IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 2 Ser.10 (February. 2021), PP 01-06
www.iosrjournals.org

Prospective analysis of demographic profile of neurovascular disorders and cortical vein thrombosis in pregnancy and puerperium

Kanaga Lakshmi[1], Muruga Lakshmi[2]
[1](Assistant Professor, Department of Obstetrics and Gynecology, Coimbatore medical college, India)
[2](Professor, Department of Obstetrics and Gynecology, Coimbatore medical college, India)

Abstract:
Background: *Neurological symptoms are not uncommon during pregnancy and puerperium. In some patients they may indicate a serious underlying problem. Obstetric cerebral venous thrombosis most commonly presents during the puerperal period and is a major cause of stroke in young women. Diagnosis of CVT is challenging due to its wide spectrum of clinical profile and needs a high suspicion.*
Materials and Methods: *Prospective analysis of women who gave birth between 2019 and 2020 was conducted. Etiology, risk factors, time of onset of illness were characterized for women with cerebrovascular disorders confirmed by neuroimaging.*
Results: *During the 1 year of observation, there were 14,119 obstetric admissions and 112 of these were diagnosed with Neurovascular disease. Among 112 Neurovascular disease 48 were CVT (42.85%) and 57 cases were PRES(51%). In CVT, headache was the commonest symptom presenting mostly in the postpartum period. Affected women are multigravida who crossed term pregnancy.*
Conclusion: *MRI/MRA/MRV has revolutionized neurodiagnosis and used as a first line diagnostic tool for CVT. Early diagnosis and early institution of therapy reduces the mortality of CVT in young females.* ***Key Word:*** *CVT, PRES, Neurovascular Disorder*

Date of Submission: 10-02-2021 Date of Acceptance: 24-02-2021

I. Introduction

Neurovascular disorders refer to a collection of diseases that result from thrombosed, ruptured, leaky, or constricted cerebral blood vessels. When they occur in pregnancy and postpartum, these diseases can be lifethreatening and disabling. These disorders include pregnancy and postpartum-related ischemic and hemorrhagic stroke, cerebral venous sinus thrombosis (CVST), posterior reversible encephalopathy syndrome (PRES), and reversible cerebral vasoconstriction syndrome (RCVS). Some of the mechanisms underlying for this disorder include venous or arterial thrombosis because of estrogen-related hypercoagulability; cerebral hypoperfusion related to acute blood loss; cardio embolism because of peripartum cardiomyopathy; and endotheliopathy, vasospasm, and hypertensive intracerebral hemorrhage (ICH) related to hypertensive disorders of pregnancy.[1,2] Thus diagnosis of cerebrovascular complications become challenging problem. In this study we evaluated frequency, demography and association of neurovascular disorders with various factors in pregnancy and puerperium on the basis of 12 months of observation.

II. Aims And Objectives

Primary objective: to find out the incidence of neurovascular disorders in pregnancy and puerperium.
Secondary objective: to analyse the demographical, epidemiological, clinical and radiological profile of CVT in pregnancy and puerperium.

III. Materials And Methods

This prospective study was conducted at Coimbatore Medical College Hospital, Coimbatore during the period of November 2019 – October 2020. During this period, our hospital has recorded 14,119 obstetric admissions. 112 consecutive patients diagnosed to have neurovascular diseases were included in the study. Informed consent was taken from the patients.
Inclusion criteria includes antenatal or postnatal patients admitted with complaints of headache, impaired consciousness, seizures and focal neurological deficit.
Exclusion criteria excludes known epileptic patients, CNS infection, head injury and psychosis.

History , clinical examination and investigations were done. Fundus examination, CT scan and MRI with MRA/MRV were done for all patients. Neurophysician opinion was obtained for all patients and was treated with anticonvulsants, antiedema measures and anticoagulants and patients were followed up till discharge from hospital or death.

IV. Review of Literature

Stroke of any cause is responsible for around 12% of maternal deaths, as well as significant adverse effects on the fetus. The incidence of stroke in pregnancy is around 30 cases per 100,000 deliveries.

