

**A STUDY OF CLINICAL AND INVESTIGATIVE PROFILE OF CORTICAL VENOUS THROMBOSIS**Dwijal Patel<sup>1</sup>, Hetal Patel<sup>2</sup>, Smita Trivedi<sup>3</sup><sup>1</sup>Senior Resident, Department of Medicine, GMERS, Gotri, Vadodara.<sup>2</sup>Assistant Professor, Department of Medicine, GMERS, Gotri, Vadodara.<sup>3</sup>Professor and HOD, Department of Medicine, Baroda Medical College, Vadodara.**ABSTRACT****BACKGROUND**

In 1825, Ribes, a French physician, described the foremost detailed explanation of Cerebral Venous Sinus Thrombosis (CVST). Infective causes, thrombophilic abnormalities, oral contraceptives, antithrombin III, protein C and protein S defects, antiphospholipid syndrome, high plasma concentrations of homocysteine, low plasma folate level are common causes of CVT. The prognosis after CVT during pregnancy and puerperium is probably better than after CVT from other causes. During the past decade, increased awareness of the diagnosis improved neuroimaging techniques and more effective treatment have improved the prognosis.

**MATERIALS AND METHODS**

32 patients admitted to SSG Hospital from November 2012 to November 2013 with a confirmed diagnosis of cerebral venous thrombosis by imaging of brain (MR Venogram) were included. Meticulous history, clinical examination and laboratory investigations were carried out in all cases. Haemorrhagic thromboembolic stroke and metabolic encephalopathy were excluded from study.

**RESULTS**

The puerperal CVT group consisted of 17 women (53.125%) and the non-puerperal group consisted of 25 patients (78.125%) of which 10 were women and 15 were men. The present study showed 42.875% of patients presented within 10 days. Headache was the most common symptom in the present study accounting for 85% of patients. In the present study, 50% of cases had seizures, 31.25% of patients had focal deficit, 53.125% of patients had altered level of consciousness and 25% of patients had papilloedema. The most common finding in the present study is haemorrhagic infarction present in 59.375% of cases. The transverse sinus is most commonly involved accounting for 65.625% followed by sigmoid sinus with 59.375% and superior sagittal sinus with 56.25%. In our study, all the 32 patients were treated with anticoagulants. All patients were subjected to LMWH and then switched on to warfarin therapy maintaining the INR value 1.5 to 2 times normal. Patients were followed at 15 days interval and values of INR reviewed. Patients of hyperhomocysteinaemia were given folic acid and vitamin B12. In the present study, mortality is 12.5%.

**CONCLUSION**

CVT diagnosed with MR venogram presenting within 10 days with symptoms of headache, seizures, focal deficit, altered level of consciousness with MRI findings of haemorrhagic transformation commonly involving transverse sinus were key findings of our study. About 80 percent of all patients now have a good neurologic outcome.

**KEYWORDS**

Cortical Venous Thrombosis - CVT.

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**BACKGROUND**

Cerebral Sinus Venous Thrombosis (CSVT) is an uncommon condition. Its clinical presentation is varied and often dramatic. It often affects young to middle-aged patients and more commonly women. Although, recognised for more than 100 years,<sup>1</sup> the annual incidence is currently estimated to be

3-4 cases per 1 million people, 3 out of 4 people with CSVT are women. It accounts for 10-20% of the aetiology of young strokes in India.<sup>2</sup>

More than 100 causes of cerebral venous sinus thrombosis have been recorded in the literature. However, even with extensive investigation, no cause is identified in 20-25% of the cases.<sup>3</sup>

CVST presents with a wide spectrum of symptoms and signs. Headache is the presenting symptom in 70-90% of cases.<sup>3,4,5</sup> Focal deficits such as hemiparesis and hemisensory disturbance, seizures, impairment of level of consciousness and papilloedema occur in one-third to three-quarters of cases.<sup>3,5</sup>

