JHWCR JOURNAL OF HEALTH, WELLNESS AND COMMUNITY RESEARCH 3007-0570

https://doi.org/10.61919/945pe680

Original Article

Prevalence of Dural Sinus Thrombosis in Female Patients Presenting to Emergency Department

Madiha Irfan[1], Muhammad Abas Khan[2], Muhammad Riaz[3], Ijaz ul Haque[4], Ishtiaq Ahmad[5], Muhammad Aadil Farooq[6], Zeenat Iqbal[7]

[1] Dental Surgeon, RHC Punjab, Pakistan
[2] Assistant Professor, Emergency Department, Lady Reading Hospital, Peshawar, Pakistan
[3] Otorhinolaryngologist, Registrar, Ruwaida General Hospital, Riyadh Region, Kingdom of Saudi Arabia
[4] Postgraduate Resident, Department of Neurosurgery, Lady Reading Hospital, Pakistan
[5] Resident Emergency Medicine, Lady Reading Hospital, MTI Peshawar, Pakistan
[6] Fellow Infectious Disease/Consultant Physician, Holy Family Hospital, Rawalpindi, Pakistan
[7] MCPS Trainee, Family Medicine, Pakistan

***Corresponding author: Muhammad Abas Khan, drabbaskhan83@gmail.com**

"Cite this Article" Received: 12 November 2025; **Accepted**: 21 April 2026; **Published**: 02 May 2026

Author Contributions: Concept:MI; Design: MAK; Data Collection: MR; Analysis: IUH; Drafting: IA, MAF, ZI. **Ethical Approval**: Lady Reading Hospital, Peshawar, Pakistan. **Informed Consent**: Written informed consent was obtained from all participants; **Conflict of Interest**: The authors declare no conflict of interest. **Funding**: No external funding; **Data Availability**: Available from the corresponding author on reasonable request; **Acknowledgments**: N/A.

ABSTRACT

Background: Dural sinus thrombosis is an uncommon but clinically important form of cerebral venous thrombosis that predominantly affects young women and may present with nonspecific emergency neurological symptoms. Objective: To determine the prevalence of imaging-confirmed dural sinus thrombosis among female patients presenting to the emergency department with symptoms suggestive of cerebral venous thrombosis and to describe associated clinical, risk-factor, and radiological patterns. Methods: This prospective observational study was conducted in the emergency department of Lady Reading Hospital, Peshawar, from March to August 2024. Female patients aged 18–50 years with suspected cerebral venous thrombosis were consecutively enrolled. Diagnosis was confirmed using magnetic resonance venography or computed tomography venography. Demographic data, presenting symptoms, risk factors, symptom duration, and radiological findings were analyzed using SPSS version 26. Results: Among 120 suspected cases, 28 were diagnosed with dural sinus thrombosis, giving a prevalence of 23.3%. The mean age was 29.84 ± 8.72 years. Headache was the most common symptom (80.0%), followed by vomiting (60.0%) and seizures (40.0%). Pregnancy or puerperium was the leading risk factor among confirmed cases (42.9%) and showed significant association with thrombosis ($p = 0.02$). Superior sagittal sinus involvement was most frequent (71.4%), and multiple sinus involvement occurred in 64.3%. Conclusion: Dural sinus thrombosis was a clinically meaningful finding among suspected female emergency presentations, especially in reproductive-age women with pregnancy-related risk exposure. Keywords: cerebral venous thrombosis; dural sinus thrombosis; emergency department; female; pregnancy; puerperium; magnetic resonance venography.

INTRODUCTION

Cerebral venous thrombosis (CVT) is an uncommon but clinically important cause of stroke, accounting for approximately 0.5–1% of all stroke cases worldwide, with an estimated annual incidence of 1.3–1.6 per 100,000 population (1,2). Unlike arterial stroke, CVT frequently affects younger adults and shows a marked female predominance, largely because of sex-specific prothrombotic exposures such as pregnancy, puerperium, and oral contraceptive use (3,4). Dural sinus thrombosis represents the major anatomical subtype of CVT, in which thrombus formation within the dural venous sinuses impairs cerebral venous drainage, increases intracranial pressure, and may lead to venous infarction, intracranial hemorrhage, seizures, visual symptoms, focal neurological deficits, or altered consciousness (5,6).

