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A Study on Clinical Profile of Cerebral Venous Thrombosis

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KEYWORDS
Clinical profile, cerebral venous thrombosis, cross sectional study

ABSTRACT:
Background: Cerebral Venous Thrombosis (CVT), commonly known as Cerebral Venous Sinus Thrombosis (CVST), is a type of venous thrombosis that affects the dural venous sinuses and cerebral veins. It is a significant subtype of cerebrovascular disease and is a leading cause of stroke in young individuals in India. In fact, an autopsy series conducted in the late 1980s found that CVST accounted for nearly 10% of all strokes in India. Materials & Methods: This is hospital based cross sectional observational study which was conducted in the Department of general medicine of Private medical college with study period of 1 year. The total sample size of the study was 25 patients. The collected data was entered in Microsoft Excel. Coding of the variables was done. Analysis was done using SPSS software (Version 27, IBM). Results: Among the 25 patients, 9 males and 16 females were part of the study. Age distribution: 30 and 80 years groups each had one person (4% and 8% respectively). 31-40 years group had three individuals (12%), 41-50 years had six (24%), 51-60 years had seven (28%), and over 60 years had eight (32%). Co-morbidities affected 84%, with motor weakness in 76%, sensory deficit in 64%, seizures in 60%, lateral rectus restriction in 36%, and aphasia in 44%. Papilledema was in 24%, coma in 8%. Anaemia and hypertension affected 95% each. Diabetes mellitus affected 85%, infections 69%, autoimmune associations 37%, and malignancy 20%.Conclusion: CVT is a disease with various symptoms and clinical features, including stroke in young individuals. It is treatable and has a positive prognosis with improved imaging techniques. Alcohol consumption is a significant risk factor. The study aimed to provide information on risk factors and clinical manifestations. Further research is needed to better understand this condition.

INTRODUCTION

Cerebral Venous Thrombosis (CVT), also commonly referred to as Cerebral Venous Sinus Thrombosis (CVST), is a form of venous thrombosis that impacts the dural venous sinuses and cerebral veins[1]. It is a crucial subtype of cerebrovascular disease and is considered a primary cause of stroke in young individuals in India. In fact, an autopsy series conducted in the late 1980s discovered that CVST accounted for nearly 10% of all strokes in India.

Cerebral venous sinus thrombosis (CVT) is a disease that primarily affects young to middle-aged individuals, with females being more susceptible than males. CVT exhibits a wide range of clinical characteristics, including various predisposing factors, brain imaging findings, and diverse outcomes[2]. Predisposing factors, presentations, therapeutic options, and outcomes may differ significantly between developed and developing countries. The condition's clinical spectrum of symptoms can result in a delayed diagnosis, as symptoms may overlap with those of underlying diseases, such as meningitis, or yield normal findings in neuroimaging[3].

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CVT is a potentially life-threatening condition that requires early clinical suspicion and prompt treatment. When treated promptly and appropriately, most patients achieve an excellent outcome[4].

Venous occlusion is caused by three primary factors, which together form Virchow's triad: changes in blood stasis, abnormalities in vessel walls, and alterations in blood composition[5]. When the equilibrium between the pro-thrombotic and fibrinolytic processes becomes disrupted, it can result in progressive venous thrombosis[6].

Impeding the circulation of blood within veins results in a surge in venous pressure, which in turn diminishes blood flow through capillaries and elevates the amount of blood in the localized region of the brain [7]. Initially, the brain can counteract this by enlarging veins and engaging additional blood vessels to ensure sufficient blood supply. However, if the pressure persists for a protracted period, it can lead to the erosion of the blood-brain barrier, resulting in vasogenic edema, a condition where fluid egresses from blood vessels and accumulates within the brain tissue[8]. This could lead to a decrease in blood flow and oxygen delivery to the brain, culminating in tissue infarction and potentially causing both cytotoxic and vasogenic edema[9,10].

Disruptions to the blood-brain barrier caused by parenchymal hemorrhage or hemorrhagic infarction can exacerbate the problem. Researchers are exploring the causes, risk factors, and pathogenesis of CVST in various studies. In objective of our current study, To observe and evaluate the demographic factors , clinical features , aetiology , radiological and laboratory investigations and prognostic characteristics of the disease , in patients admitted in our hospital and to find the prevalence of the disease.

