUSSION**

Of the 30 patients studied, the age ranged from 35 to 81 years. Most of the patients' (36.67 % of total patients) age was in between 50 to 70 years. This shares the same sort of findings (61.7±14.6 years) with the research paper published in JNNP in 2011 and with the NEMC-PCR (mean age 60.5 years).<sup>20,21</sup>

Total 1200 stroke patients were admitted in Dhaka Medical College Hospital during the study period. Among them 30 cases were posterior circulation stroke. That means 2.5% of the admitted stroke patients were suffered from posterior circulation stroke.

Among the affected patients 19 (63.33%) were male and 11 (37.67%) were female. Ma.Cristina L et al study and R.B. Libman et al also found more males compared to females in their study.<sup>22,23</sup> Male and female ratio was 1.7:1. According to NEMC-PCR 63% was male and 37 % was female.<sup>21</sup> This is similar to the findings of the present study. But in a study conducted in Southern India in 2011 stated that male and female ratio was 3.1:1.<sup>24</sup> That means in Southern India incidence of PCS is more common in males than this study conducted at Dhaka Medical College Hospital.

Approximately 57.89 % of the male patients' age was between 51 years to 70 years and 45.45 % of the affected female patients' age was between 51 years to 70 years. Incidence is less in the patients aged <51 years and >70 years in both sexes. Caplan et al., Patrick et al. and Kora S.A. et. al. found similar findings.<sup>10,12,24</sup> In Ratnavalli E et al most of the PCS patients' age was > 65 years of age.<sup>26</sup>

Specific reason was not found why hemorrhagic strokes are more common in Bangladesh than India but poorly controlled hypertension and irregular intake of anti-hypertensive medication may be the cause. As we know that the role of hypertension as a leading risk factor is well established, and its frequency has been estimated to be between 72% and 81%.<sup>25,26,27</sup>

The causative role of hypertension is supported by the presence of high blood pressure in 57.1 % of hemorrhagic strokes compared to 11.1 % in ischemic strokes. Among the males 31.58 % was ischemic stroke and remaining 68.42 % was hemorrhagic. And among the females 27.27 % was ischemic and 72.72 % was hemorrhagic stroke. So, it was clearly seen that in both male and female hemorrhagic strokes were significantly higher.

Among the ischemic PCS altered sensorium and vertigo were the most common symptoms. Both these symptoms were present in 55.6 % cases of the ischemic strokes. Whereas in Kora S.A. et. al. most common symptom in ischemic PCS was motor disturbances (63.2 %) and after that next most common was altered sensorium and headache (both was 57.8 %).<sup>24</sup>

Headache, vomiting, speech disturbances and sensory disturbances all were present in 22.2 % of ischemic strokes.

11.1 % of ischemic stroke cases complaints of motor weakness. But in the present study no patients among ischemic strokes complaints of visual disturbances or blurring of vision or blindness or diplopia or convulsion.

Similar to Kora S.A. et. al. we found that among hemorrhagic strokes 100 % patients' level of consciousness was poor.<sup>24</sup> And next to this the most common symptom was motor disturbance which was present in 76.2 % of cases in the present study. Compared to ischemic strokes where altered sensorium and motor disturbances were the presenting complaints in 55.6 % and 11.1 % cases sequentially, these were much more common in the hemorrhagic strokes. Whereas in Kora S.A. et. al. most common sign in hemorrhagic PCS next to impaired consciousness was headache and vertigo (both were present in 66.6 % of cases).<sup>24</sup>

Similarly, in the present study other presenting symptoms like vertigo, headache, vomiting, ataxia, speech disturbances, sensory disturbances all were 2-3 times more common in hemorrhagic strokes. Comparative frequency has been shown in bracket in the form of ischemic vs hemorrhagic stroke (vertigo 55.6 % vs 61.9 %; headache 22.2 % vs 66.7 %; vomiting 22.2 % vs 81 %; ataxia 11.1 % vs 42.9%; speech disturbances 22.2 % vs 61.9 %; sensory disturbances 22.2 % vs 23.8 %).

Convulsion was only present in 23.8 % of hemorrhagic stroke cases where as no ischemic stroke cases developed convulsion. It is obvious from the above data that hemorrhagic PCS presents with more symptoms than Ischemic PCS.

Overall if it is compared to the study known as Patrick et al, it is seen that all the symptoms are more common in the present study except ataxia, visual disturbances and diplopia.<sup>12</sup> Most common symptom is altered sensorium in both the study.