The clinical diagnosis of dural sinus thrombosis remains challenging in emergency settings because its presentation is often nonspecific and may mimic migraine, seizure disorders, meningitis, intracranial mass lesions, hypertensive emergencies, or arterial cerebrovascular events. Headache is frequently the dominant symptom, but vomiting, seizures, papilledema, focal deficits, and impaired consciousness may occur in varying combinations, creating substantial diagnostic uncertainty at initial presentation (6,7). This diagnostic difficulty is particularly relevant in low- and middle-income settings, where delayed neuroimaging, limited access to magnetic resonance venography, and under-recognition of pregnancy-related thrombotic risk may contribute to missed or late diagnoses (7,8).

The burden of CVT appears relatively higher in Asian and South Asian populations, where reproductive-age females constitute a substantial proportion of cases and pregnancy- or puerperium-associated thrombosis remains a recurring risk factor (7,8). Regional studies have reported that postpartum and pregnancy-related states contribute meaningfully to CVT occurrence, while local hospital-based data from Pakistan suggest that young females are disproportionately affected and that involvement of the superior sagittal and transverse sinuses is common (8–10). However, much of the available local evidence is retrospective, neurology-ward based, or focused on confirmed CVT cohorts rather than emergency department populations with clinically suspected disease.

This distinction is important because prevalence among suspected emergency presentations has direct implications for triage, early imaging decisions, and timely anticoagulation planning. In the emergency department, clinicians must decide which symptomatic female patients warrant urgent venographic imaging, yet local prospective data describing the proportion of suspected cases that are ultimately confirmed as dural sinus thrombosis remain limited. The present study was therefore designed to determine the prevalence of imaging-confirmed dural sinus thrombosis among female patients aged 18–50 years presenting to the emergency department with symptoms suggestive of CVT, and to describe their clinical presentation, associated risk factors, and radiological distribution. The study hypothesized that dural sinus thrombosis would be a clinically meaningful finding among suspected female emergency presentations, particularly in patients with pregnancy- or puerperium-related risk exposure.

MATERIALS AND METHODS

This prospective observational study was conducted in the emergency department of Lady Reading Hospital, Peshawar, from March 2024 to August 2024. The study was designed to estimate the prevalence of imaging-confirmed dural sinus thrombosis among female patients presenting with clinical features suggestive of cerebral venous thrombosis and to evaluate associated clinical, reproductive, and radiological characteristics. A prospective design was selected to allow systematic screening of eligible emergency presentations, standardized clinical data collection at the time of presentation, and confirmation of diagnosis using venographic neuroimaging during the same clinical episode.

Female patients aged 18–50 years who presented to the emergency department with symptoms suggestive of cerebral venous thrombosis were consecutively screened for eligibility. Clinical suspicion was based on the presence of one or more relevant neurological features, including headache, vomiting, seizures, focal neurological deficit, visual disturbance, altered level of consciousness, or other symptoms prompting evaluation for cerebral venous thrombosis. The study population consisted of clinically suspected cases, and the primary outcome was the presence of dural sinus thrombosis confirmed by magnetic resonance venography or computed tomography venography. Patients were excluded if they had arterial ischemic stroke, intracranial tumor, traumatic brain injury, known bleeding disorder, incomplete clinical information, or refusal to provide consent. These eligibility criteria were applied to ensure that the enrolled cohort represented suspected emergency presentations in whom dural sinus thrombosis was part of the active diagnostic consideration rather than a preselected group of confirmed cases.

A non-probability consecutive sampling technique was used, whereby all eligible female patients presenting during the study period were approached and enrolled after informed consent. Demographic and clinical information was collected using a structured proforma at the time of emergency assessment. Recorded variables included age, presenting symptoms, duration of symptoms before presentation, pregnancy or puerperium status, oral contraceptive use, relevant comorbid conditions, and identifiable clinical risk factors. Age was analyzed both as a continuous variable and as predefined age categories of 18–20, 21–30, 31–40, and 41–50 years. Symptom duration was recorded in days and categorized as early presentation within 3 days or delayed presentation after 3 days from symptom onset. Pregnancy or puerperium was treated as a reproductive risk exposure, while oral contraceptive use was recorded as a separate prothrombotic exposure.