MATERIALS & METHODS

- This is hospital based cross sectional observational study which was conducted on radiologically confirmed cases of cerebral venous thrombosis admitted in general medicine department of meenakshi medical college hospital and research institute with study period of 1 year. The total sample size of the study was 25 patients. **Inclusion criteria** – 1) Patients admitted to the inpatient department of General Medicine Meenakshi Medical College and diagnosed as CVT. 2) Patients with risk factors for CVT such as oral contraceptives, hypercoagulable states , dehydration, alcoholism, head trauma and surgery,sinusitis. 3) Patients aged 18 years or older 4) Patients who provided consent. **Exclusion criteria** – 1) Patients whose clinical presentation could be explained by any other neurological disease. The study was approved by Institutional Ethics Committee of the private medical college. A written informed consent was obtained from all the patients.

Data collection method: The study will be conducted on patients of cerebral venous thrombosis. Diagnosis of CVT is based on clinical findings and radiological findings. In all patients history including demographic factors , symptoms, personal habits, comorbid illnesses, detailed menstrual and obstetric history in case of females will be taken. All the patients will be subjected to detailed clinical examination including general, neurological and other systems examination. CT brain and MRI brain with MRA and MRV will be done in the patients. . Routine Investigations like complete blood count, erythrocyte sedimentation rate (ESR),blood urea, blood sugar, serum creatinine, serum electrolytes, lipid profile, X-ray chest, Electrocardiogram, Elisa for Human Immunodeficiency Virus (HIV), VDRL will be done , and coagulation profile including bleeding time, clotting time, prothrombin time, activated partial thromboplastin time will be done in all patients. Specific investigations like antinuclear antibody (ANA), anti phospholipid antibodies, tests for procoagulant states like protein C, protein S, antithrombin III(AT III) and serum homocysteine with an aim to detect the underlying aetiology will be done in certain patients as needed

The collected data was entered in Microsoft Excel. Coding of the variables was done. Analysis was done using SPSS software (Version 27, IBM). Descriptive statistics was used. Association between categorical tests. The outcomes of the treatment groups were compared using a test to reach the hypothesis, a P value less than 0.5 was considered significant.

RESULT

This is hospital based cross sectional observational study which was conducted on radiologically confirmed cases of cerebral venous thrombosis admitted in general

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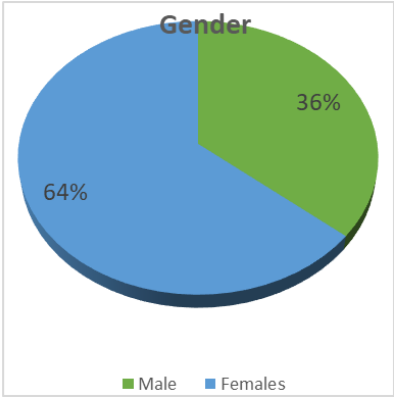
medicine department of meenakshi medical college hospital and research institute with study period of 1 year. The total sample size of the study was 25 patients.

Chart 1: Gender distribution among the study participants



Among the study patients, 9 (36%) were males and 16 (64%) were females. (**Chart 1)**

Table 1: Age distribution among the study participants

Age	Frequency (n)	Percentage (%)
< 30 years	1	4%
31 – 40 years	3	12%
41 – 50 years	6	24%
51. – 60 years	7	28%
>60 years	8	32%

Individuals under 30 years, comprises only one person, accounting for 4% of the total population. The next age group, those between 31 and 40 years, includes three individuals, making up 12% of the population. The 41 to 50 years age group contains six individuals, representing 24%. The 51 to 60 years age group is slightly larger, with seven individuals, constituting 28% of the population. The largest group is those over 60 years, with eight individuals, making up 32%. This distribution indicates a predominantly older population, as more than half of the individuals are over 50 years old. **(Table 1).**

