

# Clinical Features, Risk Factors, Imaging Characteristics and Outcome of Cerebral Sinus Thrombosis

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## ABSTRACT

**Objective:** To determine the presentation, clinical features, risk factors, imaging characteristics and outcome of patients with central venous sinus thrombosis.

**Study Design:** Cross-sectional study

**Place and Duration of Study:** This study was conducted at the Department of Medicine in Ayub Teaching Hospital Abbottabad from March 2022 to October 2022.

**Materials and Methods:** All patients carrying the diagnosis (based on magnetic resonance venography) of cerebral venous sinus thrombosis (CVST) will be included in study. The patient with arterial stroke, arteriovenous malformation, intra and extra cerebral hemorrhages, space occupying lesions, septic meningitis and autoimmune encephalitis will be excluded from study. The data collection tool will be written questionnaire and data will be analyzed in SPSS version 21.

**Results:** In present study 62 patients met the inclusive criteria. The mean age of females was 30 years and males was 40 years. The most common features of CVST were headache (93%), followed by Seizures. The most common potential cause was puerperium (64%). On MRV superior sagittal sinus was found thrombosed in 48% cases and left transverse sinus in 45% of cases. The mean duration of hospital stay was 10 days.

**Conclusion:** Majority of postpartum females have significantly high white cell count, although only 06 patients had history of localized infection. Most of patients presented with headache and seizures. Intra parenchymal bleed or superior sagittal sinus thrombosis is suspected in patients who presented predominantly with seizures. Superior sagittal sinus is most commonly thrombosed sinus (59%) in patients who presented with seizures. Prognosis of CVST is favorable than previously reported.

**Key Words:** Cerebral venous sinus, thrombosis, seizures, outcome, risk factors

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## INTRODUCTION

Cerebral venous sinus thrombosis (CVST) is venous stroke caused by thrombosis of dural sinuses which lead to venous congestion, hypoxemia and brain injury. The prevalence of CVST is more common in Asia than the west. Its prevalence is 15% in young Asian population and account for 0.5 to 1.5% of all strokes [1]. Unlike arterial stroke the venous stroke, its presentation is highly variable. The presentation of CVST can be sub-acute i.e 2-28 days or chronic >30 days.

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Sometime patient present only with chronic headache and in some cases, patient presents with coma. In present era due to great awareness and noninvasive improvement of radiological techniques now it is possible to diagnose CVST early [2]. The incidence of sinus thrombosis peaks in third decade of life with male to female ratio of 1.5:5 [3]. The risk factors vary according to age, demography and ethnic group. In Asia pregnancy related causes are found to be most common cause while in European countries OCPs (oral contraceptive pills) were found to be most common culprit for CVST. In older age the most common cause of CVST is malignancy [4]. Currently, the magnetic resonance venography (MRV) is technique of choice for CVST while CT scan with contrast increases the sensitivity to 99% for sinus thrombosis and 88% for vein thrombosis [5]. The overall case fatality rate in CVST is 5-10% [6]. The factor responsible for poor prognosis is male gender, cancer, meningitis, hemorrhage and coma at presentation.

The present study updates the existing knowledge and creates local evidence for health care authorities. To the author's knowledge there is no regional data on CVST.

The study will serve as road map for further exploration of common risk factors.