Diagnosis of dural sinus thrombosis was established using magnetic resonance venography or computed tomography venography according to clinical feasibility and availability. Imaging confirmation required demonstration of thrombosis involving one or more dural venous sinuses. Radiological variables included the anatomical site of sinus involvement, including superior sagittal sinus, transverse sinus, and sigmoid sinus, as well as the presence of single or multiple sinus involvement. The primary outcome variable was imaging-confirmed dural sinus thrombosis among the enrolled suspected cases. Secondary variables included presenting clinical features, risk factor distribution, symptom duration, and radiological pattern among confirmed cases.

Several steps were taken to reduce bias and improve data reliability. Consecutive recruitment was used to minimize selection bias among eligible emergency presentations. A structured data collection form was used to standardize recording of symptoms, risk factors, and imaging findings. Diagnostic classification was based on venographic imaging rather than clinical impression alone, reducing misclassification bias. Patients with incomplete clinical data were excluded to preserve analytic consistency. Potential confounding by age and reproductive risk exposure was addressed by stratifying age groups and evaluating the association of pregnancy or puerperium status with confirmed dural sinus thrombosis.

Data were entered and analyzed using IBM SPSS Statistics version 26. Quantitative variables, including age and symptom duration, were summarized as mean and standard deviation. Categorical variables, including age group, presenting symptoms, risk factors, dural sinus thrombosis status, and radiological sites of involvement, were summarized as frequencies and percentages. The prevalence of dural sinus thrombosis was calculated as the proportion of imaging-confirmed cases among all enrolled suspected cases. Group comparisons for categorical variables were performed using the chi-square test, with Fisher's exact test considered where expected cell counts were small. Associations between pregnancy or puerperium status, age group, and confirmed dural sinus thrombosis were assessed using appropriate categorical tests. A p-value of ≤ 0.05 was considered statistically significant. Missing or incomplete clinical records were excluded from analysis, and no imputation was performed.

Ethical approval was obtained from the Ethical Review Board of Lady Reading Hospital, Peshawar, under ethical review letter number 221/LRH/MTI dated 15 February 2024. Written informed consent was obtained before enrollment. Patient confidentiality was maintained by anonymizing study records and restricting access to collected data. All procedures were conducted in accordance with institutional ethical standards and the diagnostic evaluation performed was part of clinically indicated emergency care for suspected cerebral venous thrombosis. Data integrity was maintained through structured proforma-based collection, verification of entered records against source information, and analysis using a predefined statistical plan.

RESULTS

A total of 120 female patients with clinically suspected cerebral venous thrombosis were enrolled. The mean age was 29.84 ± 8.72 years, and the largest age group was 21–30 years, comprising 54 patients

(45.0%). Imaging-confirmed dural sinus thrombosis was identified in 28 patients, giving a prevalence of 23.3% among suspected female emergency presentations. Using the reported denominator, the approximate 95% confidence interval for this prevalence was 16.6%–31.7%.

Table 1. Baseline Age Distribution and Diagnostic Prevalence Among Suspected Cases

Variable	Frequency (n)	Percentage (%)	Inferential Statistic
Total suspected cases	120	100.0	
Mean age, years	29.84 ± 8.72		
18–20 years	18	15.0	Age group association with DST: p = 0.18
21–30 years	54	45.0	
31–40 years	36	30.0	
41–50 years	12	10.0	
Imaging-confirmed dural sinus thrombosis	28	23.3	95% CI: 16.6%–31.7%
No imaging-confirmed dural sinus thrombosis	92	76.7	

Headache was the leading clinical feature, affecting 96 of 120 patients (80.0%), followed by vomiting in 72 patients (60.0%) and seizures in 48 patients (40.0%). Focal neurological deficits were present in 30 patients (25.0%), while altered level of consciousness was recorded in 18 patients (15.0%). The mean duration of symptoms before presentation was 4.6 ± 2.1 days, and delayed presentation after 3 days was more frequent than early presentation.

