CHRONIC MENINGITIS: ETIOLOGICAL PATTERNS AND CLINICAL CHARACTERISTICS IN PATIENTS FROM A TERTIARY CARE CENTER IN EASTERN MAHARASHTRA

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Abstract

Background: Chronic meningitis, characterized by inflammation of the meninges persisting for at least four weeks, presents significant diagnostic and therapeutic challenges due to its diverse etiological agents and insidious onset. This study aims to analyze the etiological patterns and clinical characteristics of chronic meningitis in patients from a tertiary care center in Eastern Maharashtra.

Methods: A retrospective study was conducted over six months from May 2024 to June 2024, including 74 patients diagnosed with chronic meningitis. Data collected from medical records included demographic information, clinical presentation, laboratory findings, and outcomes. The study focused on the frequency and percentage of various etiological agents, clinical symptoms, and cerebrospinal fluid (CSF) characteristics. Statistical analysis involved expressing continuous variables as mean ± standard deviation and categorical variables as frequencies and percentages.

Results: The study found that Tuberculous Meningitis was the most common cause (71.6%), followed by viral meningitis (17.6%) and cryptococcal meningitis (6.8%). Clinical presentations included fever (81.1%), headache (73.0%), altered mental status (59.5%), and neck stiffness (71.6%). CSF analysis revealed increased protein levels in 67.6% of patients, low glucose levels in 45.9%, and pleocytosis in 71.6%. The gender distribution showed a higher prevalence in males (59.5%), and the majority of patients were aged 31-50 years (37.8%).

Conclusion: This study highlights Tuberculous Meningitis as the predominant cause of chronic meningitis in Eastern Maharashtra. Common clinical presentations and CSF abnormalities are crucial for diagnosis. Enhanced diagnostic facilities and targeted public health interventions are essential to reduce the morbidity and mortality associated with chronic meningitis in this region.

Keywords: Chronic meningitis, Tuberculous meningitis, Viral meningitis, Cryptococcal meningitis, Cerebrospinal fluid analysis, Eastern Maharashtra, Retrospective study.

Introduction

Chronic meningitis, characterized by prolonged inflammation of the meninges persisting for at least four weeks, represents a significant diagnostic and therapeutic challenge due to its varied etiological agents and often insidious onset. Unlike acute meningitis, which develops rapidly and presents with severe symptoms, chronic meningitis progresses slowly, leading to delayed diagnosis and treatment. This condition can result from a variety of infectious and non-infectious causes, including tuberculosis, fungal infections, viral infections, and autoimmune disorders [1,2].

The clinical presentation of chronic meningitis is often non-specific, overlapping with many other neurological conditions. Common symptoms include persistent headache, fever, altered mental status, neck stiffness, and various focal neurological deficits [1,3.] Cerebrospinal fluid (CSF) analysis plays a crucial role in the diagnosis, revealing abnormalities such as elevated protein levels, decreased glucose levels, and pleocytosis [4,5]. However, the interpretation of CSF findings requires careful consideration of the clinical context and potential differential diagnoses [1].In India, particularly in regions like Maharashtra, chronic meningitis remains a significant public health issue, often associated with high morbidity and mortality rates due to delayed diagnosis and limited access to advanced diagnostic facilities [6]. Eastern Maharashtra, with its unique demographic and epidemiological profile, provides a valuable setting for studying the patterns and outcomes of chronic meningitis.

This study aims to provide a comprehensive analysis of the etiological patterns and clinical characteristics of chronic meningitis patients at a tertiary care center in Eastern Maharashtra. By examining a cohort of 74 patients, we seek to identify common etiological agents, clinical presentations, and CSF findings, thereby contributing to improved diagnostic and therapeutic strategies for this challenging condition.

