

## Clinical, etiological and radiological profile of cerebral venous thrombosis in obstetric population at a tertiary care center in Tamil Nadu

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### Abstract

**Background and objective:** Cerebral venous thrombosis (CVT) is any thrombosis that occurs in intracranial veins and sinuses. It is a rare disorder affecting 5 persons per million per year and has a huge regional variation. In India the prevalence of CVT is about 4.5/1000 obstetric admissions. The exact pathogenesis of pregnancy associated CVT is still not clear. The clinico etiological profile also has wide regional variation. Hence this study is being done to study the clinical ,demographic profile, etiology , neuro imaging findings of CVT in obstetric population presenting to Thanjavur medical college hospital, a tertiary care center in Tamilnadu. **Methods:** Patients who are either pregnant or in their puerperal period with MRI brain and venogram reported as CVT and patients presenting to OPD with diagnosis of CVT during their pregnancy and puerperal period were included. A detailed history, examination was carried out and all patients were treated according to standard treatment protocol. They were followed up in OPD and procoagulant factor work up was done in patients when possible. **Results:** Maximum occurrence of CVT were primi, 67% were multipara, 53.3% of patients had CVT in the 2nd week of postpartum period, 44% had undergone caesarean section. We found Anemia (37.3%), Headache was the most common symptom. 78.6% had single sinus involvement and 21.3% had multiple sinus involvement. **Interpretation and conclusion:** People must be made aware of the risk factors and early symptoms of cerebral venous thrombosis. Postpartum headache deserves prompt and focused evaluation. Early diagnosis and early initiation of treatment reduces the mortality of CVT in young female

**Key words:** cerebral venous thrombosis, headache, pregnancy, puerperium, south india

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### Introduction

Cerebral venous thrombosis (CVT) is any thrombosis that occurs in intracranial veins and sinuses. It is a rare disorder affecting 5 persons per million per year and has a huge regional variation. In India the prevalence of CVT is about 4.5/1000 obstetric admissions[1]. World wide, CVT has a reported incidence of 11.6 per 100,000 deliveries per year, accounting for 6-64% of all pregnancy-related strokes[2]. The exact pathogenesis of pregnancy associated CVT is still not clear. The diagnosis of CVT is generally overlooked or delayed due to its varied clinical profile and neuroimaging signs. It remains a diagnostic challenge for the treating physician because of this nature even today. The widespread use of neuroimaging now allows for early diagnosis and changed our approach towards the management of the disease process. There were many large studies on CVT in obstetric population in the 80s but not much after that. The clinico etiological profile also has wide regional variation. Hence this study is being done to study the clinical, demographic profile, etiology, neuro imaging findings of cvt in obstetric population presented to Thanjavur medical college hospital.

### Methods

This prospective study was conducted at Thanjavur medical college, Thanjavur, during the period of January 2020 – June 2021. Patients who were either pregnant or in their puerperal period admitted with impairment of consciousness, seizures , focal neurological deficit, headache, visual disturbance were subjected to

MRI brain with venogram. Patients presenting to OPD with diagnosis of CVT during their pregnancy and puerperal period were also included.

### Inclusion criteria

Antenatal or postnatal patients with radiological evidence of cerebral venous thrombosis.

### Exclusion criteria

- (1) clinical or radiological records were incomplete,
- (2) radiological studies were inconclusive,
- (3) there was cavernous sinus thrombosis,
- (4) CVT was associated with sepsis.

Informed consent was taken from the patients prior to inclusion of individuals into the study

### History

A detailed history regarding age, parity, time of occurrence, mode of delivery, various symptoms were taken from the patients if she was conscious or taken retrospectively from the patient. Any past history of hypertension, DVT, PIH, thrombophilias, APLAS were elicited. For patients previously diagnosed with CVT , their records were used for necessary information.

### Clinical Examination

A thorough general examination to look for anemia, dehydration, sepsis, dvt and central nervous system examination was done.

### Investigations

Routine blood and urine investigations were done.

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**Treatment**

Patients were treated symptomatically along with anticoagulants and antiedema and followed up till discharge.

etc. Their details were recorded in a predesigned proforma for studying the clinicoetiological profile.