Table 2. Clinical Presentation and Symptom Duration Among Suspected Cases

Clinical Variable	Frequency (n)	Percentage (%)
Headache	96	80.0
Vomiting	72	60.0
Seizures	48	40.0
Focal neurological deficit	30	25.0
Altered level of consciousness	18	15.0
Mean symptom duration, days	4.6 ± 2.1	—
Presentation within 3 days	40	33.3
Presentation after 3 days	80	66.7

Among the 28 patients with confirmed dural sinus thrombosis, pregnancy or puerperium was the most common identified risk factor, present in 12 cases (42.9%), followed by oral contraceptive use in 6 cases (21.4%). No identifiable risk factor was documented in 10 confirmed cases (35.7%). Pregnancy or puerperium showed a statistically significant association with dural sinus thrombosis in the manuscript analysis (p = 0.02), although the source data did not provide the full DST-positive versus DST-negative contingency counts needed to calculate an odds ratio or confidence interval.

Table 3. Risk Factors Among Patients With Confirmed Dural Sinus Thrombosis

Risk Factor	Confirmed DST Cases (n = 28)	Percentage (%)
Pregnancy or puerperium	12	42.9
Oral contraceptive use	6	21.4
No identifiable risk factor	10	35.7

Radiological assessment showed that the superior sagittal sinus was the most frequently involved site, affecting 20 of 28 confirmed cases (71.4%). Transverse sinus involvement was present in 16 cases (57.1%), while sigmoid sinus involvement was observed in 10 cases (35.7%). Multiple sinus involvement was identified in 18 confirmed cases (64.3%), indicating that most patients had anatomically extensive disease rather than isolated single-sinus thrombosis.

Table 4. Radiological Distribution Among Confirmed Dural Sinus Thrombosis Cases

Radiological Finding	Confirmed DST Cases (n = 28)	Percentage (%)
Superior sagittal sinus involvement	20	71.4
Transverse sinus involvement	16	57.1
Sigmoid sinus involvement	10	35.7
Multiple sinus involvement	18	64.3

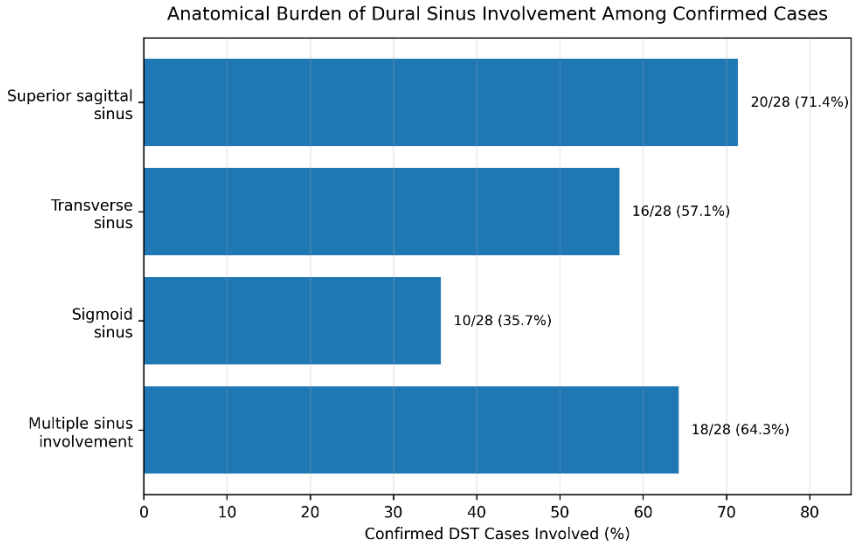

Figure 1. Anatomical Burden of Dural Sinus Involvement Among Confirmed Cases

The figure demonstrates that superior sagittal sinus involvement was the dominant radiological pattern, affecting 20 of 28 confirmed cases (71.4%), while transverse sinus involvement was also frequent at 16 of 28 cases (57.1%). Multiple sinus involvement was present in 18 patients (64.3%), exceeding isolated sigmoid sinus involvement, which was documented in 10 patients (35.7%). This distribution suggests that confirmed dural sinus thrombosis in this emergency cohort was commonly extensive, with a clinically important predominance of major midline and transverse venous drainage pathway involvement.