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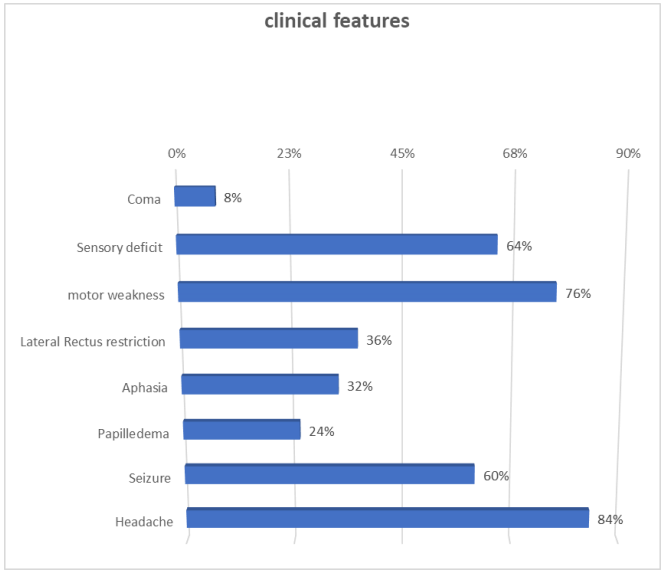
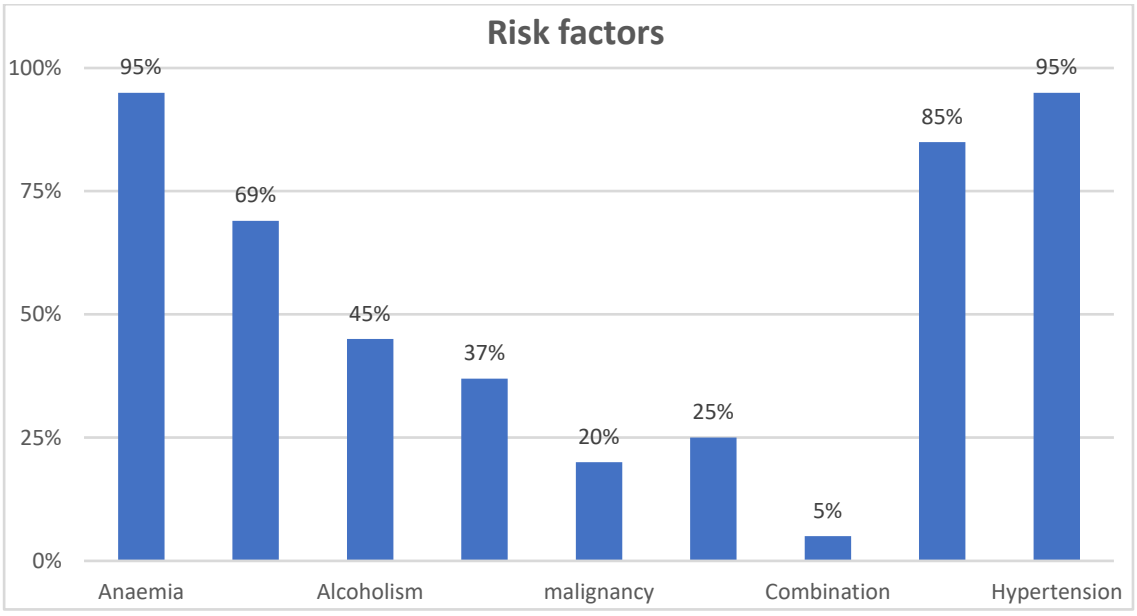
Chart 2: Details of clinical features



Headache is the most common co-morbidity, affecting 21 individuals, which constitutes 84% of the population. Motor weakness follows, impacting 19 individuals or 76% of the group. Sensory deficit is also prevalent, occurring in 16 individuals (64%). Seizures are reported by 15 individuals, accounting for 60% of the population. Lateral rectus restriction affects 9 individuals (36%), while aphasia is present in 11 individuals, making up 32%. Papilledema is less common, with 6 individuals (24%) experiencing it. Coma is the least common co-morbidity, reported by only 2 individuals, representing 8% of the population.(**Chart 2**)

Chart 3: Details on risk factors



The prevalence of various underlying conditions or associated factors within a given population, expressed as percentages. Anaemia and hypertension are the most prevalent conditions, each affecting 95% of the population. Diabetes mellitus is also highly common, present in 85% of individuals. Infection-related issues impact 69% of the population, indicating a significant association with infectious diseases. Alcoholism is noted

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in 45% of the individuals, while autoimmune associations are seen in 37%. Malignancy is present in 20% of the population, suggesting a smaller but notable prevalence of cancer. Interestingly, 25% of the cases have no identifiable cause, highlighting a substantial portion of idiopathic conditions. A combination of multiple conditions is observed in 5% of the individuals.

Table 2: Imaging findings and site among the participants

Radiological findings	Frequency (%)	Site	Frequency (%)
Hemorrhage parenchymal alone	9 (36%)	Superior sagital sinus	8(32%)
Hemorrhage with SAH SDH	4(16%)	Transverse and sigmoid	6(24%)
Hemorrhagic infarct	6(24%)	Deep-set cerebral veins	2(8%)
Edema	5(20%)	Isolated cortical vein	4(16%)
No change identified	2(8%)	Combination/mixed	5(20%)

Hemorrhage within the brain parenchyma is the most common finding, present in 36% of cases. Hemorrhagic infarcts and edema follow, observed in 24% and 20% of cases, respectively. Hemorrhages accompanied by subarachnoid or subdural hemorrhage (SAH/SDH) are noted in 16%, while no radiological changes are identified in 8% of cases. Regarding anatomical sites, the superior sagittal sinus is the most frequently affected, in 32% of cases, followed by the transverse and sigmoid sinuses at 24%. Isolated cortical vein involvement is seen in 16%, and deep-set cerebral veins in 8%. Mixed or combination site involvement occurs in 20% of cases.(**Table 2**)

