Original Research Paper

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General Medicine

CLINICAL AND DEMOGRAPHIC PROFILE OF INFECTIVE MENINGITIS IN A TERTIARY CARE CENTER: A CROSS-SECTIONAL STUDY

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ABSTRACT **Background:** Infective meningitis is a neurological emergency with significant variability in clinical presentation and outcome. Timely recognition and management can substantially influence patient prognosis. **Methods:** A cross-sectional study was conducted over one year (January–December 2024) in two tertiary care hospitals in Chigateri General Hospital and Bapuji Hospital Davangere Karnataka. 94 adult patients (aged ≥18 years) with cerebrospinal fluid (CSF)-confirmed meningitis were included. Patients with partially treated meningitis or with only radiological diagnosis were excluded. Clinical presentation, laboratory findings, treatment timing, and outcomes were documented. **Results:** Viral meningitis (36.2%) was the most common type, followed by Pyogenic (29.8%), Tubercular (18.1%), and Cryptococcal meningitis (16.0%). Neurological deficits were present in 27.7% of cases. Seizures occurred in 31.9% of patients, with late-onset seizures associated with increased mortality. Overall mortality was 24.5%. Hyponatremia (serum sodium <130 mEq/L) was detected in 55.3% of patients and significantly correlated with poor outcomes. Patients who received early empirical treatment with Antimicrobials and Corticosteroids had improved recovery compared to those whose treatment was delayed. **Conclusion:** Viral meningitis was the most prevalent with relatively good outcomes, whereas Pyogenic meningitis had the highest mortality. Hyponatremia, delayed seizures, and the presence of neurological deficits were associated with poorer prognosis. Prompt empirical treatment and supportive care remain crucial.

KEYWORDS : Meningitis, Viral, Pyogenic, Tubercular, Cryptococcal, Hyponatremia, Neurological Deficit, Mortality, Cross-Sectional Study

INTRODUCTION

Meningitis, the inflammation of the meninges and subarachnoid space, is a serious infection that can lead to permanent neurological damage or death if not promptly treated. It may result from bacterial, viral, or fungal pathogens and presents with variable clinical manifestations including fever, altered sensorium, seizures, features of raised intracranial pressure and cranial nerve deficits [1]. Infective meningitis remains a significant burden in developing countries where access to diagnostics and timely therapy may be limited [2].

This study was conducted to assess the clinical and demographic trends of infective meningitis in a tertiary care setting and to identify prognostic indicators that can guide early management and improve outcomes.

MATERIALS AND METHODS

Study Design And Setting:

This was a cross-sectional study conducted from January to December 2024 at Bapuji Hospital and Chigateri District Hospital, affiliated with J.J.M. Medical College, Davangere Karnataka.

Inclusion Criteria:

- Age ≥18 years
- CSF analysis-confirmed diagnosis of meningitis

Exclusion Criteria:

- Partially treated meningitis cases
- Radiologically diagnosed meningitis without CSF confirmation.

Data Collection:

Total of 94 patients were studied over one year (January–December 2024) in two tertiary care hospitals - Chigateri General Hospital and Bapuji Hospital Davangere Karnataka affiliated to JJM Medical College Davangere. Each participant underwent a structured evaluation including demographic details, presenting symptoms, comorbid conditions (e.g., diabetes, hypertension), complete general and systemic examination, CSF and blood investigations, imaging (when needed), and treatment details. Neurological signs, including cranial nerve deficits and seizures, were noted. Outcomes included mortality, need for intensive care, and presence of residual neurological deficits at discharge.

Statistical Analysis:

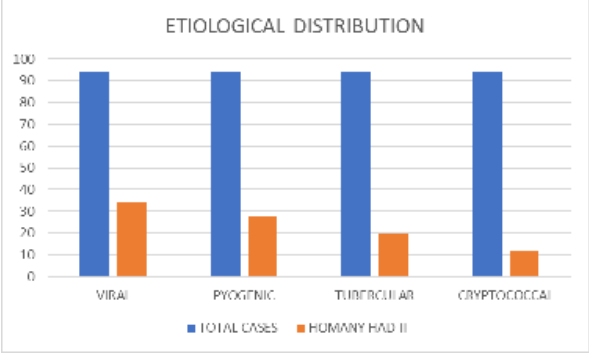
Descriptive statistics were used to summarize the data. Associations between clinical features and outcomes were evaluated qualitatively.