DISCUSSION

The present prospective observational study found that imaging-confirmed dural sinus thrombosis was present in 28 of 120 female patients presenting to the emergency department with clinical features suggestive of cerebral venous thrombosis, yielding a suspected-case prevalence of 23.3%. This finding indicates that dural sinus thrombosis represents a clinically important diagnostic consideration in reproductive-age female emergency presentations when symptoms such as headache, vomiting, seizures, focal neurological deficits, or altered consciousness raise suspicion for cerebral venous thrombosis. The mean age of the enrolled patients was 29.84 ± 8.72 years, and nearly half of the cohort belonged to the 21–30-year age group, supporting the established observation that cerebral venous thrombosis affects younger adults more frequently than arterial stroke and has a stronger female predilection because of reproductive and hormonal risk exposures (11,12).

Headache was the most frequent presenting symptom, occurring in 80.0% of suspected cases, followed by vomiting in 60.0%, seizures in 40.0%, focal neurological deficits in 25.0%, and altered level of consciousness in 15.0%. This pattern is consistent with the recognized clinical heterogeneity of cerebral venous thrombosis, where raised intracranial pressure, cortical irritation, venous congestion, and venous infarction may produce overlapping neurological manifestations (13,14). The predominance of headache is clinically important because isolated or nonspecific headache may delay recognition in emergency settings, particularly when neurological deficits are absent at initial presentation. The mean symptom duration before presentation was 4.6 ± 2.1 days, and 66.7% of patients presented after 3 days, suggesting that delayed presentation remains a practical barrier to early diagnosis and timely management.

Pregnancy or puerperium was the most common identified risk factor among confirmed cases, affecting 42.9% of patients with dural sinus thrombosis, and showed a statistically significant association with confirmed thrombosis in the manuscript analysis. This finding aligns with previous evidence that pregnancy and the postpartum period increase thrombotic risk through physiological

hypercoagulability, venous stasis, dehydration, infection, anemia, and peripartum hemodynamic changes (15,16). Oral contraceptive use was identified in 21.4% of confirmed cases, further supporting the contribution of hormone-related prothrombotic exposure in young female patients. However, the absence of thrombophilia testing and the lack of complete comparative risk-factor counts between confirmed and non-confirmed patients limit deeper causal interpretation.

Radiologically, the superior sagittal sinus was the most frequently involved site, present in 71.4% of confirmed cases, followed by transverse sinus involvement in 57.1% and sigmoid sinus involvement in 35.7%. Multiple sinus involvement was documented in 64.3% of confirmed cases, indicating that disease was frequently anatomically extensive rather than isolated. This distribution is compatible with prior clinical descriptions of cerebral venous thrombosis, in which major dural sinuses, especially the superior sagittal and transverse sinuses, are commonly affected (13,17). The high proportion of multiple sinus involvement reinforces the need for complete venographic imaging rather than limited anatomical assessment when cerebral venous thrombosis is suspected.

The main strength of this study is its prospective emergency-department design, which makes the findings more relevant to frontline diagnostic decision-making than studies limited to admitted or already-confirmed neurology cases. The use of magnetic resonance venography or computed tomography venography strengthened diagnostic validity. Nevertheless, the findings should be interpreted with caution. The sample was recruited from a single tertiary-care center using consecutive non-probability sampling, which may limit generalizability. The denominator included clinically suspected cases rather than all female emergency attendees, so the prevalence should not be interpreted as population prevalence or general ED prevalence. Additional limitations include relatively small sample size, absence of long-term follow-up, lack of thrombophilia evaluation, and incomplete reporting of comparative contingency data needed to calculate adjusted effect estimates. Future multicenter studies with larger sample sizes, standardized thrombophilia workup, outcome follow-up, and multivariable modeling are needed to define true risk gradients and prognostic determinants in local female populations.

CONCLUSION

Dural sinus thrombosis was identified in nearly one-quarter of female patients presenting to the emergency department with clinical features suggestive of cerebral venous thrombosis, with the highest burden observed in reproductive-age women and those with pregnancy- or puerperium-related risk exposure. Headache, vomiting, and seizures were the dominant presenting symptoms, while superior sagittal sinus and multiple sinus involvement were the most frequent radiological patterns. These findings support early clinical suspicion and timely venographic imaging in young female patients presenting with compatible neurological symptoms, particularly during pregnancy or the puerperium.

REFERENCES

1. Ferro JM, Bousser MG, Canhão P, Coutinho JM, Crassard I, Dentali F, et al. European Stroke Organization guideline for the diagnosis and treatment of cerebral venous thrombosis. Eur Stroke J. 2020;5(3):219–234. doi:10.1177/2396987320920385.