CVST most commonly involves superior sagittal sinus (72%) followed by lateral sinus (70%). In 30 to 40% of

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cases, more than one sinus is involved.<sup>6</sup> The diagnosis of CVST requires high index of suspicion because of its varied presentations. Neuroimaging is the cornerstone in the diagnosis of cerebral venous sinus thrombosis. Imaging modalities of choice in CVST are CT scan and MRI with MR venogram. CT scan maybe normal in 15-30% cases, but MRI with MRV is almost 100% diagnostic.<sup>7</sup>

Current therapeutic options for CVST treatment include antithrombotic therapy with unfractionated heparin, Low-Molecular-Weight Heparins (LMWH), oral anticoagulants, intravenous thrombolysis, local thrombolysis by selective sinus catheterisation and a combination of thrombolysis and anticoagulation in addition to symptomatic therapy.<sup>8</sup> CVST has an acute case fatality of less than 5% and almost 80% of patients recover without sequelae.<sup>9</sup> It has been found that early diagnosis of cerebral venous thrombosis is essential because early treatment may prevent morbidity and may even be lifesaving.

**Objectives-** To study clinical and investigative profile of patients of cortical venous thrombosis.

**MATERIALS AND METHODS**

**Source of Data-** 32 patients admitted to SSG Hospital. November 2012 to November 2013 with a confirmed diagnosis of cerebral venous thrombosis were taken up for the study and followed until discharge from the hospital or death.

**Method of Collection of Data-** Meticulous history, clinical examination and laboratory investigations were carried out in all cases of cerebral venous sinus thrombosis. Cerebral venous thrombosis was confirmed by MR venogram.

**Laboratory Investigations**

1. Complete blood count with peripheral smear.
2. ESR.
3. RBS.
4. Serum urea.
5. Serum creatinine.
6. LFT.
7. Serum electrolytes.
8. Urine routine.
9. ECG in all leads.
10. CSF analysis (wherever deemed necessary).
11. Prothrombin time.
12. Activated partial thromboplastin time.
13. CT scan.
14. MRI and MR venogram.

**Inclusion Criteria**

All patients aged >18 years suspected to have cerebral venous thrombosis based on clinical history and examination were evaluated, but only those with confirmed diagnosis (based on neuroimaging) of cerebral venous sinus thrombosis were taken up for the study.

**Diagnostic Criteria**

Patients presenting with history and examination suggestive of cerebral venous thrombosis and confirmed by imaging of brain (MR Veno).

**Exclusion Criteria**

- Hypertensive haemorrhage.
- Atherothrombotic stroke.
- Metabolic encephalopathies.

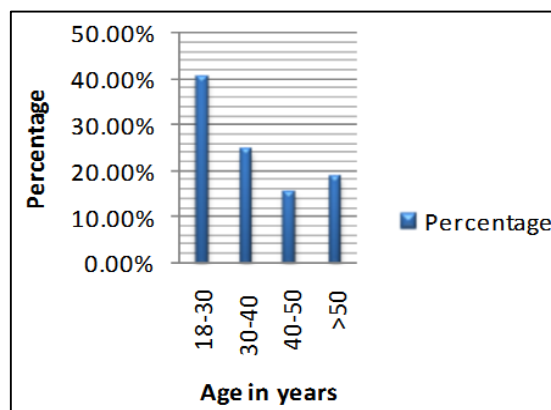
Microsoft Word and Excel have been used to generate graphs, tables, etc.

**RESULTS**

A total of 32 cases of cerebral venous sinus thrombosis were evaluated in this study.