RESULTS

1. Etiological Distribution (Total - 94):

- Viral meningitis: 34 (36.17%)
- Pyogenic meningitis: 28 (29.79%)
- Tubercular meningitis: 20 (21.28%)
- Cryptococcal meningitis: 12 (12.77%)

Table 1:- Graphical Representation Of Etiological Distribution

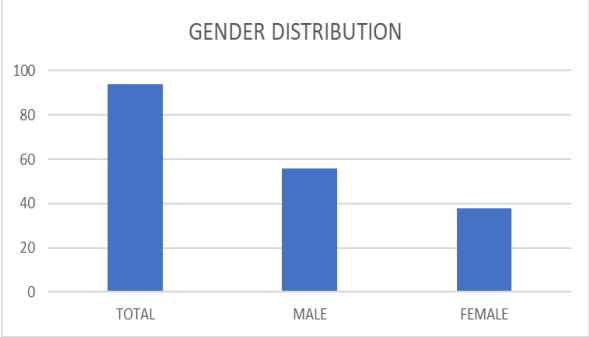


2. Demographics:

Mean age: 42 years (range 18–70 years)

Out of 94 patients 56 were Males and 38 were Females

Table 2 :- Graphical Representation Of Gender Distribution



3. Clinical Presentation:

Fever: 88 [93%]

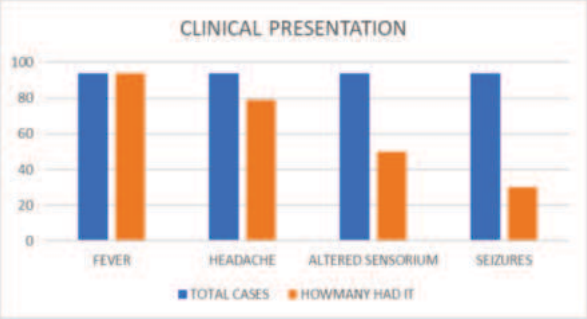
Headache: 79 [85%]

Altered mental status: 50 [54%]

Seizures: 30 [32%]

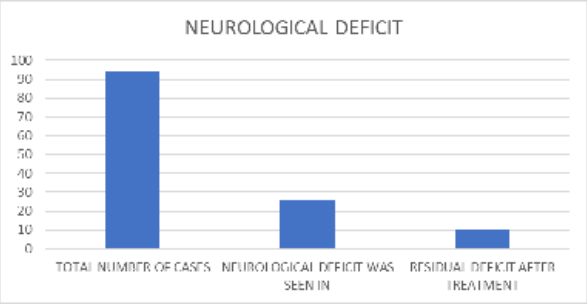
- 20 at admission
- 10 developed during hospital stay (8/10 of these patients died)

Table 3 :- Graphical Representation Of Clinical Presentation



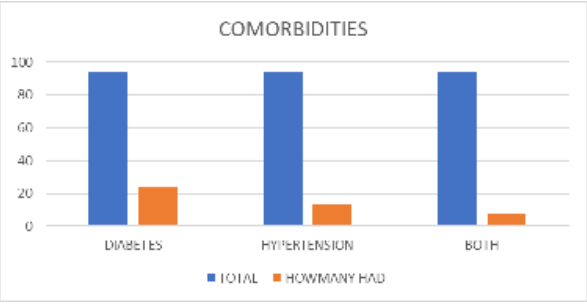
4. Neurological Deficits:
25 (27%) patients presented with neurological deficits (including hemiplegia, facial palsy, and ophthalmoplegia) and 10 of them had residual deficit after the treatment.

Table 4 :- Graphical Representation Of Patients With Neurological Deficits.



