Original Research Article

Clinico-epidemiological profile of meningitis patients diagnosed at a tertiary care hospital in Mumbai

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Abstract

Introduction: Meningitis is an inflammatory disease of the leptomeninges, the tissues surrounding the brain and spinal cord. Recently improved awareness, extensively available antibiotics and vaccines can change the epidemiological pattern of the disease.

Materials and methods: The present observational study was conducted in the Department of Medicine, Lokmanya Tilak Municipal Medical College and Hospital from February 2016 till August 2017. The study population consisted of 100 patients admitted with features of acute meningitis. All meningitis and meningococcemia cases diagnosed according to the clinical and/or laboratory criteria during the study period were included in the study. Demographic and clinical data of the patients were recorded.

Results: Of all the patients included in the study, 38% were diagnosed as bacterial meningitis, 54% as tubercular meningitis and rest as viral meningitis. All patients presented with symptoms of fever and neck stiffness. Headache, vomiting and altered sensorium were other common complaints. Most common CT head findings were that of a basal meningeal enhancement (89%). CSF was clear in 62% of the patients and raised erythrocyte count was observed in 74% of the patients. Mean adenosine deaminase (ADA) of the CSF in the study population was 7.93 ± 6.24 IU/L, ranging from 1 to 43 IU/L. Mean CSF C-reactive protein (CRP) in the study was 5.83 ± 7.11 mg/L, ranging from 0 to 25 mg/L.

Conclusion: Understanding the current and future trends in meningitis are needed to improve the quality of patient care and outcomes.

Key words

Meningococcus, India, Epidemiology, Aseptic meningitis.

Introduction

Meningitis is an inflammatory disease of the leptomeninges, the tissues surrounding the brain and spinal cord. Approximately 1.2 million cases of bacterial meningitis occur annually worldwide [1]. Meningitis is among the ten most common infectious causes of death and is responsible for approximately 135,000 deaths throughout the world each year. Pneumonia and meningitis have been reported as the leading causes of deaths among under five children in India [2]. Neurologic sequelae are common among survivors and meningitis is therefore considered a medical emergency [3]. Hence infections involving the central nervous system (CNS) particularly meningitis and encephalitis are likely to arouse tremendous anxiety in the physicians and patients and therefore early recognition, efficient decision making and rapid institution of therapy can be lifesaving.

The community based incidence of acute meningitis in India is unknown. Additionally, the exact etiological diagnosis is usually possible in every diagnosed case, as the traditional microbiological diagnosis is time consuming and newer techniques are expensive. Prior antibiotic therapy resulting low bacterial load also makes the etiological diagnosis difficult. As a result, very scarce literature emerges from India which sheds light on the etiological and epidemiological factors associated with acute meningitis. Recently improved awareness, extensively available antibiotics and vaccines can change the epidemiological pattern of the disease. This study aimed to study the clinical profile of patients diagnosed and admitted with meningitis at our hospital.

Materials and methods

The present observational study was conducted in the Department of Medicine, Lokmanya Tilak Municipal Medical College and Hospital from February 2016 till August 2017. Our institute, a government tertiary care teaching hospital in Mumbai caters the referred patients from Mumbai and adjoining districts and villages. Institutional Ethics Committee approval was obtained before starting the study. The study population consisted of patients admitted with features of acute meningitis. Patients with carcinomatous meningitis and degenerative neurological disorders were excluded from the study. Written consent was obtained from the patients or their attendants before recruitment into the study. Refusal to consent for the study did not affect the management of the patients in any manner. All meningitis and meningococcemia cases diagnosed according to the clinical and/or laboratory criteria during the study period were included in the study. Clinical criteria for diagnosis of meningitis included fever, headache, vomit, neck stiffness, signs of meningeal irritation, seizures, and/or rash. Laboratory confirmation included biochemical and microbiological examination of the cerebrospinal fluid (CSF), including culture and or antigen detection. Plain and contrast-enhanced computed tomography (CT) scan brain was done in all patients.

