



ORIGINAL ARTICLE

## Frequencies of different vascular etiologies and clinical presentations in post-partum women with suspected stroke.

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**ABSTRACT... Objective:** To determine the frequencies of different vascular etiologies and clinical presentations in post-partum women with suspected stroke. **Study Design:** Cross-sectional study. **Setting:** Department of Medicine, Bahawal Victoria Hospital, Bahawalpur. **Period:** November 2022 to May 2023. **Material & Methods:** A total of 117 female patients aged between 18-45 years in post-partum period of 30 days after delivery having clinical diagnosis of suspected stroke were included. All patients were evaluated and clinical presentation and frequency of different vascular etiologies were noted. **Results:** In 117 women, the mean age was  $32.01 \pm 5.67$  years while 59 (50.4%) women were aged  $\leq 35$  years of age. Headache was found in 61 (52.1%), seizures 56 (47.9%), altered consciousness 26 (22.2%) and weakness in 16 (13.7%) patients. Frequencies of different vascular etiologies in post-partum women with suspected stroke were cerebral venous sinus thrombosis in 21 (17.9%), arterial thrombosis 7 (6.0%) and hemorrhagic stroke in 89 (76.1%) patients. **Conclusion:** Hemorrhagic stroke was the most common vascular etiology whereas headache was the commonest clinical presentation in post-partum women with suspected stroke.

**Key words:** Arterial Thrombosis, Cerebral Venous Sinus Thrombosis, Headache, Postpartum, Stroke.

### INTRODUCTION

During peripartum and immediately after postpartum, maternal stroke may have highest occurrence rates.<sup>1,2</sup> Considering pregnancy and puerperium related complications, the impact of ischemic stroke and hemorrhagic stroke is devastating and have an incidence of 30 out of 100,000 pregnancies.<sup>3,4</sup>

Hypertensive disorders of pregnancy, migraine, and delivery through cesarean have great importance for both stroke and intracranial venous thrombosis as potential risk factors.<sup>5</sup> Irrespective of the hypertensive disorders of pregnancy, the women having infections at the time of delivery admissions, were at higher risk of stroke. These results were specific with genitourinary infections and sepsis. It seems that infections are underestimated as a risk factor for peripartum stroke.<sup>6</sup>

A retrospective study was done in Japan on pregnancy and puerperium associated stroke. Hemorrhagic strokes were observed in 73.6% of the cases, 18.4% were with arterial infarction, 6% presented venous infarction and 2% of the cases had mixed (ischemic & hemorrhagic) stroke.<sup>7</sup> Fever, thunderclap headache, blurredness of vision, focal neurologic deficits, altered level of consciousness, and seizures are commonly observed clinical manifestations associated with CVT during pregnancy.<sup>8,9</sup> One study done on cerebral venous thrombosis (CVT) patients revealed that most of the cases had headache (40%), whereas seizure (27%) and altered mental status (18%). Lesser common manifestations were focal motor deficits, visual symptoms, and dysarthria.<sup>10,11</sup> Cerebral herniation is a lethal complication of CVT.<sup>12,13</sup> Papilledema is also a common finding that might be a bedside test to diagnose in context of suspicion of CVT.<sup>14,15</sup>

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Stroke in pregnancy is an important entity to consider as it has significant impact on outcome and on the management decisions as well. Observations reveal that there are limited studies on this topic in Pakistan but we frequently see such patients in our clinical ward rounds. Moreover different studies done in different parts of the world have shown variation in results. Keeping in mind these facts, we planned to conduct this study. The study results will not only be a useful addition to the database of the population of this area but will also be helpful for the clinicians to manage such patients more effectively and to form the basis for the formulation of guidelines for optimal management in the targeted population. The study results may help to decrease morbidity and mortality also. The objectives of this study were to determine the frequencies of different vascular etiologies and clinical presentations in post-partum women with suspected stroke.

## MATERIAL & METHODS

This was a cross-sectional study performed at The Department of Medicine, Bahawal Victoria Hospital, Bahawalpur, Pakistan, from November 2022 to May 2023. A sample size of 117 was calculated using the formula  $n = z^2pq/d^2$ , [where  $z = 1.96$ , margin of error = 8%, anticipated frequency of hemorrhagic stroke as 73.6%, with 95% confidence level]. Sample was collected by using non-probability, consecutive sampling technique. Approval from "Institutional Ethical Committee" (263/IERB/QAMC Bahawalpur) was obtained. Informed and written consents were acquired from all study participants or their attendants if the patient was unconscious.

