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Original Article

DOI: https://doi.org/10.3329/jninb.v11i1.83713

Journal of National Institute of Neurosciences Bangladesh,
January 2025, Vol. 11, No. 1, pp. 3-8

ISSN (Online) 2518-6612
ISSN (Print) 2410-8030

Clinical and Radiological Profiles of Cerebral Venous Sinus Thrombosis Patients admitted at Referral Neuroscience Hospital in Bangladesh

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Abstract

Background: Cerebral venous sinus thrombosis (CVST) is a rare form of stroke frequently underdiagnosed due to its variable clinical presentation which may be related to different pattern of dural sinus involvement. **Objective:** The purpose of the present study was to evaluate the clinical and radiological profiles of patients diagnosed with Cerebral Venous Sinus Thrombosis (CVST) and to categorize the findings based on their mode of presentation. **Methodology:** This cross-sectional study was conducted in the Department of Neurology at National Institute of Neurosciences & Hospital, Dhaka, Bangladesh from January 2023 to May 2025 for a period of approximately two and half years. All the patients diagnosed as CVST, admitted at IPD were selected as study population. The patients were examined clinically and radiologically confirmed. **Results:** Of the total of 100 patients, majority of the patients were young adult (mean age 33.58 ± 13.47) with female predominance (76.0%). Headache was the most common presenting complaint (95.0%), followed by vomiting in (82%) and Impaired consciousness (43.0%). Focal deficit was found in 44.0% and papilledema 52.0% of participants. Majority of presented in the sub-acute phase (74%), while chronic presentations were relatively rare (5.0%). The majority of patients (79.0%) had multiple sinus involvement. The transverse sinus was the most frequently affected (83.0%) followed by Superior Sagittal Sinus (65.0%) and Sigmoid sinus (65.0%). Visual disturbances and papilledema were significantly more prevalent in the CVST patients with sub-acute presentation compared to the acute CVST patients ($p = 0.002$ and $p = 0.001$ respectively). **Conclusion:** In conclusion, cerebral venous thrombosis presents with diverse clinical features, often with overlapping symptoms across different stages. *[Journal of National Institute of Neurosciences Bangladesh, January 2025;11(1):3-8]*

Keywords: Clinical profiles; cerebral venous thrombosis; CVST

Introduction

Cerebral Venous Sinus Thrombosis (CVST) is an uncommon but potentially life-threatening cause of stroke, accounting for approximately 0.5% to 1.0% of all strokes worldwide. Unlike arterial strokes, CVST predominantly affects young adults and has a female preponderance[1-2]. The disease is characterized by thrombosis of the dural venous sinuses and/or cerebral veins, leading to impaired cerebral venous drainage, increased intracranial pressure, venous infarction, or hemorrhage[3].

The clinical presentation of CVST is highly variable, ranging from isolated headache to focal neurological deficits, seizures, altered consciousness, and signs of raised intracranial pressure, such as papilloedema and visual disturbances[4]. The disease can present acutely

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within 48 hours of symptom onset, sub-acutely between 48 hours and 30 days, or chronically beyond 30 days and the mode of presentation may influence both clinical findings and radiological patterns[5]. Acute presentations are often dramatic and may mimic arterial strokes, while sub-acute and chronic cases may present insidiously, with progressive neurological symptoms or isolated intracranial hypertension[6]. Because of this heterogeneity, CVST often poses a diagnostic challenge and is frequently underrecognized, particularly in resource-limited settings.

Neuroimaging is essential for the diagnosis of CVST. Magnetic Resonance Imaging (MRI) combined with Magnetic Resonance Venography (MRV) is considered the gold standard due to its high sensitivity and specificity[7]. The most commonly affected sinuses include the superior sagittal sinus, transverse sinuses especially the left and sigmoid sinuses[8]. In many patients, multiple sinuses are involved simultaneously, which may correlate with more severe clinical outcomes.

Several studies have evaluated the clinical and radiological aspects of CVST; however, limited data exist on how these features vary with the mode of presentation. Understanding these variations is important for early diagnosis and timely intervention, which are key to preventing long-term neurological deficits. In this context, the present study aims to analyze the clinical and radiological profile of patients with CVST according to their mode of presentation-acute, sub-acute, or chronic. By comparing clinical symptoms, neurological signs, and patterns of sinus involvement across these groups.

Methodology

Study Settings and Population: This cross-sectional study, carried out from January 2023 to May 2025 in Neurology department of National Institute of Neurosciences (NINS) and Hospital, Dhaka, Bangladesh, included 100 patients with CVST by convenient sampling.