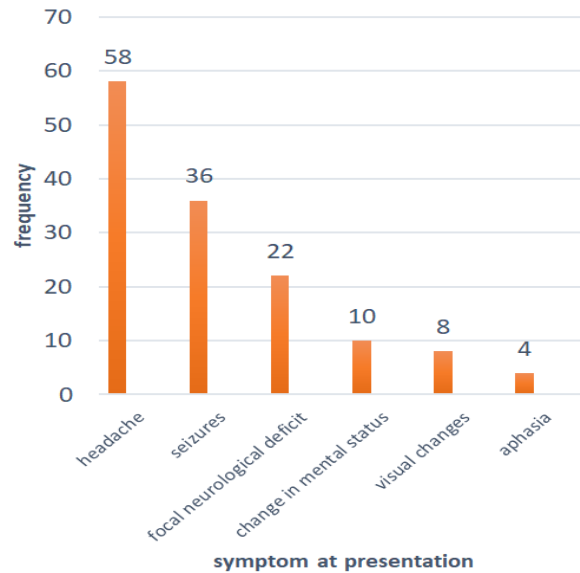
**MATERIALS AND METHODS**

This cross-sectional study will be conducted in Ayub teaching hospital Abbottabad. The hospital provides tertiary care and encompasses Neuro ICU, Neurology ward and Neuro surgery unit. The study enrolled all patients who were diagnosed as a case of Dural sinus thrombosis on MRV from March 2022 to October 2022. The retrospective data through predesigned written questionnaire was obtained and the demography, predisposing risk factors and comorbidities were recorded. Moreover, necessary investigations which help in severity and diagnosis were also included. The laboratory investigations include complete blood count, erythrocytes sedimentation rate, C reactive peptide and coagulation profile. Radiological investigations include CT brain and MR Venography. The patients with arterial stroke, arteriovenous malformation, intra and extra cerebral hemorrhages, space occupying lesions, septic meningoencephalitis and autoimmune encephalitis were excluded from study. The institutional ethical committee approved the study with approval code/Ref.No.RC-2022/EA-01/058. The data will be analyzed in SPSS version 21 and variables with P value <0.005 will be considered as significant.

**RESULTS**

In current study almost 62 patients (n=62) were recruited from different medical departments. The mean age of sample was 39.2±14, age ranges from 14 to 65. There was female gender preponderance with the 5:1 ratio. The first most common feature of CVST presentation was headache (58/62) followed by seizures (36), and Focal neurological deficit (22%), detail shown in fig1. The most common potential cause of CVST was puerperium 64% (40). The mean systolic blood pressure was 137±27. 14 patients had underlying

comorbidity. Hypertension was most common comorbidity recorded. Mean C reactive peptide (CRP) was 7 and d-dimer of 383 details shown in table 1.



**Figure No.1: Presentation of CVST**

The CT of CVST was suggestive of ischemic venous infarct in 36 individuals (58%). The frequencies of cerebral venous sinus thrombosed in MRV were superior sagittal sinus 48.3% (30/62), left transverse 45.16% (28/62) and right transverse 41.9% (26/62). Single sinus was affected in 34 subjects; details shown in table 3. In isolated superior sagittal sinus thrombosis 87% (14/16) cases presented with seizures and headache, in isolated transverse sinus thrombosis 100% (18/18) patients presented with headache while, in superior sagittal and transverse sinus 67% (8/12) patients presented with focal neurological deficit and seizures. The mean duration of patient’s hospital stay was 10 days.

**Table No.1: Lab and Clinical Characteristic of Patients with CVST**

Variables		Males	Females	P-value	Confidence interval (CI)
Age		40	30	0.00	-23 — -04
Complete blood count	HB	15.2±1.3	11.7±2.5	0.04	-5.1 — -1.7
	WBCs	7.7±1.5	12.2±3.1	0.05	2.4 — 6.5
	Platelets	227±68	280±90	0.07	-8.0 — 113
CRP		7±1	9.0±7	0.001	0.2 — 12
D-dimer		200	429	0.17	-335 — 794
PT		15±2.5	16±3.1	0.76	-1.4 — 3.0
APT		32±0.2	36±1.1	0.12	2.2 — 6.2
Mean systolic blood pressure		140±20	137±28	0.47	-22 — 15.5
Mean diastolic blood pressure		84±10	85±13	0.37	-8.0 — 10.2
GCS		14±1	12±3	0.007	-4.0 — 0.03
Comorbidities		06	08	0.004	—
State of puerperium		—	40/52	—	—

Dehydration	00	32	0.001	—
State of pregnancy	—	10/52	—	—
Localized infection	00	06	0.32	—
Oral contraceptives use	—	04	—	—
History of previous DVT	02	02	0.119	—
Active Malignancy	00	00	—	—
History of Neurological trauma	00	00	—	—

**Table No.2:Patients with details**

Investigation	Characteristics	No
CT findings	Infarct	36
	Normal	22
	hemorrhage	02
MRV Findings	Single sinus involved	34
	2 sinuses involved	26
	3 sinuses or more involved	02
Frequency of sinus thrombosis on MRV	Superior sagittal	30
	R Transverse	27
	L Transverse	27
	Sigmoid	06
	Inferior Sagittal	04