Methodology

This retrospective study was conducted at a tertiary care center in Eastern Maharashtra over a period of 6 months from May 2024 to June 2024. The study included a total of 74 patients diagnosed with chronic meningitis. The inclusion criteria for the study were patients who had clinical symptoms and signs of meningitis persisting for at least four weeks, supported by cerebrospinal fluid (CSF) analysis indicative of meningitis. Patients with acute meningitis or those with incomplete medical records were excluded from the study.Data collection involved a thorough review of patient medical records, which included demographic information, clinical presentation, laboratory findings, and outcomes. The parameters analyzed were sociodemographic factors (age and gender), etiological agents, clinical presentations, and CSF characteristics. Specifically, the study examined the frequency and percentage of various etiological agents (e.g., tuberculous, viral, cryptococcal, aspergillus, and bacterial meningitis), clinical symptoms (e.g., headache, fever, seizures, vomiting, altered mental status, hemiparesis, speech disturbances, cranial nerve palsy, neurological deficit, neck stiffness), and CSF findings (elevated protein levels, decreased glucose levels, pleocytosis, lymphocytic or neutrophilic differential leukocyte count).

Statistical analysis was performed using Microsoft office excel 2016, where continuous variables were expressed as mean ± standard deviation and categorical variables were presented as frequencies and percentages. Comparative analyses were conducted to evaluate the differences in clinical presentation and outcomes based on the etiological agents and demographic factors. The study aimed to identify patterns and correlations that could aid in the diagnosis and management of chronic meningitis in this specific population.

Results

The study included a total of 74 patients diagnosed with chronic meningitis. The gender distribution showed a higher prevalence in males (59.5%, n=44) compared to females (40.5%, n=30). The age distribution revealed that the majority of patients were between the ages of 31-50 years (37.8%,

n=28), followed by those aged 18-30 years (29.7%, n=22). Patients aged 51-60 years accounted for 18.9% (n=14), while those above 60 years comprised 2.7% (n=2).

Table 1: Demographic Distribution of Chronic Meningitis Patients

| Sociodemographic factors		Number of patients	Percentage
Gender	Male	44	59.5
	Female	30	40.5
Age	18 -30	22	29.7
	31 – 50	28	37.8
	51 – 60	14	18.9
	>60	2	2.7
Total		74	100

The etiological analysis showed that Tuberculous Meningitis was the most common cause, affecting 53 patients (71.6%), with a recovery rate of 88.7% (n=47) and a mortality rate of 11.3% (n=6). Viral Meningitis was identified in 13 patients (17.6%), with 84.6% (n=11) recovering and 15.4% (n=2) not recovering. Cryptococcal Meningitis accounted for 6.8% (n=5) of the cases, with an 80% recovery rate (n=4) and 20% mortality rate (n=1). Aspergillus Meningitis and Bacterial Meningitis were less common, each affecting 1.4% (n=1 and n=2, respectively) of the patients, all of whom recovered.

Table 2: Etiological Agents of Chronic Meningitis

Etiology and outcome of the chronic meningitis	Recovered/alive	Not recovered (death)	N
Tuberculous Meningitis	47	6	53
Viral Meningitis	11	2	13
Cryptococcal Meningitis	4	1	5
Aspergillus Meningits	1	0	1
Bacterial meningitis	2	0	2
Total	65	9	74

Clinical presentations varied among the patients, with the most common symptom being fever, reported by 81.1% (n=60) of the patients. Headache was the next most common symptom, experienced by 73.0% (n=54) of patients. Other notable symptoms included altered mental status in 59.5% (n=44), neck stiffness in 71.6% (n=53), and seizures in 43.2% (n=32). Vomiting was reported by 27.0% (n=20) of patients, while neurological deficits were observed in 14.9% (n=11) of cases. Hemiparesis, cranial nerve palsy, and speech disturbances were less frequently reported, affecting 8.1% (n=6), 8.1% (n=6), and 4.1% (n=3) of patients, respectively.