Table 3: MRS findings among the patients

MRS	Frequency (%)
0	4(16%)
1	7(28%)
2	3(12%)
3	1(4%)
4	1(4%)
5	0(0%)
6	4(16%)

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A score of 1, representing no significant disability despite symptoms, is the most common, observed in 28% of cases. A score of 2, indicating slight disability, is present in 12% of individuals. Lastly, a score of 3 and 4, reflecting moderate disability, is the least frequent, occurring in 4% of the population. Score 5 as 0% and Score 6 as 16%. **(Table 3)**

Table 4: Recurrence rate:

Recurrence	**Frequency (%)**
Yes	8(32%)
No	17(68%)

Out of the total individuals, 32% (8 individuals) experienced a recurrence of the condition, while 68% (17 individuals) did not have any recurrence. (**Table 4**)

DISCUSSION:

In study done by Shanmugasundaram N et al[11], the number of male patients was higher, and most of them belonged to the younger age group. Previous studies have reported varying degrees of male and female preponderance. In the same study male majority could be attributed to the exclusion of puerperal CVST and the higher prevalence of alcoholism and associated metabolic and nutritional risk factors in males. Regarding symptoms, CVST-related headaches lack specific diagnostic features, but they usually have a progressive onset within hours or days. It is recommended that neuroimaging be performed when red flags for CVST, such as new-onset and persistent headaches, are present. Additionally, seizures are more commonly observed in this study.

A supratentorial parenchymal lesion on MRI was found to be the only independent risk factor for presenting seizures, as reported by Kalita et al.[6] Alcoholism, a known risk factor for thrombophilia, predisposes individuals to a pro-thrombotic state, leading to an increased incidence of CVST in such individuals. Alcoholism causes dehydration, hyperviscosity, and increased platelet reactivity, which contribute to the pro-thrombotic condition. Thrombophilic tendency, another common risk factor for CVST, was identified in 34% of patients in the ISCVST cohort, with a genetic pro-thrombotic condition found in 22% of all patients.

Rajiv et al. propose a comprehensive thrombophilia panel (inherited and acquired) that can be used to assess protein C levels, protein S (free) levels, antithrombin levels, Factor VIII Lupus anticoagulant, and serum homocysteine levels, which may be affected by the acute thrombotic state or the use of anticoagulants.

In the study finding of Shanmugasundaram N et al[12] When it comes to radiological manifestations, hemorrhagic infarction was more commonly observed than bleeding in this group of cases. The size of the lesion is connected to the formation of collateral veins in the affected venous segment. Venous hypertension resulting from poor outflow can lead to edema, cerebral venous infarction (which accounts for approximately 50% of cases), and hemorrhage. If there is thrombosis of the superior sagittal sinus or the dominant transverse sinus, it can impact the arachnoid granulation's absorption of cerebrospinal fluid, leading to an increase in cerebral swelling.

In terms of outcomes, the majority of patients who make a full recovery tend to achieve relative independence, which is typically measured on the modified Rankin Scale (mRS) as a score between 0 and 2. However, many patients experience mild residual symptoms, such as headaches, motor deficits, linguistic difficulties, impaired vision or cognition, and these often persist. Only about 5-10% of survivors of the acute phase remain moderately or severely dependent (mRS 3 or 4). This figure increases to 34% in cases of massive cerebral venous sinus thrombosis (CVST).

In the same study they found that most patients were in the recovery category of mRS 0 to 2, which is consistent with previous research. The overall incidence of

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recurrent venous thrombosis within the first year after a first episode of CVST is estimated to be around 4 per 100 patient-years, and the recurrence of CVST is 0.5% to 2.2%. Notably, male sex is associated with a sevenfold increased risk of recurrence. Studies on the long-term evaluation of the risk of recurrent thrombosis after anticoagulant therapy discontinuation have reported higher figures in the first period (5.0%, 2.6%, and 1.7% patient-years in the first, third, and tenth years after discontinuation). patients who did not continue treatment also experienced a recurrence and worsening of cerebral venous thrombosis in 6% of cases

CONCLUSION:

Cerebral venous thrombosis (CVT) is a complicated disease with a wide range of clinical features and various symptoms. It remains the most common treatable and reversible cause of stroke in young individuals due to modifiable risk factors. However, with increased suspicion and enhanced imaging techniques, the overall prognosis for CVT is favorable. Alcohol consumption is a significant modifiable risk factor for this condition. The aim of this study was to provide information on the risk factors and clinical manifestations in the study population. Additional research from our country is necessary to gain a better understanding of this clinical condition.

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Conflicts of interest: Nil

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