**Follow up**

Patients were followed up in neurology opd after discharge. After 3 months procoagulant workup was done which included serum homocysteine, protein c, protein s, anti thrombin iii, factor v leiden

**Results****Age distribution**

Maximum occurrence of CVT was noted in the age group of 21-25 years contributing to 49.4%. The youngest patient in this study was 16 years and oldest was 38.

**Table I: Age Distribution**

AGE in years	No. of cases	Percentage%
<20	14	18.6
21-25	37	49.4
25-30	15	20
>30	9	12
total	75	100

**Education**

Maximum incidence of CVT was seen in women who studied primary class 42.7%. This was followed by women who studied higher classes & illiterates as 24% & 22.7% respectively.

**Table II: Education**

Education	No of cases	Percentage%
Illiterate	17	22.7
Primary	32	42.7
Hr.secondary	18	24
Graduate	8	10.7
Total	75	100

**Socioeconomic status**

Patients were classified using Modified Kuppusamy Scale. 78.6% of patients were from class V socioeconomic class followed by class IV with 14.7%.

**Table III: Socioeconomic Status**

Socio Economic Status	No of cases	Percentage%
III	5	6.7
IV	11	14.7
V	59	78.6
TOTAL	75	100

**Area of distribution****Table IV: Area distribution**

Area	No of cases	Percentage%
Rural	60	80
Urban	15	20
Total	75	100

Maximum occurrence was noted in patients from rural area contributing to 80%.

**Parity**

33% of patients were primi, 67% were multipara.

**Table V: Parity distribution**

Parity	No of cases	Percentage%
Primi	25	33
Multi	50	67
	75	100

**Time of presentation****Table VI: Time of presentation**

Duration	No of cases	Percentage%
Antepartum	4	5.3
Pp 1 week	21	28
Pp 2 week	40	53.3
Pp 3 week	10	13.4
Total	75	100

53.3% of patients had CVT in the 2nd week of postpartum period, followed by 28% of postnatal women in the first week of postpartum.

**Mode of delivery**

Of all the patients with postpartum CVA 44% had undergone caesarean section due to various reasons. 56% had undergone vaginal deliveries either labour natural or instrumental delivery.

**Table VII: Mode of delivery**

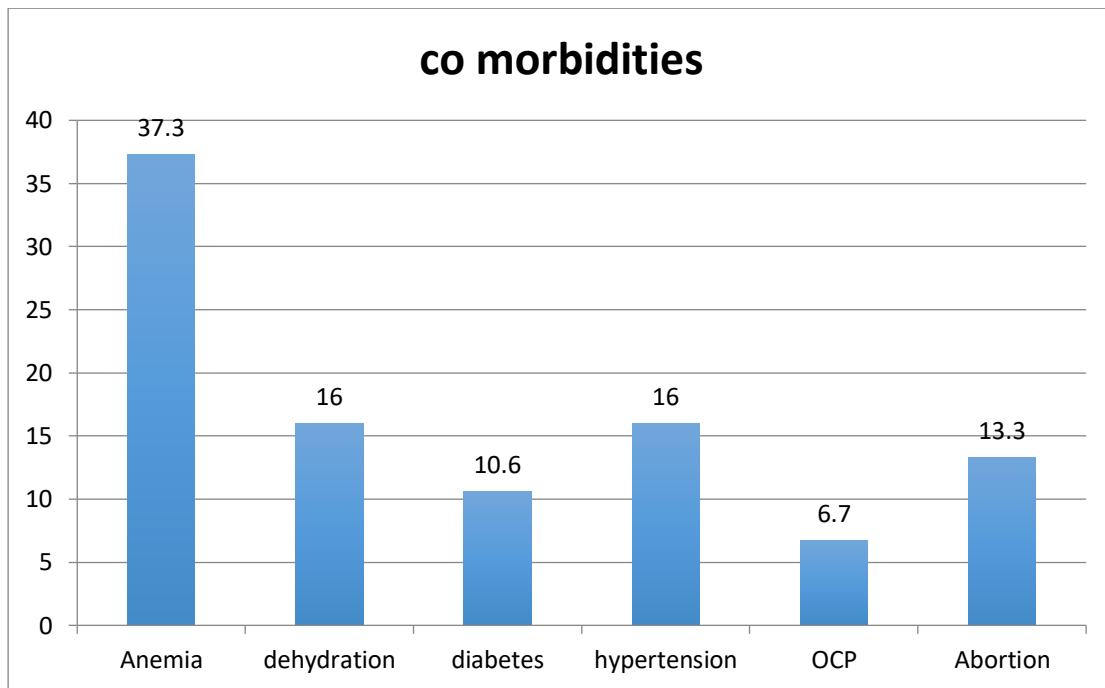
Mode of delivery	No of cases	Percentage%
Natural	42	56
Lscs	33	44
Total	75	100