Inclusion criteria were the female patients of age 18-45 years with postpartum period of 30 days, after delivery having clinical diagnosis as case of suspected stroke. Exclusion criteria were the women with history of previous stroke and those who had serum creatinine  $\geq 1.5$  mg/dl. Clinical diagnosis as a case of suspected stroke was made by a consultant physician having at least 2 years of post-fellowship experience, on ward grand rounds. Suspected stroke was defined by the presence of any one of these: i) abrupt onset neurologic deficit lasting more

than 24 hours. Neurologic deficit may be either in the form of weakness of any limb (on motor examination power less than 5/5), positive Babinski's sign (extensor response of thumb on scratching outer sole of feet) cranial nerve palsy (checked by consultant physician on standard neurological examination having at least 2 years post fellowship experience) or ii) loss of altered consciousness (on neurological examination GCS 13 or less, checked by consultant physician on standard neurological examination having at least 2 years post fellowship experience). The CVT was a labeled as YES or NO according to reporting of MRI+MRV+MRA, reported by a consultant radiologist having at least two years post fellowship experience. Hemorrhagic stroke was a labeled as YES or NO according to reporting of CT scan brain plain showing hyper dense area inside brain parenchyma was defined as intracerebral hemorrhage (reported by a consultant radiologist having at least two years post fellowship experience).

Complete bio-data, history and previous antenatal record and other medical record of the patient was analyzed. Data regarding hypertension, diabetes, proteinuria, anemia, maternal age, mode of delivery and place of delivery were collected at the time of enrolment. Headache severity, seizures, weakness of any limb and altered consciousness were inquired specifically by the researchers. Fasting blood sugar, random blood sugar, hemoglobin, serum creatinine and urine examination for proteinuria were done on the first day of presentation in hospital. Systolic and diastolic blood pressure were measured in each case with well calibrated android sphygmomanometer while patient lying in the bed, two readings of blood pressure were taken five minutes apart and average of these two was entered in proforma and patient was diagnosed as hypertensive. It was defined as presence of blood pressure readings of  $\geq 140/90$ , on two or more occasions, in ante-natal medical records. Pain severity of headache was assessed according to scale. GCS assessment and motor examination were also done by same consultant. MRI+MRA+MRV and CT brain were done in each case and were reported by a

consultant radiologist having at least two years of experience of post fellowship. Moreover, etiology of stroke was documented on the basis of reporting provided by Radiology Department of the institution.

Associated arterial thrombosis was also documented. It was labeled as YES or NO according to reporting of MRI+MRV+MRA, reported by a consultant radiologist having at least two years post fellowship experience (Brain parenchyma demonstrating high DWI signal and low ADC signal). Labeling criteria for diabetes mellitus were the presence of any of the following blood sugar levels in previous medical record of last 2 years, on two or more occasions: i) random blood sugar > 200mg/dl, ii) fasting blood sugar > 126 mg/dl. Proteinuria was defined as presence of any of the following in urine sample taken on presentation in medical department or ante-natal medical records: i) proteinuria of ++ / more on dipstick examination, ii) proteinuria on urine testing ≥ 300 mg/24 hours in record of last trimester. Hemoglobin <10 g/dl, at term was labeled as anemia. Headache severity was assessed by four point pain response scale (reported by patient or based on history by close attendant if patient was unconscious). Seizures were based on two or more episodes of focal or generalized seizures in last 48 hours before presentation in hospital (history of tonic clonic fits).

The statistical data was analyzed using “Statistical Package for Social Sciences (SPSS)” version 26.0. Quantitative variables were described as mean and standard deviation whereas representation of the qualitative variables were shown as frequency and percentages. Effect modifiers were controlled through stratification while post-stratification chi-square test was applied taking p<0.05 as significant.