Figure 1: Clinical Presentations of Chronic Meningitis Patients
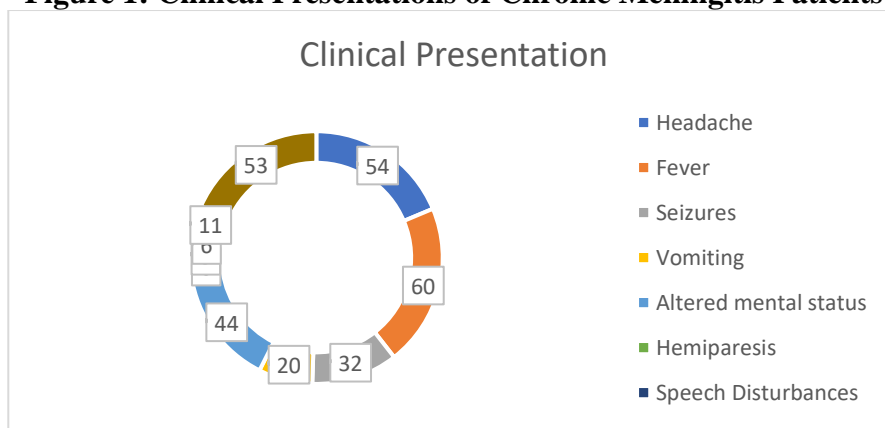
CSF analysis revealed that increased protein levels were observed in 32.4% (n=24) of the patients, with marked increases (>100 mg/dL) in 67.6% (n=50). Low glucose levels were found in 45.9% (n=34) of the patients, with markedly low levels (<40 mg/dL) in 35.1% (n=26). Normal glucose levels were noted in 17.6% (n=13) of cases. Pleocytosis was present in 71.6% (n=53) of the patients, with marked pleocytosis (>1000/mm³) in 28.4% (n=21). Differential leukocyte count (DLC) analysis showed a predominance of lymphocytic pleocytosis in 77.0% (n=57) of the patients and neutrophilic pleocytosis in 23.0% (n=17).

Table 3: Cerebrospinal Fluid (CSF) Analysis Results

CSF analysis	Interpretation	N	(%)
CSF protein	Increased	24	0.324
	Marked increase (>100)mg/dl	50	0.676
CSF Glucose	Low Glucose	34	0.459
	Markedly Low(40mg/dl)	26	0.351
	Normal	13	0.176
CSF TLC	Pleocytosis	53	0.716
	Marked Pleocytosis (>1000/mm3)	21	0.284
CSF DLC	Lymphocytic	57	0.77
	Neutrophilic	17	0.23

Sputum analysis for acid-fast bacilli (AFB) was positive in 31.1% (n=23) of the patients and negative in 13.5% (n=10). Gene Xpert analysis detected Mycobacterium tuberculosis (MTB) in 33.8% (n=25) of the patients, while MTB was not detected in 5.4% (n=4). In 14.9% (n=11) of cases, the test was not performed.

Table 4: Sputum and Gene Xpert Analysis Results

	Interpretation	**N**	**(%)**
Sputum	Positive	23	0.311
	Negative	10	0.135
Gene Xpert	MTB detcted	25	0.338
	MTB Not detcted	4	0.054
	Not done	11	0.149

Among the 74 patients, 21.6% (n=16) were HIV positive, while 78.4% (n=58) were HIV negative. Seizure types among the patients showed that 18.9% (n=14) experienced generalized tonic-clonic seizures (GCTS), 24.3% (n=18) had focal seizures, and 56.8% (n=42) had no seizures.

Discussion
This study aimed to provide a comprehensive analysis of the etiological patterns and clinical characteristics of chronic meningitis patients at a tertiary care center in Eastern Maharashtra. Chronic meningitis, defined by prolonged inflammation of the meninges lasting at least four weeks, poses significant diagnostic and therapeutic challenges due to its diverse etiological agents and often insidious onset. The study's findings are crucial for improving diagnostic and therapeutic strategies, especially in resource-limited settings.