**Co Morbidities**

In our study we found Anemia (37.3%), Hypertensive disorders (16%), Dehydration (16%) Diabetes 10.6%, OCP use 6.7%, history of abortion 13.3%, with Anemia being the most important predisposing factor for Cerebral venous thrombosis.

**Table VIII: Co morbidity**

	No of cases	Percentage%
Anemia	28	37.3
Dehydration	12	16
Gdm/dm	8	10.6
Htn	12	16
Ocp use	5	6.7
Abortion history	10	13.3



**Figure I: Co morbidities**

**Symptomatology**

In our study the most common symptom noted was headache, which was present in 85.3% of patients. It was followed by seizures 65.3% and altered sensorium 18.6%.

**Table IX: Symptomatology**

Symptoms	No of cases	Percentage%
Altered sensorium	14	18.6
Visual disturbance	15	20
Motor deficit	5	6.7
seizure	49	65.3
headache	64	85.3
vomiting	12	16
fever	8	10.6

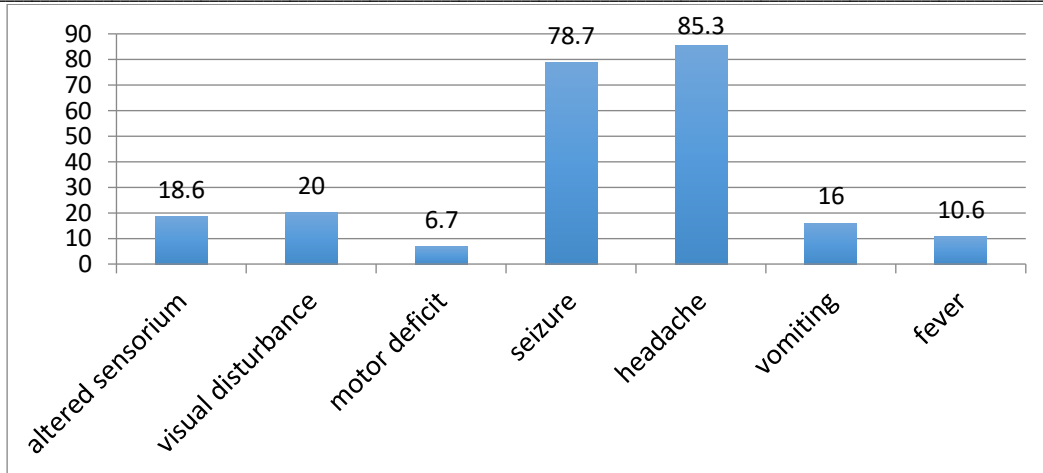


Figure II: Symptomatology

**Seizure distribution**

Among the 78.3% patients who had seizures, 30.7% were focal and 48% were generalized seizures.

**Table X: Seizure distribution**

seizure	No of cases	Percentage%
No seizure	16	21.3
Focal	23	30.7
Generalised	36	48
Total	75	100

**Neuroimaging**

The following were the MRI brain and venogram findings: Among them 78.65% had single sinus involvement and 21.3% had multiple sinus involvement. 37.3% had no parenchymal involvement, 10.6% had infarct, 46.6% had hemorrhagic infarct and 5.3% had hemorrhage. 16% had bilateral parenchymal involvement and 35% had unilateral involvement.