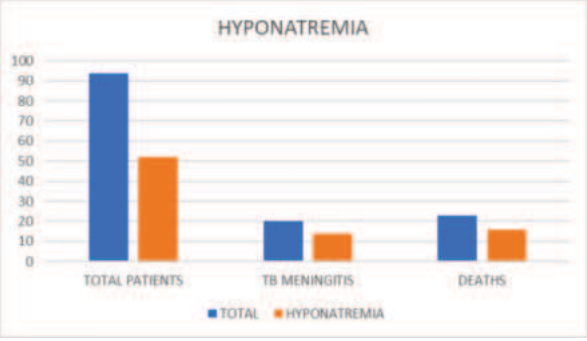
5. Comorbidities:
Diabetes: 24 patients
Hypertension: 13 patients
Both: 8 patients

Table 5 :- Graphical Representation Of Comorbidities



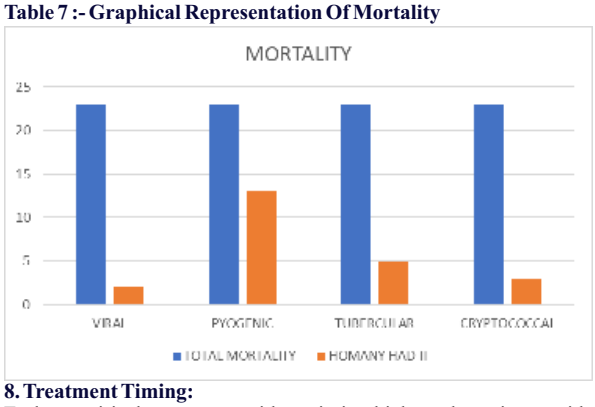
6. Hyponatremia:
Found in 52 patients (55.3%)
Common in tubercular meningitis (14/20)
16 of 23 deaths occurred in patients with hyponatremia

Table 6 :- Graphical Representation Of Hyponatremia And Its Associations



7. Mortality:
Total deaths: 23 (24.5%)
Pyogenic: 13
Tubercular: 5
Cryptococcal: 3
Viral: 2

Table 7 :- Graphical Representation Of Mortality



8. Treatment Timing:
Early empirical treatment with antimicrobials and corticosteroids before CSF results showed improved survival ($p < 0.05$)

DISCUSSION

This cross-sectional study highlights important clinical patterns in infective meningitis, aligning with recent data from Indian and global studies. Our findings of viral meningitis being the most common type with good prognosis mirrors results by Logan and MacMahon [3] and a study by Kaaij et al. in the Netherlands [8]. Conversely, pyogenic meningitis in our population had the highest mortality, similar to observations by Brouwer et al. [4] and Singh et al. [5], reinforcing the severity of bacterial meningitis when not treated promptly.

Hyponatremia was a prominent feature, especially in tubercular meningitis, as previously described by Misra et al. [6] and Kalita et al. [9], supporting its role as a negative prognostic marker. Our cryptococcal cases were exclusively among HIV-positive patients, corroborating global estimates of high cryptococcal disease burden in immunocompromised populations [7,10].

When compared with a South African study by Jarvis et al. [11], which reported a 31% mortality in cryptococcal meningitis, our mortality rate (20%) was lower, possibly due to earlier diagnosis and antifungal initiation. Moreover, our observation that early empirical treatment improved outcomes strongly supports current IDSA guidelines [12] and the WHO's emphasis on syndromic management in high-burden regions [13].

While this study's cross-sectional design limits causal inference, it offers important real-world insight into the burden and management outcomes of infective meningitis. It underscores the need for rapid empirical treatment, close monitoring of serum sodium, and tailored care for patients with comorbidities.

CONCLUSION

This study highlights that:

- Viral meningitis is the most common form with a favorable prognosis.
- Pyogenic meningitis carries the highest risk of mortality.
- Hyponatremia, delayed seizures, and initial neurological deficits are strong predictors of poor outcome.
- Prompt early and empirical treatment with antimicrobials and steroids is associated with improved outcomes.

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