**RESULTS**

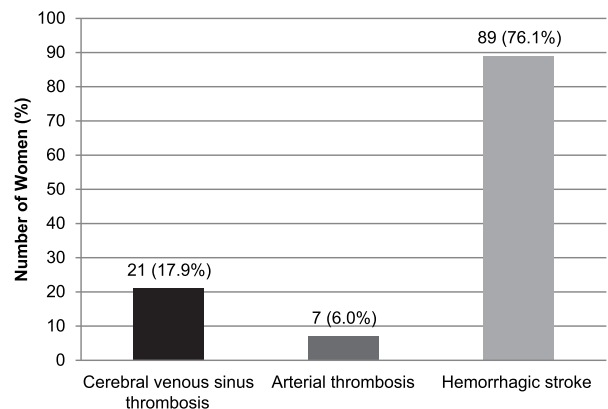
In a total of 117 women, the mean age was 32.01±5.67 years (ranging 18-45 years) while 59 (50.4%) women were aged < 35 years. The mean hemoglobin level was 10.51±3.72 g/dl. The mean systolic and diastolic BP were

BP was 127.43±14.62 mmHg and 81.32±5.43 mmHg respectively. The mean postpartum days were 16.43±6.32 days. The mean GCS was 12.24±2.31. The distribution of women according to their characteristics is shown in Table-I.

Characteristics		Frequency (%)
Age (years)	<35	59 (50.4%)
	≥35	58 (49.6%)
Mode of delivery	Spontaneous vaginal delivery	57 (48.7%)
	Cesarean section	60 (51.3%)
Place of delivery	Home	44 (37.6%)
	Hospital	73 (62.4%)
Place of living	Rural	61 (52.1%)
	Urban	56 (47.9%)
Diabetes mellitus		21 (18.0%)
Hypertension		27 (23.1%)
Proteinuria		15 (12.8%)
Anemia		28 (23.9%)
Frequency of clinical presentation	Headache	61 (52.1%)
	Seizures	56 (47.9%)
	Altered consciousness	26 (22.2%)
	Weakness	16 (13.7%)

**Table-II. Distribution of patients characteristics (n=117)**

Frequencies of different vascular etiologies in post-partum women with suspected stroke were cerebral venous sinus thrombosis in 21 (17.9%), arterial thrombosis in 7(6.0%) and hemorrhagic stroke in 89 (76.1%) women (Figure-1).



**Figure-1. Frequencies of different vascular etiologies in post-partum women with suspected stroke**

The CVT was found to have significant association with place of delivery (p=0.002), place of living

( $p=0.015$ ) and diabetes mellitus ( $p=0.008$ ) as shown in Table-II.

Stratification of arterial thrombosis did not show significant association with any of the study variables as shown in Table-III.

Hemorrhagic stroke was found to have significant association with place of delivery ( $p=0.014$ ), place of living ( $p=0.019$ ), diabetes mellitus ( $p=0.005$ ) and proteinuria ( $p=0.020$ ) as shown in Table-IV.

		Yes (n=21)	No (n=96)	P-Value
Age (years)	<35	7 (11.9%)	52 (88.1%)	0.084
	≥35	14 (24.1%)	44 (75.9%)	
Mode of delivery	SVD	7 (12.3%)	50 (87.7%)	0.119
	CS	14 (23.3%)	46 (76.7%)	
Place of delivery	Home	14 (31.8%)	30 (68.2%)	0.002
	Hospital	7 (9.6%)	66 (90.4%)	
Place of living	Rural	16 (26.2%)	45 (73.8%)	0.015
	Urban	5 (8.9%)	51 (91.1%)	
Diabetes mellitus	Yes	8 (38.1%)	13 (61.9%)	0.008
Hypertension	Yes	3 (11.1%)	24 (88.9%)	0.291
Proteinuria	Yes	-	15 (100.0%)	0.052
Anemia	Yes	4 (14.3%)	24 (85.7%)	0.563

**Table-II. Stratification of cerebral vein thrombosis with respect to hypertension, Diabetes, proteinuria, anemia, maternal age, mode of delivery and place of delivery (N=117)**

		Yes (n=7)	No (n=110)	P-Value
Age (years)	<35	4 (6.8%)	55 (93.2%)	0.714
	≥35	3 (5.2%)	55 (94.8%)	
Mode of delivery	SVD	3 (5.3%)	54 (94.7%)	0.749
	CS	4 (6.7%)	56 (93.3%)	
Place of delivery	Home	2 (4.6%)	42 (95.4%)	0.611
	Hospital	5 (6.8%)	68 (93.2%)	
Place of living	Rural	4 (6.6%)	57 (93.4%)	0.785
	Urban	3 (5.6%)	53 (94.6%)	
DM	Yes	2 (9.5%)	19 (90.5%)	0.450
HTN	Yes	2 (7.4%)	25 (92.6%)	0.722
Proteinuria	Yes	-	15 (100.0%)	0.295
Anemia	Yes	3 (10.7%)	25 (89.3%)	0.226

