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THE CLINICAL LANDSCAPE OF ADULT TUBERCULOUS MENINGITIS: A RETROSPECTIVE STUDY FROM A TERRITORY CENTER

Neurology

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ABSTRACT

Background: Tuberculous meningitis (TBM) is one of the most severe forms of extrapulmonary tuberculosis with high morbidity and mortality, particularly in endemic countries like India. **Objectives:** This study was conducted to describe the clinical profile, complications, and short-term outcomes of adult patients with TBM and to evaluate the association between British medical research council (BMRC) staging, hydrocephalus, and clinical outcomes. **Methods:** A retrospective single center observational study was conducted at a tertiary care center over a span of two years i.e (2023-2025), compromising 20 adult patients who met the diagnostic criteria for tuberculous meningitis. Data regarding demographics, clinical features, BMRC staging, complications, and outcomes at discharge were collected and analyzed using descriptive statistics and basic inferential tests. **Results:** The mean age was 44.5 ± 15.8 years with male predominance (55%). Common presenting symptoms were fever (90%), headache (60%), and vomiting (60%). BMRC Stage 2 was the most common (45%). Major complications included hydrocephalus (20%), altered sensorium (40%), limb paresis (20%), and ICU admission (30%). At discharge, complete recovery was observed in 12 patients (60%), residual neurological deficit in 2 (10%), mortality in 2 (10%), and leaving against medical advice (LAMA) in 4 (20%). BMRC Stage 3 was associated with higher rates of poor outcome (67% vs 20% in Stage 1, p=0.09). Hydrocephalus showed a suggestive association with poor outcome (p=0.12). **Conclusions:** TBM continues to cause significant neurological complications and morbidity. Advanced BMRC stage and hydrocephalus are important predictors of poor outcome. Early diagnosis, prompt anti-tubercular treatment, and aggressive management of complications are crucial to improve outcomes.

KEYWORDS

Tuberculous Meningitis, TBM, BMRC Staging, Hydrocephalus, Isoniazid Hepatitis

INTRODUCTION

Tuberculous clinically consequential form of extrapulmonary tuberculosis, characterized by profound neurological sequalae, high case fatality rates, and substantial long-term morbidity among affected individuals. Despite effective anti-tubercular therapy, it is associated with high mortality and long-term neurological sequelae, especially in high-burden countries like India[1,2]. Delayed diagnosis and advanced disease at presentation are major contributors to poor prognosis. The BMRC staging system is a widely used tool for prognostication and severity classification. Common complications include hydrocephalus, cerebral infarction, cranial nerve involvement, and raised intracranial pressure[3]. This study aimed to describe the clinical spectrum, complications, and short-term outcomes of adult TBM patients at our tertiary meningitis (TBM) constitutes the most severe and care center.

METHODS

This retrospective observational study was conducted by reviewing medical records of adult patients admitted with TBM. Diagnosis was based on clinical presentation, cerebrospinal fluid (CSF) analysis, neuroimaging, and therapeutic response.

Data collected included demographics, duration of symptoms, presenting complaints, GCS score, BMRC stage at admission, comorbidities, neurological and radiological complications, treatment-related adverse events (e.g., isoniazid-induced hepatitis), and clinical outcome at discharge.

Descriptive statistics were used. Associations between variables were analyzed using Chi-square test or Fisher's exact test. A p-value <0.05 was considered statistically significant. Due to the small sample size, emphasis was also placed on observed trends.

RESULTS:

Table 1: Presentations

Variable	Findings
Age	Mean 44.5 ± 15.8 years (Range 22–66 years)
Gender	Male 11 (55%), Female 9 (45%)
Duration of symptoms	Median 10 days (Range 2–60 days)
Common symptoms	Fever 18 (90%), Headache 12 (60%), Vomiting 12 (60%), Altered sensorium 9 (45%)
BMRC Stage at admission	Stage 1: 5 (25%), Stage 2: 9 (45%), Stage 3: 6 (30%)
Comorbidities	Hypertension 8 (40%), Diabetes mellitus 5 (25%)
Median hospital stay	13.5 days (Range 2–32 days)

Table 2: Neurological and Radiological Complications in Adult TBM Patients (n=20)

Complication	Number (%)
Hydrocephalus	4 (20)
Altered sensorium	8 (40)
Cerebral infarction	2 (10)
Tuberculoma	1 (5)
Cranial nerve involvement	3 (15)
Raised ICP	3 (15)
Mechanical ventilation	2 (10)
VP shunt	1 (5)
Limb power loss (≥1 limb)	4 (20)
ICU admission	6 (30)
Isoniazid-induced hepatitis	2 (10)