Age in Years	Number of Patients	Percentage
18-30	13	40.625%
30-40	8	25%
40-50	5	15.625%
>50	6	18.75%

**Table 1. Age Incidence**

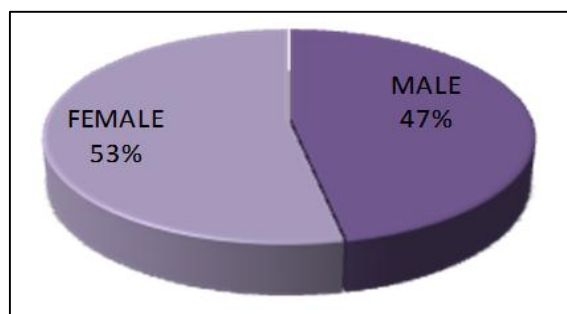


**Graph 1. Age Incidence**

The mean age of the patients in present study was 37.96875 ± 28.2. Majority of them were in the age group of 18 to 30 contributing to 40.625%. The youngest being 17 and eldest 72.

Gender	Number of Patients	Percentage
Male	15	46.875%
Female	17	53.125%
<b>Total</b>	<b>32</b>	<b>100%</b>

**Table 2. Sex Distribution**



**Graph 2. Sex Distribution**

In the present study, male:female ratio is 1.12:1.

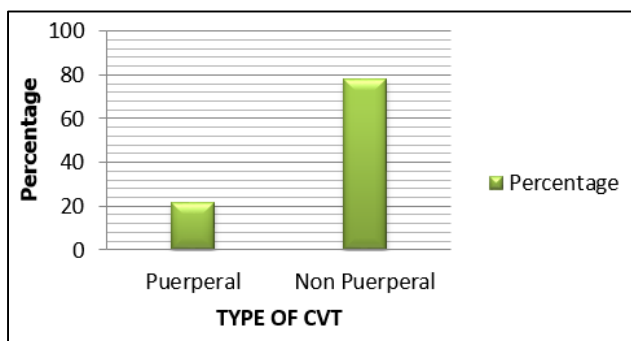
Sex	Mean Age	Std. Deviation	Range
Female	38.588	17.2593	17-72
Male	37.266	10.8131	22-65

**Table 3. Mean Age of Patients**

The mean age of female patients is 38.588 with a standard deviation of 17.2593, whereas mean age of male patient is 37.266 with a standard deviation of 10.8131 in the present study.

Type of CVT	Number of Patients	Percentage
Puerperal	7	21.875
Non-puerperal	25	78.125
<b>Total</b>	<b>32</b>	<b>100%</b>

**Table 4 (a). Type of CVT**



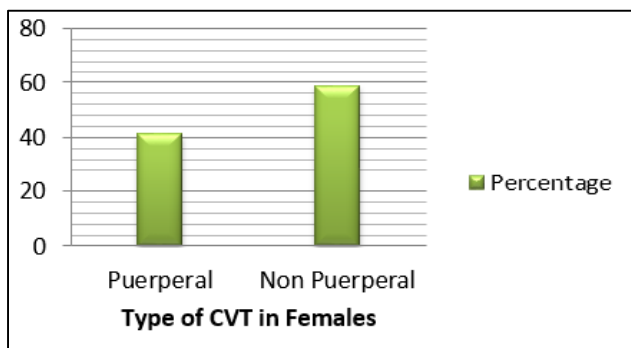
**Graph 3 (a). Type of CVT**

In the present study, out of 32, 21.875% belonged to puerperal group and 78.125% belong to nonpuerperal group. Out of 25, 10 were females and 15 were males.

Type of CVT in Female	Total	Percentage
Puerperal	7	41.17
Nonpuerperal	10	58.823

**Table 4 (b) Type of CVT in Females**

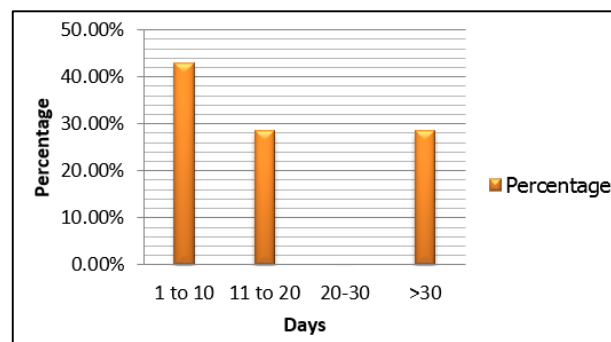
In the present study, out of 17 females, 10 were nonpuerperal (58.823%) and 7 were puerperal (41.17%).