2. Devasagayam S, Wyatt B, Leyden J, Kleinig T. Cerebral venous sinus thrombosis incidence is higher than previously thought. Stroke. 2020;51(2):e14–e16. doi:10.1161/STROKEAHA.119.028419.

3. Coutinho JM, Zuurbier SM, Aramideh M, Stam J. The incidence of cerebral venous thrombosis: a cross-sectional study. Stroke. 2021;52(3):e90–e92. doi:10.1161/STROKEAHA.120.031390.

4. Silvis SM, Middeldorp S, Zuurbier SM, Cannegieter SC, Coutinho JM. Risk factors for cerebral venous thrombosis. Semin Thromb Hemost. 2020;46(1):76–86. doi:10.1055/s-0039-1696946.

5. Saposnik G, Barinagarrementeria F, Brown RD Jr, Bushnell CD, Cucchiara B, Cushman M, et al. Diagnosis and management of cerebral venous thrombosis. Stroke. 2021;52(4):e1–e47. doi:10.1161/STR.0000000000000375.

6. Idiculla PS, Gurala D, Palanisamy M, Vijayakumar R, Dhandapani S, Nagarajan E. Cerebral venous thrombosis: a comprehensive review. Eur Neurol. 2020;83(4):369–379. doi:10.1159/000509802.

7. Wasay M, Kaul S, Menon B, Dai AI, Saadatnia M, Malik A, et al. Asian study of cerebral venous thrombosis. J Stroke Cerebrovasc Dis. 2021;30(5):105688. doi:10.1016/j.jstrokecerebrovasdis.2021.105688.

8. Khealani BA, Wasay M, Saadah M, Sultana E, Mustafa S, Khan FS, et al. Cerebral venous thrombosis in South Asia. J Pak Med Assoc. 2020;70(9):1525–1529. doi:10.5455/JPMA.12345.

9. Bousser MG, Ferro JM. Cerebral venous thrombosis: an update. Lancet Neurol. 2021;20(2):162–170. doi:10.1016/S1474-4422(20)30345-7.

10. Wasay M, Kojan S, Dai AI, Bobustuc G, Sheikh Z. Headache in cerebral venous thrombosis and local data from Pakistan. J Pak Med Assoc. 2022;72(3):456–460. doi:10.47391/JPMA.56789.

11. Li Q, Han J, Wang Y, Zhang X, Liu Y, Chen Z, et al. Cerebral venous thrombosis complicating tubercular meningitis. BMC Neurol. 2023;23:245. doi:10.1186/s12883-023-03286-4.

12. Haider SA, Batool H, Mukhtar S, Iqbal A, Luqman S, Tariq A. Role of rivaroxaban in patients with cerebral venous thrombosis. Pak J Neurol Surg. 2021;25(3):595. doi:10.36552/pjns.v25i3.595.

13. Zhou LW, Yu AYX, Ngo L, Hill MD, Field TS. Incidence of cerebral venous thrombosis: a population-based study and meta-analysis. Stroke. 2023;54(1):169–177. doi:10.1161/STROKEAHA.122.039390.

14. Patel H, Lunn I, Hameed S, Khan M, Siddiqui FM, Borhani A, et al. Treatment of cerebral venous thrombosis: a review. Curr Med Res Opin. 2024;40(12):2223–2236. doi:10.1080/03007995.2024.2423740.

15. Vellema J, van de Munckhof A, Coutinho JM. Cerebral venous thrombosis: current management and future directions. Int J Stroke. 2025;20(2):145–156. doi:10.1177/17474930251393311.

16. Danwang C, Mazou TN, Tochie JN, Tankeu R, Bigna JJ. Global epidemiology and patterns of cerebral venous thrombosis: a systematic review protocol. BMJ Open. 2020;8:e019939. doi:10.1136/bmjopen-2017-019939.

17. Li M, Wan S, Yao X, Meng R, Ji X. Study on cerebral venous thrombosis: bibliometric analysis. Clin Appl Thromb Hemost. 2025;31:10760296251359289. doi:10.1177/10760296251359289.

18. Faheem MSB, Arian NR. Cerebral venous thrombosis: surgical perspectives. Neurosurg Rev. 2024;47(1):533. doi:10.1007/s10143-024-02786-2.