Study Procedure: In this hospital-based cross-sectional study, patients admitted to the inpatient service during this period, who met the diagnostic criteria for cerebral venous sinus thrombosis (CVST) were considered for inclusion. Patients with incomplete clinical or radiological records and unwilling to participate in the study were excluded. On admission, potential participants were screened by the neurology team. A detailed neurological examination was performed by an attending neurologist and recorded on the data collection sheet, including level of consciousness (Glasgow Coma Scale), focal motor/sensory deficits, cranial nerve findings, signs of raised intracranial pressure (headache characteristics, vomiting, papilledema), and seizures. Mode of presentation was classified using symptom onset-to-presentation interval: acute (≤48 hours), sub-acute (48 hours to 30 days), chronic (>30 days). MRI brain including T1, T2, FLAIR, diffusion-weighted imaging (DWI) and gradient recalled echo (GRE) sequence plus MR venography (MRV) to identify thrombus and define sinus involvement.

Statistical Analysis: Categorical data were expressed as frequencies and percentages, while numeric data were expressed as mean (±SD) when normally distributed and as median and interquartile range (IQR; 25^{th} -75^{th} percentile) when skewed. Assessment of normality of data was done by Shapiro-Wilk test. Comparison of categorical variable was done by $\chi 2$-test and numeric variable by unpaired t-test or Mann-Whitney U test as applicable. P values < 0.05 were considered as significant. SPSS (version 26.0) was used for data analysis.

Ethical Consideration: Written informed consent was taken from the attendants of the participants. All procedures of the present study were carried out in accordance with the principles for human investigations (i.e., Helsinki Declaration 2013) and also with the ethical guidelines of the Institutional research ethics. Formal ethics approval was granted by the local ethics committee (Ref: IRB/NINS/…..). Participants in the study were informed about the procedure and purpose of the study and confidentiality of information provided. All participants consented willingly to be a part of the study during the data collection periods. All data were collected anonymously and were analyzed using the coding system.

Results

The table above summarizes the demographic and clinical characteristics of the study participants diagnosed with Cerebral Venous Sinus Thrombosis (CVST).

The mean age of the patients was 33.58 years with a standard deviation of 13.47 years, indicating a predominance of CVST in younger individuals. Females constituted the majority of the cohort (76.0%), while males accounted for 24.0% cases. The most common presenting symptom was headache, reported by 95.0% of the patients, followed by vomiting in 82.0%. Impaired consciousness and focal neurological deficits were present in 43.0% and 44.0% of the

patients, respectively. Other notable clinical features included visual disturbances (41.0%), papilloedema (52.0%), and seizures (27.0%). On neurological assessment, the median Glasgow Coma Scale (GCS) score was 15, with an interquartile range (IQR) of 14 to 15, indicating that most patients had relatively preserved consciousness on admission. The median modified Rankin Scale (mRS) score on admission was 3 (IQR: 3–4), suggesting moderate disability in the majority of patients at presentation (Table 1).

Table 1: Demographic and Clinical Characteristics of the Participants

Variables	Values
Age	
(Years; mean ± SD)	33.58 ± 13.47
Gender	
Male	24.0%
Female	76.0%
Clinical Features	
Headache	95.0%
Vomiting	82.0%
Impaired consciousness	43.0%
Visual disturbance (Diplopia, Visual dimness or blurring)	41.0%
Seizure	27.0%
Focal deficit	44.0%
Papilloedema	52.0%
GCS score (Median and IQR)	15(14-15)
MRS score (On admission) (Median and IQR)	3(3-4)

This chart visually emphasizes that the majority of CVST cases in the cohort presented in the sub-acute phase (74.0%), while chronic presentations were relatively rare (5.0%). The acute presentation was observed in 21.0% of patients (Figure I).