Most common clinical sign in ischemic PCS is impaired consciousness which was present in 55.6 % of the total ischemic PCS cases. Whereas this sign was present in all the cases of hemorrhagic PCS (100%). Like presenting symptoms, most of the clinical signs were also more common in hemorrhagic stroke. For example, disorientation is more common in hemorrhagic PCS (71.4 %) compared to 11.1 % in ischemic PCS. Similarly, speech disturbances, memory impairment, motor weakness, sensory disturbances, cerebellar signs and fundal changes like hypertensive and diabetic retinopathy were more common in hemorrhagic strokes.



Ischemic vs hemorrhagic PCS (speech disturbances 44.4% vs 76.2%; memory impairment 22.2% vs 19%; motor weakness 44.4% vs 76.2%; sensory disturbances 22.2% vs 28.6%; cerebellar signs 22.2% vs 38.1%; and fundal changes 22.2% vs 57.1%). But few clinical signs were more common in ischemic strokes, such as cranial nerve involvement (33.3%) was more common in ischemic PCS than 9.6 % in hemorrhagic PCS. Nystagmus was a more frequent finding in ischemic PCS (33.3%) than in hemorrhagic PCS (19%).

Tobacco abuse and dyslipidemia were the most common risk factors (both were present in 44.4% of cases) in ischemic PCS. Other factors that were found associated with ischemic PCS were BMI >25 (was present in 55.6 % of cases), carotid artery disease (was present in 44.4% of cases), ischemic heart disease (was present in 33.3% of cases) though these are directly related to or result of dyslipidemia.

In hemorrhagic PCS most common risk factor was hypertension. It was seen that hypertensive patients who used to take anti-hypertensives irregularly and those who did not take anti-hypertensives were commonly suffered from hemorrhagic stroke. This is also seen in hemorrhagic strokes in other vascular territories of the brain.

Next to hypertension most common risk factor was diabetes. But it is not clear why this is a less common risk factor in Ischemic PCS. Diabetes is present in 33.3% cases of hemorrhagic PCS compared to 22.2% in ischemic PCS.

Other risk factors that were present includes dyslipidemia and conditions associated with it. Dyslipidemia was present in 28.6 % cases, TIA & BMI > 25 28.6 % cases, Ischemic heart disease 23.8 % cases in hemorrhagic PCS.

Most common risk factor was hypertension in the present study which is comparable with the Caplan et. al. But in the other studies most common risk factor was tobacco abuse. In these studies, most of the cases was ischemic PCS. And this may be the reason behind this difference.<sup>10,24,25,26</sup> A comparative table has been given below to show how much difference was there among different studies.

In the present study also tobacco abuse was the most common risk factor for ischemic PCS as I already have mentioned above. And similarly, for the hemorrhagic PCS most common risk factor was hypertension, this has also been mentioned above. As in the present study 70% cases were hemorrhagic PCS so when most common risk factor was calculated for the total number of patients it was found to be hypertension.

Patients were followed up for 7 days to see immediate outcome of the treatment. We found that most of the

patient died in hemorrhagic PCS but most of the patient was improved in ischemic PCS. 22.2 % patient was died ischemic stroke whereas 57.1 % was died in hemorrhagic stroke within 7 days.

Level of consciousness, symptoms like vertigo, headache etc. speech disturbances & motor weakness were significantly improved compared to what those were 7 days back in 44.4 % of cases of ischemic PCS and in 38.1 % of cases of hemorrhagic PCS.

Approximately 33.3 % patient was remained in the same condition after 7 days of treatment in ischemic PCS compared to 4.8 % in hemorrhagic PCS. So, most of the hemorrhagic cases were either improved or deteriorated.

Compared to other studies like Patrick et al (25.6%), Jones et al (27.5%) and Uma et al (17%) mortality ratio is higher this study (46.7%).<sup>9,14,25</sup> Percentage of improvement in this study was 44.4% in ischemic PCS and 38.1% in hemorrhagic PCS (average 40%) whereas it was higher in Patrick et al<sup>9</sup> study (46%) and Uma et al<sup>25</sup> study (52%) but in Jones et al<sup>14</sup> study it was 35% on an average.<sup>9,25,14</sup> Death ratio was higher may be due to lack of adequate treatment facilities here.

## CONCLUSIONS

Study shows that PCS commonly affects the elderly but may occur in young. Clinical profile of PCS in this study emphasizes deep concern about elderly persons and those having risk factors like hypertension, tobacco abuse, diabetes, dyslipidemia. Knowledge of clinical characteristics of PCS is necessarily a concern of prevention and management strategy of this strokes.

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