



## CLINICAL STUDY OF CEREBRAL VENOUS THROMBOSIS WITH HYPONATREMIA

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### KEYWORDS :

#### INTRODUCTION

Cerebral Venous Sinus Thrombosis (CVT) has been recognized since the early part of the nineteenth century but still remains a diagnostic and therapeutic challenge for clinician, given the varying and often misleading clinical presentation of this condition. It forms a distinct subgroup of cerebrovascular disease and is one of the commonest causes of stroke in India. Cross et al.<sup>1</sup> noted "usually recovery is rapid and complete, if the patient survives acute episode". Three-fourth of causes of cerebral thrombosis in pregnancy and puerperium reported by him, survive with good recovery.

Although it may present with variety of signs and symptoms Headache is the most frequent and often the earliest manifestation.<sup>2</sup> The diagnosis of cerebral venous sinus thrombosis requires high index of suspicion. CT Brain may show direct or indirect signs of cerebral venous thrombosis. It may be normal in 10% of patients. In such cases advanced neurological diagnostic like Magnetic Resonance Imaging with Venography is necessary to confirm cerebral venous thrombosis, but it is not always readily available in many hospitals.<sup>3</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.

Cerebral Venous Sinus Thrombosis is considered to be a medical emergency,<sup>4</sup> mode of onset highly variable, and spectrum of its clinical manifestations is extremely wide.

The purpose of the present study is to evaluate sample of cerebral venous sinus thrombosis patients, their clinical presentations and any significant association with Hyponatremia. As there is very less literature pertaining to association of Hyponatremia with Cerebral Venous Sinus Thrombosis, and the so far available literature is showing reports of Hyponatremia in Cavernous Venous Thrombosis and in a few cases of Hemorrhagic Brain Infarction, this study is aimed at determining any significant association between the both.

#### AIMS AND OBJECTIVES

1. To study the clinical profile of cerebral venous thrombosis
2. To know the incidence of hyponatremia in the same, in patients admitted in Medciti Institute of Medical Sciences, Ghanpur, Medchal

#### MATERIALS AND METHODS

Patients with cerebral venous sinus thrombosis admitted to Medciti Institute of Medical Sciences, Medchal, Ghanpur during the period of January 2016 to January 2017 are taken up for the study.

#### Sample Size

A total of 30 patients admitted in hospital during study period who had clinical and radiological features (direct and indirect signs) suggestive of cerebral sinus venous thrombosis were selected.

**Type of Study** – Descriptive Study

#### Inclusion Criteria

1. Patients above 18 years of age presenting with history suggestive of cerebral venous thrombosis and confirmed by imaging of brain

(CT scan / MRI).

#### EXCLUSION CRITERIA

1. CT scan inconclusive of CVT
2. Hypertensive haemorrhage
3. Arterial stroke
4. Metabolic encephalopathies
5. Space occupying lesions

Data was collected by using pre-tested proforma meeting the objectives of the study. Purpose of the study was carefully explained to the patients and informed consent was taken.

All patients were interviewed. Detailed history was taken with respect to epidemiological, clinical features, radiological features, with special emphasis on suspected precipitating or predisposing factors such as puerperium, fever, sepsis, anemia, abortions and oral contraception.

Detailed examination of patients was carried out including general physical examination for any evidence of anemia, dehydration, sepsis, deep vein thrombosis of leg and detailed neurological assessment with other systems were done to look for any evidence of etiologies.

#### INVESTIGATIONS

1. Hb%
2. TC
3. ESR
4. Peripheral smear
5. RBS
6. Serum urea
7. Serum creatinine
8. Urine routine
9. ECG in all leads
10. Ocular fundus
11. Chest X-ray
12. CT scan
13. Wherever possible MRV, ANA, APLA, antithrombin III, Serum Homocystiene, Protein C&S
14. Serum Electrolytes

The results (Descriptive Statistics) were analyzed by calculating percentages, the mean values and standard deviation.

Inferential statistics were analyzed using the software IBM7SPSS version 22. Univariate analysis was done using Binomial test of significance.