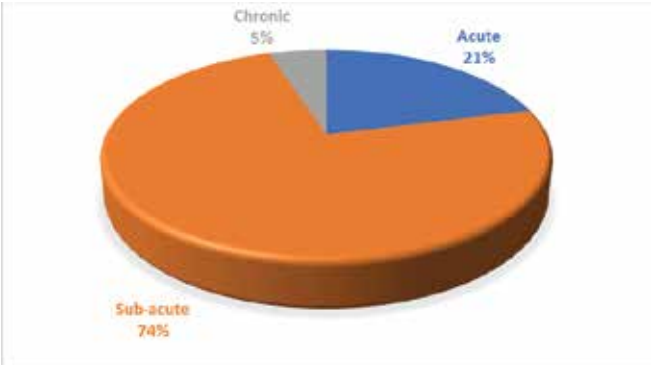

Figure I: Distribution of CVST Patients Based on the mode of Clinical Presentation

In this study, the majority of patients (79.0%) had multiple sinus involvement, while 21.0% had single sinus thrombosis. The transverse sinus was the most frequently affected (83.0%) venous sinus, of which, left transverse sinus 50.0%, right transverse sinus 22.0%, and bilateral involvement 11% cases. Involvement of the internal jugular vein was observed in 22.0% of cases. Less frequently involved sinuses included the straight sinus (14.0%) and cavernous sinus (2.0%). While comparing patients presenting in with acute CVST to those with the sub-acute phase (n = 74), the mean age did not differ significantly between the groups (35.05± 18.07 years vs. 32.72 ± 12.14 years; p = 0.494), and gender distribution was also comparable (p = 0.602) (Tabel 2).

Table 2: Pattern of Venous Sinus Involvement in CVST patients (n=100)

Variables		Percent
Number of sinuses involved		
Multiple		79
Single		21
Sinus Involved		
Superior Sagittal Sinus		65
	Left	50
	Right	22
	Both	11
Transverse Sinus	Total	83
Sigmoid Sinus		65
	Right	13
	Left	9
Internal jugular vein	Total	22
Cavernous sinus		2
Straight Sinus		14

Clinically, headache was the most common presenting symptom in both groups, followed by vomiting, impaired consciousness, and seizures, with no statistically significant differences in these features. However, vomiting was more frequent in the acute group (95.2%) compared to the sub-acute group (77.0%), showing a trend toward significance (p = 0.061). Importantly, visual disturbances and papilledema were significantly more prevalent in the sub-acute group compared to the acute group (p = 0.002 and p = 0.001 respectively). There was also no significant difference in the occurrence of focal neurological deficits between the groups (p = 0.722). Radiologically, although multiple sinus involvement was more common in both groups, the difference in distribution between single and multiple sinus involvement across acute and sub-acute presentations

was not statistically significant (p = 0.271) (Table 3). hepatocellular carcinoma (HCC) and liver abscess. Complications of cirrhosis was the underlying cause of death in HCC and sepsis and multiorgan failure was the underlying cause of death in liver abscess (Table 3).

Table 3: Comparison of Demographic and Clinical Profile in the Participants with Acute and Sub-Acute Presentation

Variables	Mode of Presentation		P value
	Acute (n=21)	Sub- Acute (n=74)	
Age (Years; mean ± SD)	35.05± 18.07	32.72 ± 12.14	0.494
Gender			
Male	6(29.0%)	17(23.0%)	0.602
Female	15(71.0%)	57(77.0%)	
Symptoms			
Headache	20(95.0%)	70(95.0%)	0.908
Vomiting	20(95.0%)	57(77.0%)	0.061
Impaired consciousness	8(38.0%)	33(45.0%)	0.600
Seizure	6(29.0%)	21(28.0%)	0.836
Visual problem			
Present	2(10.0%)	35(47.0%)	0.002
Signs			
Focal deficit present	12(57.0%)	39(53.0%)	0.722
Papilledema Present	4(19.0%)	43(58.0%)	0.001
Sinus involvement			
Single sinus affected	6(29.0%)	13(18.0%)	
Multiple affected	15(71.0%)	61(82.0%)	0.271

This bar chart illustrates the distribution of sinus involvement in CVST in different mode (Acute, Sub-acute & chronic) of presentation. Sub-acute phase is the commonest prestation involves all venous sinuses. In sub-acute stage, the transverse sinus was the most frequently affected (63.0%), followed by Superior Sagittal Sinus (53.0%), Sigmoid sinus (48.0%) and internal jugular vein (18.0%). In acute presentation, the transverse sinus also was the most frequently affected sinus (16.0%), followed by Sigmoid sinus (15.0%) (Figure II).