**Table XI: Neuroimaging**

	No of cases	Percentage%
Single sinus	59	78.6
Multiple sinus	16	21.3
NO Parenchymal involvement	28	37.3
Hemorrhagic infarct	35	46.6
Hemorrhage	4	5.3
Infarct	8	10.6
Bilateral	12	16
Unilateral	35	46.6

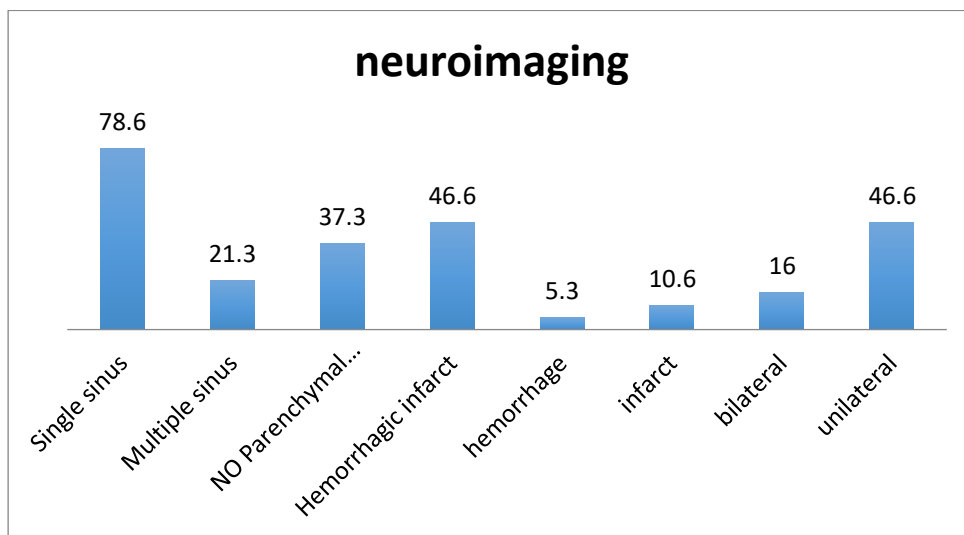


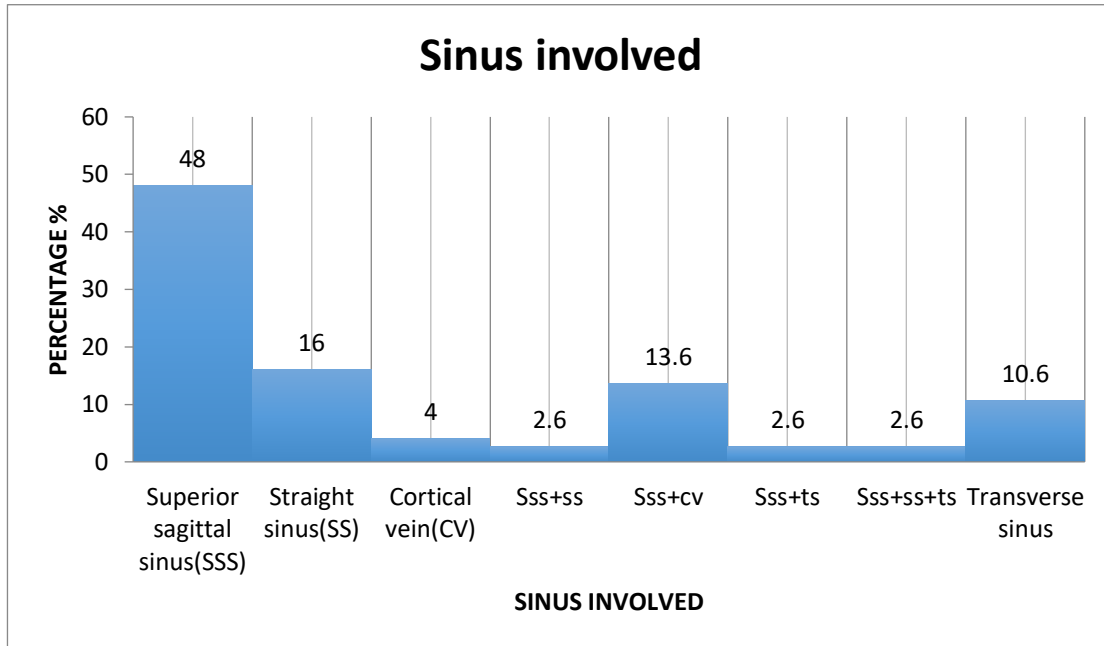
Figure II: Neuro imaging

**Sinus involved**

Majority of them had superior sagittal sinus (sss) involvement (48%). Other sinuses involved were straight sinus(ss) 16%,transverse sinus (ts) 10.6%, cortical vein (cv) 4%, sss+ss 2.6%, sss+cv 13.6%, sss+ts 2.6%, sss+ss+ts 2.6%

