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Original Research Paper

Radio-Diagnosis

SEASONAL VARIATION IN CEREBRAL VENOUS SINUS THROMBOSIS: A RETROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT Cerebral Venous Sinus Thrombosis (CVST) is a rare but potentially life-threatening condition with varied etiology. While seasonal patterns have been observed in arterial strokes, little is known about their influence on CVST. This paper analyzes a retrospective study from a rural medical college in Central India, covering CVST patients over a three-year period, to determine whether seasonal temperature fluctuations influence the incidence and clinical characteristics of CVST. The results suggest a significant increase in CVST cases during high-temperature months, with dehydration proposed as a key contributing factor. While numerous risk factors for CVST are well established, the role of seasonal variation in its incidence remains less clearly defined. Understanding seasonal trends may provide insight into environmental or behavioural triggers influencing CVST onset. **Objective:** To analyze the seasonal distribution of CVST cases and assess potential correlations with climatic factors such as temperature and humidity.

KEYWORDS :

INTRODUCTION

Cerebral venous sinus thrombosis (CVST) is an uncommon but increasingly recognized cause of stroke, particularly in younger individuals, accounts for approximately 0.5–3% of all strokes and is characterized by blood clotting in the cerebral venous or dural sinuses, and in rare instances, the cortical veins.1, 2 According to reports, the yearly incidence rate of CVST is 3–4 cases per million for adults and 7 cases per million for children.3. Despite being uncommon, CVST has a high mortality rate in the first month and significant neurological sequelae.3, 4 As compared with the to mid-1970s, before the advent of magnetic resonance imaging (MRI), CVST has been diagnosed more frequently over the past decade, and with time, more associated etiologies will be described.2,4

Prior to the development of antibiotics, infection was the primary cause of CVST; however, at the present time, a hypercoagulable state is the primary cause.5. Either an imbalance in the body's homeostasis or a diminished function of the natural antithrombotic system can cause venous thrombosis. Infection, brain tumors, inflammatory diseases, inherited thrombophilias, head trauma that results in cerebral hemorrhage, and specific drugs are some of the other factors causing this alteration.3, 4

Dehydration may have an essential role in venous thrombosis, particularly in neonates and infants.6 It is worth noting that several studies on arterial stroke have found seasonal and temporal variations in the incidence of such events, as well as a possible link between daily temperature and stroke incidence7-8.. The primary goal of this study was to determine whether there is an association between CVST occurrence and temperature; in other words, whether there is seasonal change in CVST.

In tropical countries like India, the monsoon season is associated with a rise in infectious diseases. Septic CVST, linked to infections such as otitis, mastoiditis, and systemic illness, may be more prevalent during this season (9).

This study investigates the seasonal distribution of CVST cases in a rural region of central India to explore the potential impact of climatic conditions on CVST onset and severity.

METHODOLOGY

Study Design and Setting

This was a retrospective observational study conducted at a tertiary rural care center in central India.

Study Duration

The data were collected over a period of 3 years from [March 2022 to July 2025].

Study Population

All patients diagnosed with Cerebral Venous Sinus Thrombosis (CVST) based on clinical features and radiological confirmation via magnetic resonance venography (MRV) and/or CT venography were included.

Inclusion Criteria

- Patients of all age groups and genders diagnosed with CVST.
- Radiological confirmation of thrombosis in one or more cerebral venous sinuses.
- Complete records including date of presentation and relevant clinical details.

Exclusion Criteria

- Incomplete or missing radiological data.
- Recurrent CVST cases (only first episode included).
- Patients with secondary CVST due to head trauma or neurosurgical procedures.

Data Collection

Patient data were retrieved from the hospital's medical records database. The following variables were extracted:

- Demographic details (age, sex)
- Date of symptom onset and hospital admission
- Clinical presentation
- Imaging findings
- Identified risk factors (e.g., dehydration, postpartum state, infections)

The date of hospital admission was used to categorize cases by season:

- **Winter:** October to February
- **Summer:** March to May.
- **Monsoon:** June to September

RESULTS

A total of 97 patients diagnosed with Cerebral Venous Sinus Thrombosis (CVST) were included in the study.

Demographic Profile

- The mean age of patients was 37 years.
- Of the 97 patients, 72 (74.2%) were male and 25 (25.8%) were female, resulting in a male-to-female ratio of approximately 2.9:1.
- Among the female patients, 4 (16%) were using oral contraceptive pills (OCP), and 4 (16%) were pregnant at the time of diagnosis.