Our study identified Tuberculous Meningitis (TBM) as the most prevalent cause of chronic meningitis, affecting 71.6% of patients. This finding aligns with recent studies highlighting TBM as a major contributor to chronic meningitis in regions with high tuberculosis prevalence. For instance, a study conducted in South India found that TBM accounted for 82.6% of meningitis cases in HIV-

positive patients[7]. Similarly, research from a tertiary hospital in Pakistan reported tuberculosis as the most common central nervous system infection, seen in 47.4% of cases [8].

Viral meningitis was the second most common cause, affecting 17.6% of the patients in our study. A study using multiplex PCR assays found that viral causes were detected in 40.4% of aseptic meningitis cases, with enterovirus and human herpesvirus 6 being the most common viruses identified [9]. These findings underscore the significance of viral infections in the etiology of chronic meningitis.

Cryptococcal meningitis, although less frequent, was associated with a high mortality rate of 20% in our study. This is consistent with findings from Northern Egypt, where Cryptococcus was the most common cause of meningitis in HIV patients, with a high associated mortality[10] (Abd El-Wahab et al., 2020).

The clinical presentation of chronic meningitis in our study was similar to those reported in other studies, with fever (81.1%) and headache (73.0%) being the most common symptoms. This aligns with a study from Vietnam where fever (93.9%) and vomiting (60.6%) were predominant symptoms in bacterial meningitis cases[11].

CSF analysis remains crucial for diagnosis, with our findings showing increased protein levels in 67.6% of patients, low glucose levels in 45.9%, and pleocytosis in 71.6%. These results are consistent with other studies highlighting similar CSF abnormalities in chronic meningitis patients[5].

Our study found a higher prevalence of chronic meningitis in males (59.5%) compared to females (40.5%), and the majority of patients were between the ages of 31-50 years (37.8%). These demographic trends are consistent with other studies that have reported a predominance of chronic meningitis in adult males[4].

Among our patients, 21.6% were HIV positive, highlighting the importance of targeted diagnostic and treatment strategies for this high-risk group. A study from South India found a similar trend, with a significant number of young male HIV-positive patients presenting with TBM[7]. Seizures were reported in 43.2% of our patients, which is notably high and indicates severe disease progression or delayed diagnosis.

Conclusion

This study provides a detailed analysis of the etiological patterns and clinical characteristics of chronic meningitis in patients from a tertiary care center in Eastern Maharashtra. The findings highlight that Tuberculous Meningitis (TBM) is the predominant cause, accounting for 71.6% of cases, followed by viral meningitis at 17.6%, and Cryptococcal meningitis at 6.8%. These etiological patterns are consistent with regional and global trends, underscoring the significant burden of tuberculosis and viral infections in the context of chronic meningitis.

The clinical presentations predominantly include fever, headache, altered mental status, and neck stiffness, which are common but nonspecific symptoms that complicate early diagnosis. Cerebrospinal fluid (CSF) analysis revealed increased protein levels, decreased glucose levels, and pleocytosis as critical diagnostic markers. These findings are crucial for clinicians in resource-limited settings to make timely and accurate diagnoses.

Demographically, the higher prevalence in males and the adult age group (31-50 years) aligns with existing literature, indicating the need for targeted public health interventions. The significant number of HIV-positive patients (21.6%) with chronic meningitis further emphasizes the need for integrated HIV and meningitis treatment programs.

Overall, this study underscores the necessity for enhanced diagnostic facilities, prompt treatment protocols, and public health strategies tailored to the epidemiological profile of Eastern Maharashtra. These measures are essential to reduce the high morbidity and mortality associated with chronic meningitis in this region.

Limitations

The retrospective design introduces potential biases related to data collection and accuracy, as reliance on medical records can result in incomplete or missing data. Being a single-center study, the findings may not be generalizable to other regions or healthcare settings, and the sample size of 74 patients may not capture the full spectrum of chronic meningitis cases. Advanced diagnostic tools were not uniformly available, possibly leading to underdiagnosis or misclassification of some etiological agents. The study did not comprehensively evaluate the impact of HIV status and other comorbidities on clinical outcomes, which could be significant confounding factors.

Conflict of Interest

The authors declare no conflict of interest related to this study.

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