**Graph 3 (b). Type of CVT in Females**

Duration (Days)	Number of Patients	Percentage
1-10	3	42.857
11-20	2	28.571
21-30	0	0
>30	2	28.571

**Table 5. Duration from Delivery Till Onset of Symptom**

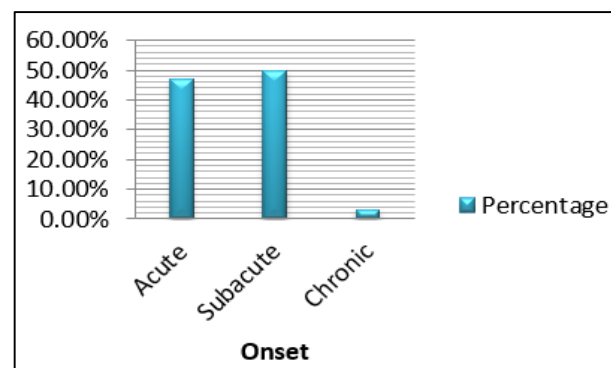


**Graph 4. Duration from Delivery Till Onset of Symptom**

In the present study, out of 7 patients of puerperal, 3 of CVT cases occurred during 1 to 10 days after delivery.

Onset	Number of Patients	Percentage
Acute	15	46.875%
Subacute	16	50%
Chronic	1	3.125%
<b>Total</b>	<b>32</b>	

**Table 6. Mode of Onset**

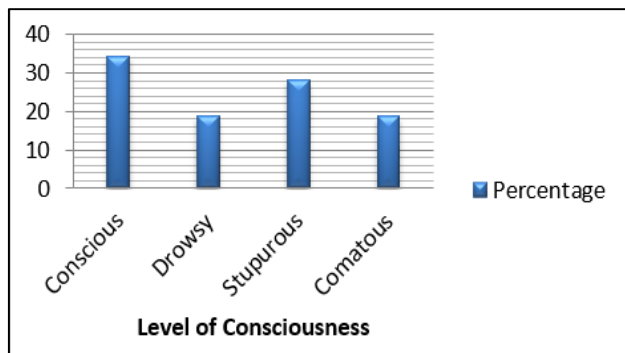


**Graph 5. Mode of Onset**

Those who were presented within 48 hrs. were considered to have acute onset with onset longer than 48 hrs., but less than 1 month were considered subacute and with more than 1 month as chronic. In present study, 15 cases (46.88%) had acute presentation and 16 (50%) had subacute.

Level of Consciousness	Number of Patients	Percentage
Conscious	11	34.375
Drowsy	6	18.75
Stuporous	9	28.125
Comatous	6	18.75
<b>Total</b>	<b>32</b>	

**Table 7. Level of Consciousness**

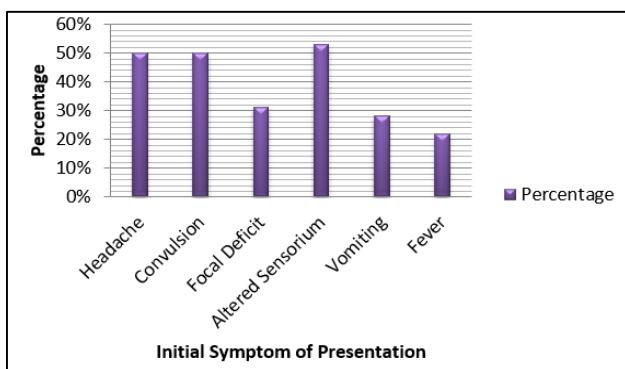


**Graph 6. Level of Consciousness**

In the present study, 11 (34.375%) patients out of 32 were conscious at the time of presentation.