A 'p' value of less than 0.05 was considered statistically significant

#### RESULTS

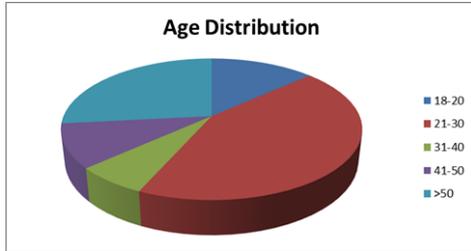
A total of 30 cases of cerebral venous thrombosis were evaluated in the present study.

**1. Age Incidence**

**Table 1: Age incidence**

Age in Years	Number of patients (n)	%
18-20	4	13.3
21-30	13	43.3
31-40	2	6.6
41-50	3	10
>50	8	26.6

**Figure 1: Age incidence**



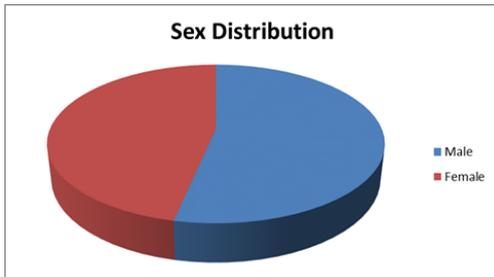
The mean age of the patients in the present study was 36.6%. Majority of them were in the age group 21-40 years contributing to 50%. The youngest age being 19 and oldest 80 years

**2. Sex Incidence**

**Table 2: Sex incidence**

Gender	Number of Patients(n)	%
Male	16	53.3
Female	14	46.6

**Figure 2: Sex incidence**

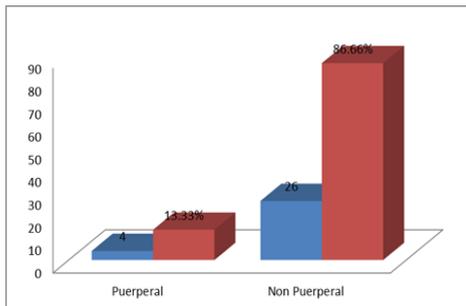


In the present study male: female is 1.14:1.3. Types of CVT

**Table 3: Types of CVT**

Type of CVT	Number of Cases	Percentage (%)
Puerperal	4	13.33
Non-Puerperal	26	86.66
Total	30	100

**Figure 3: Types of CVT**



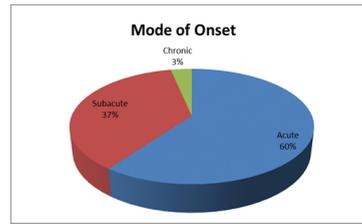
In the present study, out of 30, 4 (13.33%) patients belong to puerperal group and 26 (86.66%) belong to non-puerperal group.

**4. Clinical signs and symptoms**

**Table 4: Mode of Onset**

Mode of Onset	Number of Cases	Percentage(%)
Acute	18	60
Subacute	11	36.66
Chronic	1	3.33

**Figure 4: Mode of Onset**



Those who presented within 48 hours were considered to have acute onset, with onset longer than 48 hours but less than 1 month were considered subacute, and with onset more than 1 month as chronic<sup>2</sup> (Boussier et al., 1985).

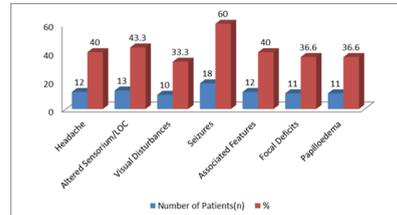
In the present study, 18 cases (60%) of CVT had acute presentation, followed by 11 cases (36.66%) with subacute presentation.

**5. Initial Symptoms**

**Table 5: Initial symptoms and signs**

Sl.No	Clinical Presentation	Number of Patients(n)	Percentage (%)
1	Headache	12	40
2	Altered Sensorium/LOC	13	43.3
3	Visual Disturbances	10	33.3
4	Seizures	18	60
5	Associated Features	12	40
6	Focal Deficits	11	36.6
7	Papilledema	11	36.6

**Figure 5: Initial symptoms and signs**



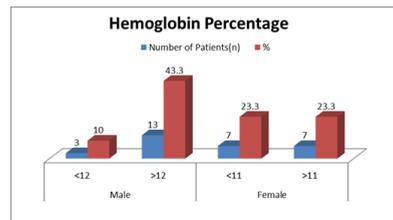
In the present study, most common symptom is seizures contributing to 60% (18 cases) followed by altered sensorium/LOC in 43.3% (13 cases).