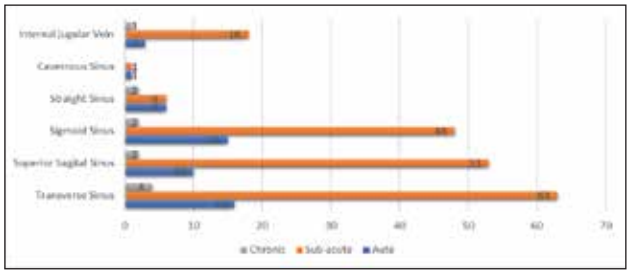

Figure II: Comparison of sinus involvement in the cerebral venous sinus thrombosis patients with acute, Sub-acute and chronic presentation

Discussion

This study presents a comprehensive evaluation of the clinical and radiological profiles of patients with Cerebral venous sinus thrombosis (CVST) categorized according to their mode of presentation. The findings highlight the heterogeneous nature of cerebral venous sinus thrombosis, which continues to pose diagnostic challenges due to its wide-ranging clinical manifestations and variable imaging patterns.

The mean age of the study population was 33.58 years, with a predominance of younger adults affected-a demographic trend consistent with several previous studies that have identified cerebral venous sinus thrombosis as a disease of the young to middle-aged population[1,2]. The striking female predominance (76.0%) in our cohort is also in line with global data, often attributed to risk factors unique to women, such as hormonal contraceptive use, pregnancy, and the puerperium[3].

From a clinical standpoint, headache emerged as the most common symptom, reported by 95.0% of patients. This aligns with previous literature, where headache has been consistently documented as the predominant symptom in cerebral venous sinus thrombosis cases, often being the initial or sole manifestation[3,9]. Other frequent symptoms included vomiting (82.0%), visual disturbances (41.0%), and seizures (27.0%). Impaired consciousness and focal neurological deficits were each observed in nearly half of patients, underlining the potential for cerebral venous sinus thrombosis to mimic other neurological emergencies such as stroke or intracranial infection[11]. The median Glasgow Coma Scale (GCS) score of 15, however, suggests that a majority of patients had preserved consciousness at presentation, despite the severity of the underlying condition[11]. Similarly, the median modified Rankin Scale (mRS) score of 3 at admission reflected moderate functional impairment, consistent with prior studies reporting variable functional deficits at presentation[5].

In terms of the mode of presentation, the sub-acute phase was the most prevalent, seen in 74% of cases, followed by the acute phase (21.0%) and chronic phase (5.0%). This finding is consistent with the often subtle and delayed onset of cerebral venous sinus thrombosis symptoms, which may contribute to diagnostic delays[1]. While the mean age and gender distribution did not significantly differ between the acute and sub-acute groups, some clinical features did show notable trends. Vomiting was more common in the acute group, which could reflect the more abrupt onset of intracranial

pressure changes in this subset. Most notably, visual disturbances and papilledema were significantly more common in sub-acute presentations ($p = 0.002$ and $p = 0.001$ respectively), likely due to the progressive nature of venous outflow obstruction and sustained intracranial hypertension in patients with delayed diagnosis. It is also noted in earlier studies.

Notably, multiple sinus thrombosis was present in 79.0% of patients, underscoring the often-widespread nature of venous involvement in cerebral venous sinus thrombosis. Like other previous study, this trend was observed across all modes of presentation[14].

Conclusion

Cerebral venous sinus thrombosis presents with diverse clinical features, often with overlapping symptoms across different stages. These findings emphasize the importance of considering cerebral venous sinus thrombosis in the differential diagnosis of young patients, particularly females, presenting with headache, visual complaints, or papilloedema, even when neurological examination is relatively preserved. The prominence of visual disturbances and papilloedema in sub-acute cases also suggests a critical window for early recognition to prevent progression.

Acknowledgements
None

Conflict of interest: Authors declared no conflict of interest.

Financial Disclosure
This research project was not funded by any organization.

Contribution to authors: MI, MBA, MRQ, MH, CNHR, SRH, was involved in protocol preparation, MI, JAJA, CNHR, SRH, SI, MNU, MBA, MRQ, MH, was involved in data collection and literature search, MI, CNHR, MH, was involved in manuscript writing, MI, MBA, MRQ, CNHR, MNU, SRH, SI, JAJA, was involved in preparation and revision of this manuscript. All authors read and approved the final manuscript.

Data Availability
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study the written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

How to cite this article: Islam M, Alam JAJ, Refayet CNH, Uddin MN, Haque SR, Islam S, Azam MB, Quddus MR, Hasan M. Clinical and Radiological Profiles of Cerebral Venous Sinus Thrombosis Patients admitted at Referral Neuroscience Hospital in Bangladesh. J Natl Inst Neurosci Bangladesh, 2025;11(1):3-8

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Article Info
Received on: 7 September 2024
Accepted on: 24 November 2024
Published on: 1 January 2025

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