CVST and venous stroke: CVST refers to thrombus formation in the veins or venous sinuses of the head. CVST is an uncommon cause of stroke in the general population (0.5-1% of all strokes) but has a higher incidence in pregnancy (2% of pregnancy strokes), with a prevalence of about 12 cases per 100000 pregnancies. Patients with CVST typically present with gradual onset, worsening headaches, often with a high-pressure phenotype and with a postural relationship (typically worse lying than sitting or standing) and worse with Valsalva, due to further elevation of intracranial pressure. These headaches sometimes with additional mental status changes, seizures, and focal neurological deficits.

Acute ischemic arterial stroke: Pregnant women are at two to three times higher risk for stroke compared to the general population, with the highest risk in the third trimester and first 6-12 weeks after delivery. Patients with acute ischemic arterial stroke most often present with the sudden onset of focal neurological signs and symptoms, often without headache or with a mild headache-a feature more common among younger women with strokes. **Hemorrhagic stroke (intracranial hemorrhage):** Hemorrhagic stroke, synonymous with intracranial hemorrhage. occurs in the postpartum state more frequently than in pregnancy and is associated with an in-hospital maternal mortality rate of around 20%. Hemorrhagic stroke often presents with sudden onset, severe headache— termed a "thunderclap headache," or described as the "worst headache of life," with or without other neurological symptoms.

Posterior reversible encephalopathy syndrome (PRES): The typical presentation of PRES involves the gradual onset of headache, with visual and mental status changes, seizures, and neurological deficits. On MRI, widespread T2/FLAIR hyperintensities (which appear as confluent white patches) representing vasogenic edema can be seen in the white matter of the posterior brain regions: the occipital, parietal and temporal lobes, the cerebellum, and the brainstem. PRES may occur either during pregnancy or postpartum.

Reversible cerebral vasoconstriction syndrome (RCVS): RCVS presents with a "thunderclap headache," or the sudden onset of the worst headache of one's life. Like PRES, RCVS can also be associated with mental status changes, visual complaints, and seizures. RCVS occurs more commonly in postpartum than pregnant women, and it was previously known as postpartum angiopathy.

Pathogenesis of neurologic complications of preeclampsia: Two theories are postulated to explain cerebral abnormalities associated with Eclampsia. Endothelial dysfunctions play a central role in both theories. The 1ST theory suggests that vasospasm of cerebral vasculature in women with severe preeclampsia and Eclampsia is a response to acute severe hypertension (cerebral overregulation leads to vasospasm). Vasospasm results in cytotoxic oedema, ischemia and tissue infarction. Alternate theory suggests that sudden elevation in systemic blood pressure may exceed cerebral vascular autoregulation, regions of vasoconstriction and forced vasodilatation develop resulting in increased hydrostatic pressure and extravasation of plasma and RBC and vasogenic oedema described as posterior reversible leukoencephalopathy syndrome(PRES).

V. Results

Neurovascular disorder was diagnosed radiologically in 112 patients presented with antepartum and postpartum eclampsia, postpartum seizures, headache, giddiness, neurological deficit like aphasia, hemiplegia, hemiparesis, numbness and vision abnormality and fundus examination finding of papilloedema during the study period. Eclampsia was the commonest presentation for neurovascular disorders where as for CVT, headache was the commonest. (Table 1) Among them 48 had CVT (Table 1) involving mostly multiple sinuses followed by superior sagittal sinus.

Table 1: MRI findings:

MRI FINDINGS	CVT	48	42.85%
	PRES	57	51%
	RCVS	4	3.5%
	ICH	1	0.9%
	SAH	1	0.9%
	AQUEDUCTAL STENOSIS	1	0.9%

INVOLVEMENT OF SINUSES IN CVT	SUPERIOR SINUS	14	29%
	LATERAL SINUS	11	23%
	MULTIPLE SINUSES	19	40%
	CONFLUENCE OF SINUS	2	4%
	DEEP VENOUS SINUS	2	4%

Table 2: Modes of presentation:

MODES OF PRESENTATION	NVD		CVT	
ECLAMPSIA	42	38%	10	20.83
POSTPARTUM SEIZURES	27	24%	12	25%
HEADACHE	27	24%	17	35.41%
GIDDINESS	7	6%	3	6.25%
NEURODEFICIT	15	13%	9	18.75%
PAPILLOEDEMA	35	31%	8	16.66%

The incidence of both neurovascular disorders on the whole and CVT were highest in women with age between 20 and 30 years. The occurrence of NVD was highest in primi whereas CVT in multigravida and both were highest in the postpartum period more than 5 days and after term delivery(Table 3).