**12. Investigations**

**Table 6: Hemoglobin percentage**

Gender	Hb%(gm/dL)	Number of Patients(n)	Percentage (%)
Male	<12	3	10
	>12	13	43.3
Female	<11	7	23.3
	>11	7	23.3

**Figure 6:**



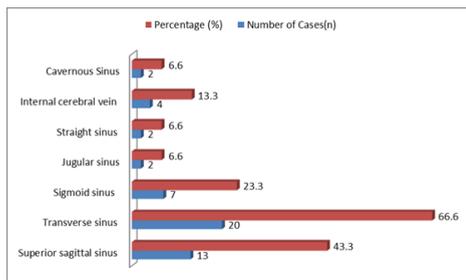
In the present study, out of 30, 10(33.33%) patients were anemic.

**1. Sinuses involved (Imaging)**

**Table 7: Sinus involved (Imaging)**

Sinus involved	Number of Cases(n)	Percentage (%)
Superior sagittal sinus	13	43.3
Transverse sinus	20	66.6
Sigmoid sinus	7	23.3
Jugular sinus	2	6.6
Straight sinus	2	6.6
Internal cerebral vein	4	13.3
Cavernous Sinus	2	6.6

**Figure 7: Sinus involved in Imaging**



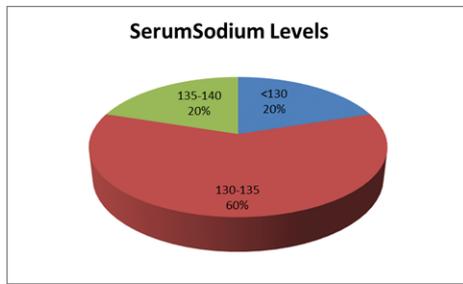
In the present study, the most common sinus involved was transverse sinus in 20 patients accounting to 66% followed by superior sagittal sinus (43.3%) in 13 patients.

**Serum Sodium**

**Table 8: Serum Sodium Levels**

Serum Sodium(mmol/L)	Number of Patients(n)	Percentage(%)
<130	6	20
130-135	18	60
135-140	6	20

**Figure 8:**



In the present study 6 cases had serum sodium levels <130mmol/L and 18 cases <135mmol/L, overall contributing to 80% cases with hyponatremia.

**Table 9 : Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
Age	30	19	80	36.63	18.816
Hb(g%)	30	5.3	16.9	12.043	2.4656
Serum Sodium (mmol/l)	30	120.0	138.0	131.833	3.7608
Valid N (listwise)	30				

**Table 10 : Serum Sodium**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Hyponatremia	22	73.3	73.3	73.3
Normal	8	26.7	26.7	100.0
Total	30	100.0	100.0	

**Table 11:**

Hypothesis Test Summary			
Null Hypothesis	Test	Sig.	Decision
1 The categories defined by S. Sodium = Hyponatremia and Normal occur with probabilities 0 and 0.5.	One-Sample Binomial Test	.018	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05. Present study rejected null hypothesis with a significant 'P' value of 0.018 (P<0.05).

Thus showing patients with cerebral venous thrombosis having significant association with Hyponatremia

**DISCUSSION**

In this study, totally 30 cases were studied.

**1. Age Distribution**

**Table 12: Mean age of onset**

Authors	Number of Patients	Percentage(%)
Daif et al. (1994) <sup>4</sup>	40	27.8
Nagaraj et al. (1999) <sup>5</sup>	150	24.2
Strolz E et al. (2005) <sup>6</sup>	79	42.8
Present Study	30	50

Comparing the age group involved, 21-40 years was the commonest age group involved in various series (Mehta SR et al<sup>7</sup>, 77.8% and Ameri et al<sup>8</sup>, 61%). The present study also showed similar findings with 50% in the same age . group, with mean age of onset 36.63 years.