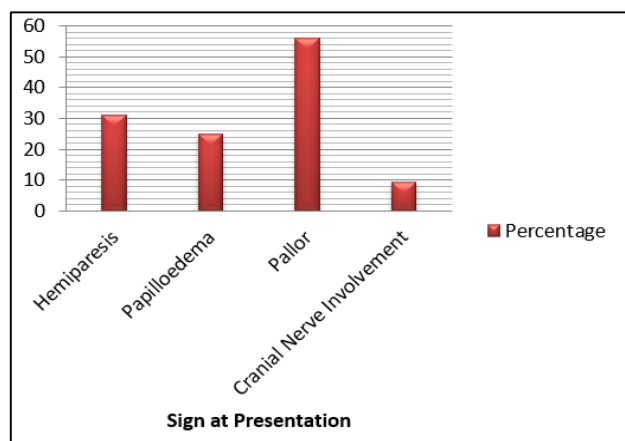
Initial Symptoms of Presentation	Number of Patients	Percentage
Headache	16	50%
Convulsion	16	50%
Focal deficit	10	31.25%
Altered sensorium	17	53.125%
Vomiting	9	28.125%
Fever	7	21.875%

**Table 8. Initial Symptoms of Presentation**



**Graph 7. Initial Symptom of Presentation**

In the present study, 17 (53.125%) patients presented with altered sensorium was the most common symptom, 16 (50%) patients presented with headache, 16 (50%) patients presented with convulsion.



**Graph 8. Sign at Presentation**

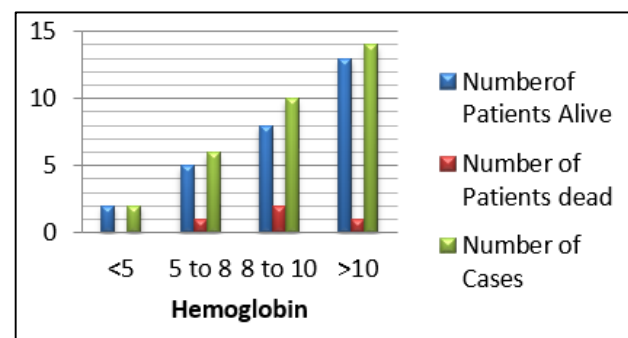
Sign	Number of Patients	Percentage
Hemiparesis	10	31.25
Papilloedema	8	25
Pallor	18	56.25
Cranial nerve involvement	3	9.375

**Table 9. Clinical Signs at Presentation**

In the present study, 10 (31.25%) patients presented with hemiparesis and 56.25% patient had pallor.

Hb (g%)	Number of Patients Alive	Number of Patients Dead	Number of Cases
<5	2	0	2
5-8	5	1	6
8-10	8	2	10
>10	13	1	14

**Table 10. Investigations**



**Graph 9. Investigations**

In the present study, out of 32 patients, 13 were anaemic accounting for 32.5% and the mortality was higher when the degree of anaemia was severe.

The investigative procedures like leucocyte count, blood sugar, serum creatinine, blood urea, liver function tests and serum electrolytes did not contribute to the diagnosis and were nonspecific.

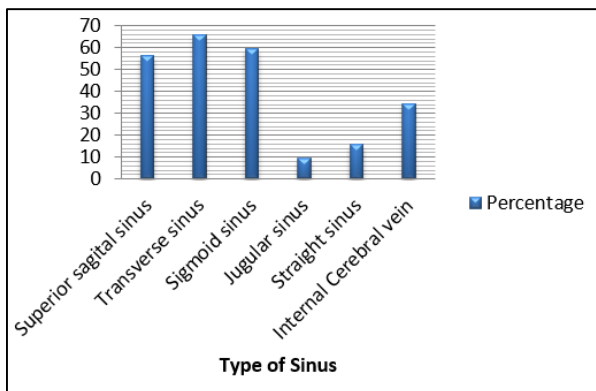
Sinus	No. of Patients	Percentage
Superior sagittal sinus	18	56.25
Transverse sinus	21	65.625
Sigmoid sinus	19	59.375
Jugular sinus	3	9.375
Straight sinus	5	15.625
Internal cerebral vein	11	34.375

**Table 11. Sinus Involvement**

In the present study, superior sagittal sinus was involved in 56.25%, transverse sinus in 65.625% and sigmoid sinus in 59.375%.