**Table-III. Stratification of arterial thrombosis with respect to hypertension, Diabetes, proteinuria, anemia, maternal age, mode of delivery and place of delivery (N=117)**

		Yes (n=89)	No (n=28)	P-Value
Age (years)	<35	48 (81.36%)	11 (18.64%)	0.176
	≥35	41 (70.69%)	17 (29.31%)	
Mode of delivery	SVD	47 (82.46%)	10 (17.54%)	0.115
	CS	42 (70.0%)	18 (30.0%)	
Place of delivery	Home	28 (63.64%)	16 (36.36%)	0.014
	Hospital	61 (83.56%)	12 (16.44%)	
Place of living	Rural	41 (35.04%)	20 (64.96%)	0.019
	Urban	48 (85.71%)	08 (14.29%)	
Diabetes mellitus	Yes	11 (52.38%)	10 (47.62%)	0.005
Hypertension	Yes	22 (81.48%)	05 (18.52%)	0.452
Proteinuria	Yes	15 (100.0%)	00 (0.0%)	0.020
Anemia	Yes	21 (75.0%)	07 (25.0%)	0.879

**Table-IV. Stratification of hemorrhagic stroke with respect to hypertension, Diabetes, proteinuria, anemia, maternal age, mode of delivery and place of delivery (N=117)**

## DISCUSSION

Among all pregnancy-associated strokes, the incidence of cerebral venous thrombosis is merely 2%. On the other hand, 12 out of 100,000 deliveries were reported with ischemic stroke.<sup>16</sup> During the period of third trimester and postpartum, women are at highest risk of developing CVT, which is similar to the time interval for likelihood of venous thromboembolic events.<sup>17</sup>

In this study, the frequencies of different vascular etiologies in post-partum women with suspected stroke were cerebral venous sinus thrombosis in 17.9%, arterial thrombosis in 6.0% and hemorrhagic stroke in 76.1% women. Recent publications show that CVT and thrombophilias have been reviewed in-depth to assess their causes and risk factors.<sup>16</sup> Reduced levels of circulating antithrombotic factors, venous stasis, or an abrupt drop in blood volume following to the delivery are physiologic changes that may occur during pregnancy and cause arterial or venous thromboembolism.<sup>18</sup> Considering the risk factors of stroke which are associated with general population, obesity has an increasing occurrence among young generation and it might also be a risk factor for young pregnant females as well. Hypertension, diabetes, valvular heart disease, hypercoagulable disorders, sickle cell disease, lupus, abuse of tobacco and other substances, and migraines are some other risk factors which are associated with pregnancy-related stroke.<sup>19,20</sup> Pre-existing, gestational, or linked to preeclampsia or eclampsia are all possible causes of hypertension in pregnancy. In pregnant women with hypertension, the risk of stroke is 6 to 9 times higher as compared to those who are without hypertension. Pregnancy, labor and delivery related complications such as hyperemesis gravidarum, anemia, thrombocytopenia, postpartum hemorrhage, transfusion, fluid, electrolyte and acid-base disorders, and infection may also increase the risk of stroke.<sup>21,22</sup>

Cesarean delivery has been a potential cause for peri-partum stroke, but still a causal relationship has to be established.<sup>19,23</sup> In literature, the possible causes of stroke among young women with or

without pregnancy are mentioned. Venous sinus thrombosis, cardioembolism, CNS or systemic vasculitis have not specific relation with pregnancy. While, preeclampsia/eclampsia, amniotic fluid embolism and postpartum angiopathy are pregnancy-related complications.<sup>24,25</sup> Postpartum cardiomyopathy can arise cardioembolism, watershed infarction from hypotension, which is less common.

## CONCLUSION

Hemorrhagic stroke was the most common vascular etiology whereas headache was the commonest clinical presentation in post-partum women with suspected stroke. Early recognition and management of this condition should be done in order to reduce the mortality and morbidity in the community.





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3	Syed Zain Ul Abidin	Drafting.	
4	Ghulam Jilani	Data collection, Data analysis.	
5	M. Waqas Saeed	Data collection, Literature review.	