**Table XII: Sinus involved**

Sinus involved	No of cases	Percentage%
Superior sagittal sinus(SSS)	36	48
Straight sinus(SS)	12	16
Cortical vein(CV)	3	4
Sss+ss	2	2.6
Sss+cv	10	13.6
Sss+ts	2	2.6
Sss+ss+ts	2	2.6
Transverse sinus(ts)	8	10.6



**Figure IV: Sinus involved**

**Prothrombotic work up**

Patients were found to have prothrombotic risk factors like lupus anticoagulant(12%)elevated factor 8 (4%)protein c deficiency 4%, protein s deficiency 2.6%, hyperhomocystenemia 4%, 12% were negative for prothrombotic factors.

**Table XIII: Prothrombotic workup**

	No of cases	Percentage%
Lupus anticoagulant	9	12
Elevated factor 8	3	4
Protein c deficiency	3	4
Protein s deficiency	2	2.6
Hyperhomocystenemia	3	4
Multiple factor	1	1.3
negative	9	12
Not done	45	60

**Discussion**

Cerebral Venous thrombosis is the leading cause for stroke in pregnancy and puerperium and has its maximum incidence in puerperium. In India Bansal et al reported puerperal CVT as 4.5/1000 obstetric admission[1].

We had 75 patients, all diagnosed to have Cerebral venous thrombosis in a period from January 2020 to June 2021. Highest incidence of CVT was seen in 21-25 years contributing to 49.4% of total cases. This is similar to a study by Lanska et al where he mentioned 15-25 year is most vulnerable to obstetric stroke[2].20% of cases belonged to 26-30 year group. Youngest age patient was 16 year old and the oldest was 38 years.

Among 75 patients maximum incidence was noted in patients who did

their primary school (42.7%). Maximum occurrence of CVT was noted in Class V socio-economic class which was 78.6%, followed by class IV 14.7%. This might be because most of the patients admitted in our hospital belong to class V and our hospital is located surrounded by rural area. In this study, 80% of the patients are from rural area which may be due to late identification of risk factors, poor awareness and non accessibility of health care system. Wrong beliefs like prolonged bed rest, post partum water restriction, poor nutrition may be the cause for this high incidence.

The maximum incidence was noted in multipara which is 67%, primipara contributing to 33% which is similar to study by sasikala et al[3].

In this study 53.3% of CVT occurred in 2nd week of postpartum.

Sharma N et al reported that postpartum CVT usually occurred 7-10 days after delivery[4] which is almost similar to our study. Pregnancy induces several prothrombotic changes in the coagulation system that persists at least during early puerperium. Hypercoagulability worsens after delivery as a result of volume depletion and trauma. The greatest risk period for the occurrence of CVT is in the third trimester and the first 4 postpartum weeks[5].

Among the 75 patients, 56% had natural labour and 44% had lscs similar to a study by sasikala et al[6]. Some studies state that caesarean section will increase the risk due to post surgical decline of protein C level due to surgically induced tissue damage. There may be also prolonged immobilisation causing venous stasis[7].

Among them 37.3% had anemia,16% had hypertension, 13.3% had history of abortion,10.6% had diabetes,16% were found to have dehydration,6.7% had history of OCP use. This is similar to study by Sivus et al[8]. A case-control study by Zuurbier *et al.* showed obese women who use oral contraceptives to have a 30-times higher risk of CVT as compared with women with normal weight who do not use contraceptives[9]. Maternal hypertension, Caesarean delivery, intercurrent infections, excessive vomiting during pregnancy and increasing maternal age were identified as independent risk factors for CVT in the puerperium period[2].