**DISCUSSION**

The mean age of our cohort is 39 years with female gender preponderance. Women are significantly younger than males with the mean age of 30 and 40 years respectively. A multi-center study conducted in Pakistan by Khealani et al<sup>7</sup> reported mean age of 35 years with male and female mean age of 38 and 33 years respectively. The reason in age difference can be the cause related to CVST— Obstetric causes presented in younger age while infectious and malignancy related causes presented late<sup>[8]</sup>. The most common symptom at presentation is headache which is consistent with khealani et al and other international studies<sup>[8,9,10]</sup>. The male to female ratio is in accordance to De Bruijn SF et al<sup>[3]</sup>. Headache can be acute, sub-acute or chronic and it is due to intracranial hypertension. Usually, headache is diffuse and it is positional and get worsen with Valsalva maneuver<sup>[9]</sup>. Seizures followed by focal neurological deficit are 2<sup>nd</sup> and 3<sup>rd</sup> most common symptoms recorded in our study contrary to khalani et al which reported focal neurological deficit followed by seizures. There are multiple reasons for this, our cohort comprise most of females and obstetric causes are major risk factors of CVST in our cohort, it is well established that higher incidence of seizures observed in peripartum is up to 76% by one study<sup>[10]</sup>. Majority, 55% patients belong to far fang areas and they are late at presentation, as seizures are common at evolutionary stage of CVST<sup>[11]</sup>. Difference in Degree and number of sinus involvement also can be reason for late motor deficit and early seizures. In our study all patients having hemorrhagic transformation on CT have experienced seizures as a predominant symptom at presentation<sup>[12]</sup>. In the west 54% females have history

of OCP use and onset of CVST<sup>[11]</sup> and some studies even state the risk of CVST increase up to 6-fold with the use of OCP<sup>[13]</sup>. The risk can be reached to 30 folds when BMI is >30 and concomitant use of OCP<sup>[4]</sup>. But surprisingly in our study only 04 females had history of OCP use. When compared with Khealani only 12% practiced OCP. This needs further exploration of risk factors in patients presented with CVST like hypothyroidism, hyperhomocysteinemia, hematological thrombophilia syndromes etc. Recently a study conducted by Bano S et al at Lahore reported that use of OCP is uncommon in Pakistan but no concrete reason explained<sup>[14]</sup>. In present study d-dimer is assessed in 21 patients, 18 showed high titer therefore the sensitivity of d-dimer is 86% and 3 patients represented false negative result. CRP level is accessed in 18 individuals, among which 08 had positive result<sup>[15]</sup>. So, sensitivity for CRP is 44.4%, 10 patients had negative results for CRP. The WBCS count of female are significantly higher than males, subtle infection in hospital can be the reason although only 06 females had history of localized infection in head and neck areas. Khealani et al reported infectious rate of 18% in patient presented with sinus thrombosis. For the confirmatory diagnosis of CVST neuroimaging is considered as principal tool. Topographically the frequency of sinus thrombosis involved on MRV is in accordance to that reported by Khealani et al, the most commonly involved sinus is superior sagittal sinus, followed by transverse and sigmoid sinus. Our recorded frequency of sinus thrombosis is also in accordance to the study done in Lahore<sup>[9]</sup>. But a multicentered internal study in Argentina reported transverse sinus thrombosis and hemorrhagic finding as a common finding. The difference can be due to sample size and demographic variability with underlying risk factors<sup>[2]</sup>. We found 58% developed venous infarct on CT brain without contrast while Khealani reported 66%. The difference can be due to early diagnosis and older data reported by khealani et al. The mean duration of hospital stay is 10 days while Khealani recorded 9 days. There is no death recorded in our study population, the reason can be that our study sample lack factors associated with unfavorable outcomes like preponderance of male gender, coma at presentation, intracerebral hemorrhage, meningitis and cancer<sup>[5]</sup>.

## CONCLUSION

We have concluded that venous strokes are not uncommon in young females. CVST should be considered in differential diagnosis if young female is presented to hospital with particular headache and history of major predisposing event. Superior sagittal sinus is most commonly thrombosed sinus (59%) in patients who presented with seizures. The most common risk factor is puerperium in our setup. CVST with Hemorrhage on CT scan mostly presented with seizures. The most common sinus thrombosed is superior sagittal sinus. D-dimers are mostly positive but negative result cannot exclude the diagnosis of CVST. Further detailed should be obtained from females regarding infection as majority had significantly high WBCs count at presentation. OCPs use is uncommon practice in Pakistan. Prognosis of CVST is better than reported previously.

### Author's Contribution:

Concept & Design of Study: Mohsin khan  
 Drafting: Faizan Banaras,  
 Saif ud Din  
 Data Analysis: Niama Khan, Nisar  
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 Revisiting Critically: Haidar Zaman  
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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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