**2. Symptoms and clinical findings**

**Table 13: Level of consciousness**

Authors	Number of cases studied	Percentage with LOC/ Altered sensorium(%)
Bousser et al. (1985) <sup>2</sup>	38	26
Nagaraj et al. (1989) <sup>9</sup>	200	81
Ameri et al. (1992) <sup>8</sup>	110	30
Nagaraj et al. (1999) <sup>5</sup>	73	57.53
Neki S et al. (2003) <sup>10</sup>	14	56
Strolz E et al. (2005) <sup>6</sup>	79	36.7
Present study	30	43.3

In the present study, 43.4 % of patients had altered level of consciousness which is comparable with Nagaraj et al.<sup>9</sup> and Neki S et al.<sup>10</sup> who had 57.53% and 56% respectively.

**Table 14: Headache**

Authors	Number of cases studied	Percentage of cases with Headache(%)
Bousser et al. (1985) <sup>2</sup>	38	74
Daif et al. (1994) <sup>4</sup>	40	82
Nagaraj et al.(1999) <sup>5</sup>	95	71
Kumar S et al. (2003) <sup>11</sup>	85	66
Neki S et al. (2003) <sup>10</sup>	14	85.5
Mehta SR et al.(2003) <sup>7</sup>	43	77.8
Strolz E et al. (2005) <sup>6</sup>	79	73.4
Present study	30	40

Headache was present in 40% of patients in the present study. The present study is comparable to Kumar et al.<sup>11</sup> which showed 66%. Other studies showed, Neki S et al. 10 - 85.5%, Daif et al<sup>4</sup>.- 82% and Mehta SR et al.<sup>7</sup>- 77.8%.

**Table 15: Seizures**

Authors	Number of cases studied	Percentage of cases with Seizures(%)
Bousser et al.(1985) <sup>2</sup>	38	29
Ameri et al. (1992) <sup>8</sup>	110	37
Kumar S et al. (2003) <sup>11</sup>	85	67
Mehta SR et al(2003) <sup>7</sup>	43	26.6
Strolz et al.(2005) <sup>6</sup>	79	39.2
Present study	30	60

The manifestations that indicate the cerebral cortical involvement are convulsions, paralysis and at times seizures are heralding symptoms and should arouse the suspicion of diagnosis.

In the present study, 60 % of cases had seizures which are comparable with Kumar

S et al.<sup>11</sup> In contrast, other studies showed less compared to present study.

**Table 16: Focal deficits**

Authors	Number of cases studied	Percentage of cases with Focal Deficits
Bousser et al. (1985) <sup>2</sup>	38	35
Srinivasan et al. (1983) <sup>12</sup>	200	69
Kumar S et al.(2003) <sup>11</sup>	85	66
Strolz E et al. (2005) <sup>6</sup>	79	56.9
Present study	30	36.6

In the present study, 36.6% of patients had focal deficits compared to Bousser et al. <sup>2</sup> (1985) which showed 35 % and Strolz E et al.<sup>6</sup> (2005) which showed 56.9%.

**Table 17: Papilloedema**

Authors	Number of cases studied	Percentage of cases with Papilledema(%)
Bousser et al. (1985) <sup>3</sup>	38	45
Kumar S et al. (2003) <sup>11</sup>	85	32
Neki S et al. (2003) <sup>10</sup>	14	80
Mehta SR et al. (2003) <sup>7</sup>	43	77.8
Strolz E et al. (2005) <sup>6</sup>	79	30.3
Present study	30	36.6

In the present study, 36.6% of patients had papilloedema. Similar observations noted with Strolz E et al.<sup>6</sup>, Kumar S et al.<sup>11</sup>, and Bousser et al.<sup>3</sup> who also had papilloedema in 30.3%, 32% and 45% respectively.

## INVESTIGATIONS

### Anemia

Anemia has often been noted in 10 (33.33%) of patients in the present study. The investigative procedures like leucocyte count, blood sugar, ESR did not contribute to the diagnosis and were non-specific.

Narayan, et al., 2012<sup>13</sup> study showed anemia as a major risk factor with 79 cases (18.4%) of 428 cases.