CSF	Number of Patients	Percentage
Normal	6	37.5
Pleocytosis	3	18.75
Protein rise	7	43.75

**Table 12. CSF Analysis**

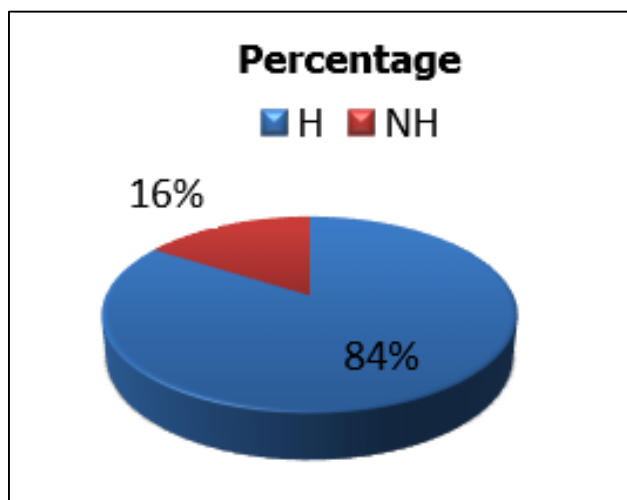


**Graph 10. Sinus Involvement**

16 patients were suspected to have meningitis out of which 6 were normal, 7 showed rise in protein and 3 showed pleocytosis.

MRI	No. of Patients	%
Haemorrhagic infarct	21	65.625
Non-haemorrhagic infarct	4	12.5

**Table 13. MRI Findings**



**Graph 11. MRI Findings**

Out of 32 patients, 21 patients had haemorrhagic infarct and 4 had non-haemorrhagic infarct.

Status	Number of Patients	Percentage
Alive	28	87.7%
Dead	4	12.5%
<b>Total</b>	<b>32</b>	

**Table 14. Mortality Rate**

In the present study, mortality death is 12.5%, out of 32 patients 4 died.

	HI	NHI	Total
Alive	19	4	23
Mortality	2	2	4
	<b>Mortality</b>		<b>Percentage</b>
HI	2		9.5%
NHI	2		50%

**Table 15. Mortality in Hemorrhagic Infarct and Non-Hemorrhagic Infarct**

In the present study, 2 patients in haemorrhagic (9.5%) and 2 patients in non-haemorrhagic (50%) expired.

	Mortality	Percentage
1	1	25
2 or more than 2	3	75

**Table 16. Number of Sinus Involved**

In the present study, mortality was more in patients with more number of sinus involved.

**Aetiology-** Out of 32 patients, we were able to find out aetiology in patients. Of the patients, 1 was diagnosed with hyperhomocysteinaemia, 3 were traumatic, 2 were associated with mastoiditis, 1 with tuberculosis and 1 with suspected pancreatic malignancy.

- Puerperal-----7
- Infective-----3
- Traumatic-----3
- Hyperhomocysteinaemia-----1

**DISCUSSION**

In this study, totally 32 cases were studied.

**Age Incidence- Mean Age at Onset**

Author	No. of Patients	Percentage
Daif et al (1995)	40	27.8
Nagaraja et al (1999)	150	24.2
Strolz et al (2005)	79	42.8
Present study (2012)	32	37.9

**Table 17. Age Incidence**

Comparing the age group involved, 20-40 years was the commonest age group involved in various series (Metha SR et al, 77.8% and Ameri et al, 61%). The present study also showed similar finding with 65.625% in the same age group with mean age of onset 37.96 ± 14.38 years, which is comparable to other studies.