Table 3:

FACTOR	DISTRIBUTION	NVD	%	CVT	%
AGE	LESS THAN 20 YEARS	14	12.5%	6	12.5%
	20 -30 YEARS	89	79.5%	38	79.16%
	MORE THAN 30 YEARS	9	8%	4	8.33%
PARITY	DISTRIBUTION	NVD	%	CVT	%
	PRIMI	67	60%	19	39.58%
	MULTI	45	40%	29	60.41%
PERIOD OF ONSET	DISTRIBUTION	NVD	%	CVT	%
	ANTEPARTUM	40	36%	6	12.5%
	PP LESS THAN 5DAYS	26	23%	14	29.16%
	PP MORE THAN 5 DAYS	46	41%	28	58.33%
DURATION OF GESTATION	DISTRIBUTION	NVD	%	CVT	%
	I TRIMESTER	1	0.9%	1	2%
	II TRIMESTER	1	0.9%	1	2%
	PRETERM	38	34%	10	21%
	TERM	72	64%	36	75%

Both NVD and CVT occurred most frequently in women in urban areas and particularly during the month of august to September. But in patients from hilly areas CVT was the most common disorder accounting to 69%.(Table 4).

Table 4:

PLACE	DISTRIBUTION	NVD	%	CVT	%
	CBE	72	64%	21	43.75%
	TIRUPUR	27	24%	18	37.5%
	HILLY AREAS	13	12%	9	18.75%
SEASONAL VARIATION	DISTRIBUTION	NVD	%	CVT	%
	NOV – JAN	27	24.01%	12	25%
	FEB-APR	18	16.07%	7	14.58%
	MAY – JULY	25	22.32%	9	18.75%
	AUG – SEP	42	37.5%	28	58.33%

Both NVD and CVT manifested highest in women who underwent caesarean section. The association of comorbid conditions with neurovascular disorders was highest among women with GHT and its associated complications like preeclampsia, Hellp syndrome, antepartum and postpartum eclampsia where as anemia was the frequently associated comorbid condition with respect to CVT.(Table 5) and no risk factors were identified in 22% of NVD patients and 18% of CVT patients.

Table 5:

MODE OF DELIVERY	MODE	NVD	%	CVT	%
	LN	21	19	12	25%
	LSCS	89	80	35	73%
	SURGICAL ABORTION	1	1	1	2%
CO MORBIDITIES	CO MORBIDITIES	NVD	%	CVT	%
	ANAEMIA	28	25%	18	37.5%
	GHT	53	47%	17	35%
	GDM	3	3%	1	2%
	HEART DISEASE	1	0.8%	1	2%
	THROMBOPHILIA	1	0.8%	1	2%
	AKI	1	0.8%	1	2%
	NO RISK FACTORS	25	22%	9	18.5%

2 maternal deaths reported among 112 patients. The cause was intracranial haemorrhage associated with antepartum eclampsia and another patient with CVT associated with postpartum eclampsia. This emphasise the strong association of GHT with mortality of neurovascular disorders.(Table 6)

Table 6:

MORTALITY	NVD	PERCENTAGE	CVT	CVT AMONG NVD
ANTEPARTUM	1	0.8%	0	
POSTPARTUM	1	0.8%	1	2%

VI. Discussion

A wide variety of well-known conditions may cause or predispose to CVT, and their relative importance may vary in different areas of the world.[3]

During the 1 year of observation, there were 14,119 obstetric admissions and 112 of these were diagnosed with Neurovascular disease. In our study antepartum and postpartum eclampsia was the most common presenting symptom seen in 38% of neurovascular diseases. With respect to CVT headache was the most frequent symptom. The mechanism of headache is postulated to be the stretching of nerve fibers in the walls of the occluded sinus and local inflammation, as suggested by the evidence of contrast enhancement of the sinus wall surrounding the clot. In present study headache as a presenting symptom has been documented in 35.41% of cases similar to many other studies.