Radiological Evaluation

- CT venography was used in 36 (37.1%) cases.
- MR venography was used in 61 (62.9%) patients.

In addition to cerebral sinus venous thrombosis other neuroimaging findings were

1) Hemorrhagic infarction was the most common finding, observed in 59 (60.8%) patients.
2) Isolated hemorrhage without infarction was seen in 10 (10.3%) cases.
3) Non-hemorrhagic infarcts were noted in 6 (6.2%) patients.

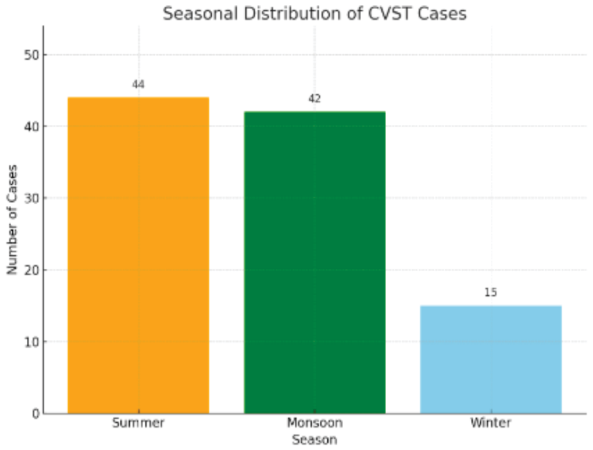
Finding Type	Number of Patients	Percentage
Hemorrhagic infarction	59	60.8%
Isolated hemorrhage without infarction	10	10.3%
Non-hemorrhagic infarcts	6	6.2%
Other/Unspecified	22	22.7%
Total	97	100%

Seasonal Distribution

Analysis of seasonal presentation revealed:

- Summer season accounted for the highest number of cases, with 44 (45.4%) patients presenting between March and May.
- Monsoon season (June to September) followed closely, with 42 (43.3%) cases.
- The lowest incidence was observed during the winter months (October to February), with only 15 (15.5%) cases.

This distribution indicates a possible seasonal variation in CVST occurrence, with a higher frequency during warmer and humid months (summer and monsoon) and reduced incidence during colder months.



DISCUSSION

The study reveals a distinct seasonal variation in CVST incidence, with a clear peak during the summer and monsoon months. The possible contributing factors are:

1. Dehydration during summer: Excessive heat leads to significant fluid loss, reducing plasma volume, increasing hematocrit and blood viscosity, and thereby fostering a pro-thrombotic state that may elevate the risk of thrombotic events.(10)
2. Infection-Related Thrombosis during Monsoon: The rainy season in India sees a spike in infections, including sinusitis, gastroenteritis, and systemic febrile illnesses. These infections can trigger inflammatory and hypercoagulable states, contributing to CVST [11].
3. Radiological Patterns: The predominance of hemorrhagic infarctions (60.8%) aligns with existing studies and is likely due to venous congestion and rupture of small veins under elevated intracranial pressure [12].
4. Gender Disparity: In the present study there is male predominance (2.9:1) which contrasts with Western data (13), where females often predominate due to hormonal risk factors, however the data is similar to other Indian studies (14) . Cultural and occupational differences may account for the variance in rural Indian settings .

Comparison With Literature

Previous studies have reported a summer peak in CVST cases, particularly from India and the Middle East. For instance:

- A large, region-specific cohort from South India (Vellore and surrounding districts) found that the majority of CVT cases (42.3%) occurred during summer months, compared with 32.7% in autumn and 25.0% in winter, confirming a significant summer incidence peak (15)
- A study from Iran similarly noted increased CVST incidence during elevated temperature periods (16).

In contrast, European data often shows no clear seasonal correlation:

- A Portuguese study observed a peak in CVST incidence during autumn and winter, not summer (17)

Limitations

- Retrospective design with potential record bias.
- Lack of environmental data (temperature, humidity, infection rates).
- Season defined by date of admission, not necessarily disease onset.
- Single-center study may not reflect broader epidemiological trends.

CONCLUSION

This study highlights a significant seasonal pattern in CVST incidence, with a higher frequency during summer and monsoon months. Recognizing environmental and behavioural risk factors may aid early diagnosis, especially in resource-limited and tropical settings. Public health measures promoting hydration and infection control during high-risk seasons could reduce CVST burden.

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