**Sex Ratio-** Male-to-female ratio in various studies revealed Metha SR et al 1:1.5.

Daif et al is 1:1 and Bousser et al (1985) is 1.24:1. In the present study, M:F:1.1:1. The present study is comparable to Daif et al.

**Types of CVT Patients**

The study group consisted of 32 patients. The puerperal CVT group consisted of 17 women (53.125%) and the non-puerperal group consisted of 25 patients (78.125%) of which 10 were women and 15 were men.

Nagaraj et al (1987) had found that 200 out of 230 cases (86%) of CVT seen over eight years were puerperal in nature. The experience of other authors from India had been similar like Neki NS et al (2003) had found 62% of cases of CVT in postpartum period. Cantu C. et al from Mexico reported that obstetric CVT accounted for 59% of the cases.

**Duration from Delivery to Onset of Symptoms**

Kumar S et al (2003) had found that 65 out of 85 cases (76%) of CVT presented with symptom duration of 4 days or less.

The present study showed 42.875% of patients presented within 10 days.

**Mode of Onset**

Bousser et al (1985) had arbitrarily defined three main modes of onset based on the time elapsed between the appearance of the first symptom and the date of entry in hospital; acute as <48 hours, subacute as longer than 48 hours, but less than one month and chronic as >1 month.

Author	Acute	Subacute	Chronic
Bousser et al (1985)	36.84	26.32%	36.84%
Daif et al (1995)	35%	40%	25%
Present study (2012)	46.825%	50%	3.125%

**Table 18. Mode of Onset**

**Clinical Symptoms and Signs  
Headache**

Author	No. of Patients	Percentage
Bousser et al (1985)	38	74
Daif et al (1995)	40	82
Kumar S. et al (2003)	85	66
Mehta SR. (2003)	45	77.8
Strolz et al (2005)	79	73.4
Present study (2012)	16	50

**Table 19. Clinical Symptoms and Signs**

Headache was the most common symptom in the present study accounting for 85% of patients. The present study is comparable with Kumar S et al.

**CONVULSION**

In the present study, 50% of cases had seizures, which is comparable with Kumar S. et al. The manifestations that indicate the cerebral cortical involvement are convulsions and paralysis. At times, seizures are heralding symptoms and should arouse the suspicion of diagnosis.

Author	No. of Patients	Percentage
Bousser et al (1985)	38	35
Kumar S. et al (2003)	85	66
Strolz et al (2005)	79	56
Present study (2012)	10	31.25

**Table 20. Focal Deficits**

In the present study, 31.25% of patients had focal deficit. The present study is comparable with Bousser et al.

Author	No. of Patients	Percentage
Bousser et al (1985)	38	26
Ameri et al (1992)	110	30
Nagaraj et al (1999)	73	57.53
Neki et al (2003)	14	56
Strolz et al (2005)	79	36.7
Present study (2012)	17	53.125

**Table 21. Altered Sensorium**

In the present study, 53.125% of patients had altered level of consciousness, which is comparable with Nagaraj et al and Neki S. et al who had 57.53% and 56%, respectively.

Author	No. of Patients (n)	Percentage
Bousser et al (1985)	38	45
Kumar S. et al (2003)	85	32
Mehta SR. (2003)	45	77.8
Strolz et al (2005)	79	30.3
Present study (2012)	8	25

**Table 22. Papilloedema**

In the present study, 25% of patients had papilloedema. Similar observations were noted with Strolz et al who had papilloedema in 30.3% of the cases.

**Investigations**

**Anaemia-** Anaemia has often been noted in 18 (56.25%) of the patients in the present study.

The investigative procedures like leucocyte count, blood sugar, serum creatinine, blood urea, ESR, liver function tests, serum electrolytes did not contribute to the diagnosis and were nonspecific.

In the present study, CSF analysis showed nonspecific changes like pleocytosis (>5 cells/mm<sup>3</sup> in 3 patients), raised proteins (>45 mg/dL in 7 patients), which did not contribute to the diagnosis of CVT.