In our study 9 out of 15 patients presented with Neurological deficit had CVT(60%) out of which 1 had hemiplegia,

3 patients had hemiparesis similar to Pai et al and Narayan et al.[4] Focal neurological deficit presents depending on the area involved. The incidence of coma was 11% (1 in 9) compared to other case series from India that reported 43% to 93% of patients had an altered sensorium at presentation.[10] The reason for this decrease is probably due to patients seeking medical help earlier in the recent times.Aphasia was present in 2 patients (22%); vision abnormality was present in 2 patients (22%). The fundus was normal in 40 patients with CVT but 8 patients had signs of papilloedema(16.66%).

MRI is the preferred imaging option in pregnancy. In puerperium, CT and MRI can be used as the condition warrants. In the present study 112 neurovascular diseases cases were associated with pregnancy and puerperium. This complication is also common in India, with a prevalence of 4.5/1000 obstetric admissions.[5]Among 112 Neurovascular disease 48 were CVT (42.85%) and 57 cases were PRES(51%). Combined sinus thrombosis, 19 out of 48 cases (40%) was more common than single sinus involvement similar to other studies. This prospective observational study shows the incidence of CVT to be 3.4 per 1000 obstetric admissions.

Jiann-Shing et al from Taiwan reported that in women of 15-40 years of age, with first ever stroke proportion of CVT is 39% in pregnancy related stroke as compared to only 5% in pregnancy unrelated stroke.[6]A significant association has constantly been found with young age from developing as well as developed countries.In our study 79.5% Neurovascular diseases occurred between 20 and 30 years of age and the incidence of CVT was also higher and around 43%.

Although in the Indian population, multiparas are more often affected in CVT than primiparas, in a proportion of 4: 1, in our population this difference was not so striking (1.5:1). CVT should be suspected in any woman who develops neurological symptoms in the immediate postpartum period, since in our study population nearly 29.16% of NVD were CVT in less than 5 days postpartum and 58.33% were CVT in more than 5 days postpartum. The ratio of CVT during puerperium and pregnancy is reported to be 2.1:1 to 3.25:1 from European countries and 13:1 to 14:1 from developing countries like Mexico and India.[7] Higher risk during puerperium has been attributed to bad obstetrical practices i.e. home deliveries by untrained dais and restriction of water intake during immediate postpartum. In our study it is 7 : 1.

CVT usually presents either late in pregnancy or puerperium but cases have been reported as early as 8 weeks. 1 case was reported in the first trimester who subsequently underwent termination and 1 in the second trimester at 20 weeks and both presented with headaches. Hypercoagulability plays an important role in development of CVT during pregnancy and puerperium. Several changes occur in the coagulation system, which are more marked during the third trimester, and render it a hypercoagulable state. 75% of CVT occurred in patients who crossed 37 weeks of gestation and nearly 96% patients fell in the third trimester. In addition dehydration as a result blood loss during delivery and bad obstetric practices and local trauma during delivery worsen the prothrombotic state. The hypercoagulability and venous stasis as a result of prolonged bed rest, instrumental delivery or Caesarean section will lead to thrombosis.[8]

With the demographic profile though the incidence of Neurovascular diseases were higher in Urban (Coimbatore) 64 %, the incidence of CVT among them was higher in Hilly areas (Sathy,Ooty) 69%. Seasonal variation when observed the incidence was highest between august to September accounting nearly 58.33% of CVT cases.

When analyzing the risk factors of neurovascular disorder with respect to CVT, Caesarean section may increase the risk by postsurgical decline of protein C levels, presumably because surgically induced tissue damage induces the activation of blood clotting with increased thrombin generation, which in turn both activates protein C and accelerates its clearance from plasma.[9] In our study 73% of CVT patients had undergone LSCS and 35 out of 89 cases with Neurovascular diseases had LSCS. Caesarean section and infections have been found to be independent risk factors of obstetric CVT and they increase the risk by three times.

Cantu et al noted a significantly higher proportion of anaemia and ESR in puerperal cases compared to non puerperal cases. 37.5% cases of CVT had anaemia. Several mechanisms have been proposed to explain the

association between IDA and thrombosis, as iron is an important regulator of thrombopoiesis:[10] low iron levels disinhibit megakaryocyte activity, which provokes secondary thrombocytosis, thus leading to a hypercoagulable state. In addition, microcytosis alters red cells deformability, which increases viscosity and possibly the risk of venous thrombosis. Finally, anemic hypoxia secondary to iron deficiency may occur as the oxygen-carrying capacity of erythrocytes decreases, especially in situations where the metabolic demands are increased. All these conditions lead to a turbulent blood flow, causing platelets to come more frequently in contact with the endothelial lining.Though the incidence of GHT and its associated conditions was high (47%) in NVD, the incidence of anemia is 37.5% in CVT.