**Table 18: Sinuses involved**

Sinuses involved	Ameri et al. (1992)8(%)	Daif et al. (1994)4 (%)	Strolz E et al. (2005) 6(%)	Present Study (%)
Superior sagittal sinus	72	85	72.2	43.3
Transverse sinus	70	2.5	38	66.6
Sigmoid sinus		32	20.3	23.3
Jugular sinus			70.6	6.6
Straight sinus	16	7	7.6	6.6
Internal cerebral vein	8	10	6.3	13.3
Cavernous Sinus				6.6

In the present study, the Transverse Sinus is most commonly involved accounting for 66.6 % comparable to Ameri et al.<sup>8</sup> followed by Superior Saggital Sinus with 43.3%, Sigmoid Sinus with 23.3 % comparable to Daif et al.<sup>4</sup> And Strolz E<sup>6</sup> et al.

**Table 19: Mortality**

Authors	Number of cases studied	Percentage of Mortality
Bansal et al. <sup>14</sup> (1980)	138	27.5
Srinivasan et al. <sup>12</sup> (1983)	135	25.9
Nagaraj et al. <sup>9</sup> (1989)	200	21.7
Storz E et al. <sup>6</sup> (2005)	79	15
Present study	30	6.6

Contrary to ischemic arterial stroke, CVT could be described as an "all or nothing" disease with good short and long term outcomes when the acute phase of illness has been survived.

In the present study, the mortality is 6.6 % which is comparable with various other studies. Similar observations noted with Strolz E et al.<sup>6</sup>, Srinivas et al.<sup>12</sup>, and Nagaraj et al.<sup>9</sup> with 15%, 25.9% and 21.7% respectively

### Serum Sodium Levels.

**Table :20**

Serum Sodium(mmol/L)	Number of Patients(n)	Percentage (%)
<130	6	20
130-135	18	60
135-140	6	20

In the present study significant proportion of cases presented with hyponatremia. 6 cases (20%) with moderate hyponatremia and 18 cases (60%) with mild hyponatremia. Those with severe hyponatremia of <125mmol/l not been seen during this study.

Only incidence of hyponatremia with cerebral venous thrombosis has been studied. Obvious cause for the hyponatremia, Syndrome of Inappropriate Diuresis or Cerebral Salt Wasting Syndrome has not been evaluated.

Prior literature available was only of case reports about hyponatremia

in conjunction with cavernous sinus thrombosis and cases of autoimmune hypothyroidism (Thyroiditis) with Deep vein thrombosis. Previous studies from India have shown CSVT to be highly prevalent and generally associated with postpartum state.

The largest international multicentric trial of CSVT in 2004 included very few patients from Asia and Africa.<sup>15</sup> With the greater availability of MRI, CSVT is being increasingly diagnosed in both genders and at an early stage in India. Many new risk factors are being identified due to more complete workup.

In the present study, CSVT was found more frequently in men. Previous studies found 60–79% of CSVT patients to be women and reported it as the commonest cause of stroke in young women in India. The mean age in the present study was 36.6 years. Most common presenting features in the present study were seizures, altered sensorium and headache as was shown in the previous studies.

Superior sagittal sinus was the most frequent sinus involved. However, other sinuses were also involved alone or in combination.

Mortality noticed during this study, 2 cases (6.6%), were both cavernous sinus thrombosis. Suspected etiology was septic emboli. Progress of events leading to death were rapid, leading not to establish foci and causative organisms.

Hyponatremia, though been noticed in many cases, needs to be evaluated further in future studies to understand the basic pathological process leading to it. Dehydration is though an inciting/triggering factor, its absolute role as an etiological factor is yet to be studied.

## CONCLUSION

The present study emphasizes that cerebral venous thrombosis is an important cause of stroke especially in young. The spectrum of clinical presentation is extremely wide. Important clinical signs to suggest this disorder are presentation with seizures, recent headache, vomiting and papilloedema in the appropriate clinical settings. The diagnostic test of choice is MRI with MR venography. Management with intravenous heparin followed by oral anticoagulants is appropriate and the prognosis is generally favourable.

Hyponatremia in association with cerebral venous thrombosis has to be corrected promptly as in other cases.

As the current study comprised only a small sample size, significant strength of association between hyponatremia and cerebral venous thrombosis, mechanisms causing hyponatremia have to be studied further in future studies.

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