Author	Haemorrhagic Infarction	Non-Haemorrhagic
Nagaraj et al (1989)	40.9%	51.6%
Dixit et al (1997)	48.4%	32.3%
Present study (2012)	59.375%	12.5%

**Table 23. Radiological Features**

The most common finding in the present study is haemorrhagic infarction present in 59.375% of cases. Similar observations noted with various studies like Nagaraj et al, Dixit et al with 40.9% and 48.4%, respectively.

Sinuses Involved	Ameri et al (1992)	Daif et al (1994)	Strolz et al (2005)	Present Study (2012)
Superior sagittal sinus	72	85	72.2	56.25
Transverse sinus	70	2.5	38	65.625
Sigmoid sinus	-	32	20.3	59.375
Jugular sinus	-	-	76	9.3755
Straight sinus	16	7	7.6	15.625
Internal cerebral vein	8	10	6.3	34.375

**Table 24. Sinus involved**

In the present study, the transverse sinus is most commonly involved accounting for 65.625% followed by sigmoid sinus with 59.375% and superior sagittal sinus with 56.25%. Comparable with other studies like Strolz et al (72.2%) and Ameri et al (72%).

**Treatment and Prognosis-** Treatment of CVT ranges from observation to anticoagulation.



In our study, all the 32 patients were treated with anticoagulants.

All patients were subjected to LMWH and then switched on to warfarin therapy maintaining the INR value 1.5 to 2 times normal. Patients were followed at 15 days interval and values of INR reviewed.

Patients of hyperhomocysteinaemia were given folic acid and vitamin B12.

The different routes of administration reflect uncertainty of opinions among neurologists as to what type of heparin to be used. In the part, CVST had been associated with a dismal prognosis and high mortality rate, reaching 30-50%. The recent ISCVT study performed in the era of modern neuroimaging, LMWH administration and endovascular intervention reported much lower mortality rates (8-14%) and significantly better outcome. A meta-analysis of 19 studies conducted by Dertali et al (2006) showed that the mortality rate during the peri-hospitalisation period was about 5.6%, while at the end of the follow-up period, this percentage increased to 9.4%.

	N	Recovered	Death
Age >30 yrs.	19	16	3
Duration <10 days	28	25	3
Altered sensorium	17	14	3
Convulsions	16	14	2
Fever	7	6	1
Focal deficit	10	8	2
Puerperium	7	7	0
Haemorrhagic infarct	21	19	2
Non-haemorrhagic infarct	4	2	2
SSS involvement	18	15	3
Transverse sinus involvement	21	18	3
Sigmoid sinus	19	16	3
Two or more sinus involvement	23	20	3
Single sinus involvement	9	8	1

**Table 25. Prognostic Factor**

Author	No. of Patients (n)	%
Ameri et al (1992)	110	5.45
Daif et al (1995)	40	10
Debrujin et al (2001)	59	10.17
Mehta SR. et al (2003)	45	4.44
Strolz et al (2005)	79	15
Present study (2012)	4	12.5

**Table 26. Mortality**

In the present study, mortality is 12.5%, which is comparable with Daif et al and Debrujin et al with 10% and 10.17%, respectively.

## CONCLUSION

Out of 32 patients, puerperal CVT group consisted of 17 women (53.125%) and the non-puerperal group consisted of 25 patients (78.125%) of which 10 were women and 15 were men, 42.875% of patients presented within 10 days, 50% of cases had seizures, 31.25% of patients had focal deficit, 53.125% of patients had altered level of consciousness, 25% of patients had papilloedema, which is manifestation that indicate the cerebral cortical involvement are convulsions and paralysis. At times, seizures are heralding symptoms and should arouse the suspicion of diagnosis.

The most common radiologic finding is haemorrhagic infarction. The transverse sinus is most commonly involved followed by sigmoid sinus and superior sagittal sinus.

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