Management includes supportive care, seizure control, measures to lower intracranial pressure, search and treatment of possible infection. To prevent further thrombosis, anticoagulation is the preferred treatment, currently. All the 48 cases were treated with heparin and only one in whom heparin was used died. Use of heparin reduces the mortality as proven by similar studies like Srinivasan et al, Bousser and Ferro et al.[11]

Compared to arterial stroke CVT has favourable outcome.[12] Most of our patients in the present study have recovered completely. In the past, CVT was diagnosed mainly at autopsy and was considered to be a lethal disease with a mortality ranging from 30-50%. In present study the mortality was <2% due to better obstetric care, advent of newer imaging techniques and increased sensitization towards diagnosis.

VII. Conclusion

Neurovascular diseases are not uncommon. It must be considered in young women presenting with any neurologic manifestation related to CNS during pregnancy (especially 3rd trimester) and puerperium. The diagnosis of CVT should be suspected in cases of subacute headache accompanied by other focal neurological deficits, seizures or altered consciousness. MRI/ MRA/MRV has revolutionized neuro diagnosis and used as the first line diagnostic tool for CVT. Identifying and treating anemia and GHT in the earlier weeks of gestation may prevent the neurovascular disorders as they form the etiology of about 72% in NVD and 72.5% in CVT. Early diagnosis and early institution of therapy reduces the mortality of CVT in young females.

References

[1]. Johnson AC, CipollaMJ. The cerebral circulation during pregnancy: adapting to preserve normalcy. Physiology 2015:30: 139-147.
[2]. Lanska DJ, Kryscio RJ. Risk factors for peripartu m and postpartum stroke and intracranial venous thrombosis. Stroke. 2000; 31:12741282. Crossref | Medline Google Scholar
[3]. Ameri A, Bousser M-G. Cerebral venous thrombosis. Neurol Clin.1992; 10:87-1 11.
[4]. Pai N, Ghosh K, Shetty S. Hereditary thrombophilia in cerebral venous thrombosis: a study from India. Blood CoagulFibrinol. 2013;24(5):540-3.
[5]. Bansal BC, Gupta RR, Prakash C. Stroke during pregnancy and puerperium in young females below the age of 40 as a result of cerebral venous/venous sinus thrombosis. Jpn Heart J. 1980;21:171-183.
[6]. Jiann-Shing J, Sung-Chun T, Ping-Keung Y. Stroke in women of reproductive age:comparison between stroke related and unrelated to pregnancy. J NeurolSci 2004;221:25-9.
[7]. Panagariya A, Maru A. Cerebral venous thrombosis in pregnancy and puerperium–a prospective study. J Assoc Physicians India. 1997;45:857-9.
[8]. Bouser M-G, Russell RR. Cerebral venous thrombosis. W B Saunders publishers. London. Ist edition 1997: pp 47-87.
[9]. Bonnar J, Davidson JF, Pidgeon CF, McNicol GP, Douglas AS. Fibrin degradation products in normal and abnormal pregnancy and parturition. BMJ. 1969;3:137-40.
[10]. M. Franchini, G. Targher, M. Montagnana, and G. Lippi, "Iron and thrombosis," Annals of Hematology, vol. 87, no. 3, pp. 167-173, 2008. View at: Publisher Site | Google Scholar
[11]. Cakmak S, Hermier M, Montavont A, Derex L, Mauguière F, Trouillas P, et al. T2*-weighted MRI in cortical venous thrombosis. Neurology. 2004;63(9):1698.
[12]. Dash D, Prasad K, Joseph L. Cerebral venous thrombosis: An Indian perspective. Neurol India. 2015;63(3):318-28.

Kanaga Lakshmi, et. al. "Prospective analysis of demographic profile of neurovascular disorders and cortical vein thrombosis in pregnancy and puerperium." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(02), 2021, pp. 01-06.