Among the symptoms present in these patients majority had headache(85.3%).The mechanism of headache is postulated to be the stretching of nerve fibers in the walls of the occluded sinus and local inflammation. It is followed by seizure(65.3%),altered sensorium (18.6%)visual disturbance(20%)vomiting 16%,fever (10.6%),motor deficit (6.7%).This is similar to a study conducted by durmus et al[10].

Older studies had higher incidence of patients with altered sensorium to the level of coma which has reduced in recent times, probably because early medical attention[11].

Among the 59 patients who had seizure, 48% had generalized seizure and 30.7% had focal seizures. Kalita *et al.* conducted a retrospective study to evaluate the frequency and predicting factors responsible for seizures as the predominant presentation in patients with CVT On multivariate analysis, only the presence of a supratentorial parenchymal lesion on MRI was independently associated with a higher risk of presenting seizures[12].

All the patients underwent MRI Brain with venogram to confirm the diagnosis of CVT. Among them 78.65% had single sinus involvement and 21.3% had multiple sinus involvement. 37.3% % had no parenchymal involvement, 10.6% had infarct, 46.6% had hemorrhagic infarct and 5.3% had hemorrhage. 16% had bilateral parenchymal involvement and 35% had unilateral involvement. These results are similar to observation by Issar et al[13].

Majority had superior sagittal sinus (sss) involved (48%), straight sinus(ss) 16%,transverse sinus (ts) 10.6%, cortical vein (cv) 4%, sss+ss 2.6%, sss+cv 13.6%, sss+ts 2.6%, sss+ss+ts 2.6% .This is similar to study conducted by Nalini et al in north east India, where 85 obstetric CVT was analysed.

Prothrombotic workup was done in 30 patients. Lupus anticoagulant, factor 8, protein c, protein s, sr. homocysteine were done. Among them 9 patients were negative. 9 patients were positive lupus anticoagulant, 3 patients had elevated factor 8, 3 had protein c deficiency and 2 had protein s deficiency, 3 had hyperhomocysteinemia, 1 had both protein c deficiency and hyperhomocysteinemia. Normal pregnancy is accompanied by increased concentrations of factors VII, VIII, and X and von Willebrand factor and fibrinogen. Free protein S is decreased during pregnancy. These changes, which may not completely return to baseline until more than 8 weeks postpartum, begin with conception and result in the hypercoagulable state of pregnancy[15].

All patients were treated with anticoagulation according to treatment guidelines and were followed up.

Among the 75 patients, 73 patients recovered without any focal deficit and on follow up. 2 patients died. Both were elderly multiparous women, with CVT involving multiple sinus and massive intracranial hemorrhage.

#### Limitations

Many patients were not affordable for prothrombotic work up. Only limited investigations were possible in prothrombotic work up.

#### Conclusion

CVT is the commonest cause for post partum stroke. Though hypercoagulable state of pregnancy by itself can be a risk, it is possible to prevent CVT by timely identification and correction of risk factors. Important risk factors are anemia, preeclampsia, infection, operative procedures and dehydration.

In our study

- Highest incidence of Cerebral Venous Thrombosis was observed in age group 21- 25years.
- Maximum number of CVT occurred in multiparas.
- 93.3% of Cerebral Venous Thrombosis occurred in lower socio economic group (class V and class IV). 80% of patients belonged to rural area.
- Incidence of postpartum CVT was highest in 2nd week of postpartum with 53.3%.
- 44% of patients had undergone Lower segment caesarean section.
- The commonest risk factor anemia was noted in 37.3% of study population and the second commonest was hypertensive disorders of pregnancy 16%. And OCP use 16%
- Headache was the most commonest symptom followed by convulsions.
- In postpartum cerebral venous thrombosis Superior sagittal sinus was most commonly involved.
- People must be made aware of the risk factors and early symptoms of cerebral venous thrombosis. Risk factors like anemia, pre eclampsia,

infection and dehydration should be identified at the level of Primary health care systems itself. Postpartum headache deserves prompt and focused evaluation. Early diagnosis and early initiation of treatment reduces the mortality of CVT in young female.

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