Table 3: Clinical Outcomes at Discharge (n=20)

Outcome	Number (%)
Complete recovery	12 (60)
Residual neurological deficit	2 (10)
Mortality	2 (10)

Table 4: Association Between BMRC Stage and Outcome (n=20)

BMRC Stage	Complete Recovery	Poor Outcome*	Total	Poor Outcome (%)
Stage 1	4	1	5	20
Stage 2	6	3	9	33
Stage 3	2	4	6	67
Total	12	8	20	40

*Poor outcome = Residual deficit + Mortality + LAMA Chi-square test: $\chi^2 = 4.82$, $p = 0.09$

Table 5: Association Between Hydrocephalus and Outcome (n=20)

Hydrocephalus	Complete Recovery	Poor Outcome	Total
Present	1 (25%)	3 (75%)	4
Absent	11 (69%)	5 (31%)	16

DISCUSSION

The clinical presentation observed in the present study, characterized by fever (90%), headache (60%), vomiting (60%), altered sensorium (45%), and meningeal signs, closely aligns with the classical symptomatology of tuberculous meningitis (TBM) described in endemic regions[1,4] These manifestations, however, remain inherently non-specific, frequently contributing to diagnostic delays, as evidenced by the wide range of symptom duration observed in the present cohort (2–60 days). Such delays inevitably contribute to disease progression and advanced BMRC staging at the time of hospital admission[5].

Hydrocephalus represented the most prevalent radiological complication in the present cohort (20%), consistent with its well-documented high prevalence in TBM, attributable to basal exudate formation impairing cerebrospinal fluid (CSF) circulation and absorption[6,7]. Furthermore, hydrocephalus demonstrated a clinically meaningful, though statistically non-significant, association with unfavorable outcomes (poor outcome rate: 75%; p=0.12), a finding aligned with prior investigations consistently identifying hydrocephalus as a significant independent predictor of mortality and persistent neurological sequelae in TBM[7,8]. Additional neurological complications, including cerebral infarction (10%), cranial nerve palsies (15%), and raised intracranial pressure (15%), reflect the underlying vasculitic and inflammatory pathophysiology of TBM involving the basal meninges, findings comparable to those reported from other high-burden settings.

A clinically significant finding in the present study was the association between BMRC staging at admission and short-term clinical outcomes. Patients presenting with BMRC Stage III disease demonstrated a markedly higher poor outcome rate (67%) compared to those with BMRC Stage I (20%), with a trend approaching statistical significance (p=0.09). This observation strongly corroborates the prognostic utility of the BMRC staging system, as validated across multiple prospective cohort studies and meta-analyses. Advanced staging at presentation, frequently attributable to diagnostic delays and prevalent comorbidities including hypertension and diabetes mellitus, present in 40% and 25% of the study cohort, respectively remains among the most consistent and well-established predictors of adverse clinical outcomes in TBM[5].

The overall in-hospital mortality rate in the present study was 10%, comparatively lower than the 20–50% mortality rates reported across global and Indian case series. This relatively favorable mortality rate may be attributed to the limited sample size, access to tertiary-level hospital-based care, and timely therapeutic intervention in a proportion of cases. Notably, 20% of patients left against medical advice underscoring the persistent influence of socioeconomic barriers and healthcare access limitations inherent to resource-constrained settings[10]. Treatment-related adverse effects, particularly isoniazid-induced hepatotoxicity (10%), emphasize the imperative for systematic and regular monitoring of hepatic function indices throughout the course of anti-tubercular therapy (ATT)[11].

The principal strengths of the present study include the provision of real-world clinical data from a TBM-endemic region, with exploratory correlation analyses conducted between key prognostic determinants and short-term clinical outcomes. Acknowledged limitations include the small sample size (n=20), retrospective study design, incomplete clinical documentation, absence of long-term follow-up data, and limited availability of microbiological confirmation data. These constraints necessitate cautious interpretation of the findings and underscore the need for larger, prospective, multicenter studies to validate the observations reported.

CONCLUSIONS

This study highlights the significant neurological burden of tuberculous meningitis in adults. BMRC staging and hydrocephalus are useful prognostic indicators. Early suspicion, prompt anti-tubercular therapy combined with corticosteroids, and aggressive management of complications are essential. Larger prospective studies are warranted.

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