Diagnosis of tubercular meningitis was made based on Maria's criteria [4] supported by findings of mycobacterial culture by conventional and automated method, CSF cytology and staining, polymerase chain reaction (PCR), and line probe assay (LPA). Lowenstein-Jensen's medium (LJ) was used for the detection of Mycobacterium tuberculosis complex by conventional culture with weekly inspection. Bacterial meningitis was diagnosed based on Gram's staining of the centrifuged deposit of CSF and culture done on a plate of chocolate agar, 5% sheep blood agar, MacConkey and a tube of brain heart infusion broth, incubated for 24-48 hours in humid air plus 5-10% CO_2 at 37 degrees. A case of viral meningitis was defined on the basis of following criteria: fever, signs and

symptoms of brain inflammation, CSF white blood cell count C10/mm3 and routine CSF culture negative for common bacteria.

Demographic data of the patients were obtained from the medical records. Clinical history of the patient, findings of the clinical examination and findings of the laboratory investigations were noted in a pre-designed semi-structured questionnaire. Data were summarized by descriptive statistics i.e., mean and standard deviation for numerical variables and frequency and percentages for categorical variables. All patients were treated by supportive care like intravenous fluid, correction of electrolytes, decongestive measures to reduce intracranial tension, ionotropes in hemodynamic instability, maintenance of blood glucose, anticonvulsants, antibiotics, antiviral, psychiatric management as and when needed.

Results

Over a period of 18 months, 100 patients were enrolled in the study. Most common age group of the patients was 21 to 40 years (45%) and 48% were males. Clinical presentation was that of meningitis alone in 88% of the patients, meningoencephalitis in 44% of the patients had 73% had a classical triad of fever, altered sensorium and neck stiffness (**Table - 1**). Of all the patients included in the study, 38% were diagnosed as bacterial meningitis, 54% as tubercular meningitis and rest as viral meningitis. Based on the history provided by the patients, 17% were alcoholics, 3% were smokers and 4% were alcoholics and smokers both. Furthermore, 57% of the patients were anemic. All patients presented with symptoms of fever and neck stiffness. Headache, vomiting and altered sensorium were other common complaints (**Table - 2**). Anorexia, weight loss and night sweats were reported by 49% of the patients, and cough more than two weeks by 31%. Sixty percent of all patients had illness of more than 5 days at the time of presentation at the hospital. Cranial nerve 6 was the most commonly involved cranial nerve. Most common CT head findings were that of a basal meningeal enhancement (89%). Tuberculoma (26%), and pre-contrast basal hyperdensity (32%) were other commonly noted CT head findings. CSF was clear in 62% of the patients and raised erythrocyte count was observed in 74% of the patients. Mean adenosine deaminase (ADA) of the CSF in the study population was 7.93 ± 6.24 IU/L, ranging from 1 to 43 IU/L. Mean CSF C-reactive protein (CRP) in the study was 5.83 ± 7.11 mg/L, ranging from 0 to 25 mg/L.

Table – 1: Distribution of patients according to their baseline characteristics.

Age distribution (in years)	**Frequency (%)**
Less than 20 years	28 (28%)
21 to 40	45 (45%)
41 to 60	23 (23%)
61 to 80	03 (03%)
More than 80	01 (01%)
Gender distribution	
Females	48 (48%)
Males	52 (52%)
Diagnosis	
Bacterial meningitis	38 (38%)
Tubercular meningitis	54 (54%)
Viral meningitis	08 (08%)
Risk factors	
Alcohol	17 (17%)
Smoking	03 (03%)
Smoking and alcohol	04 (04%)
Intravenous drug abuse	01 (01%)
None	75 (75%)
Clinical presentation	
Meningitis	88 (88%)
Meningoencephalitis	44 (44%)
Triad (fever + altered sensorium + neck stiffness)	73 (73%)

Discussion

This observational study describes the clinico-epidemiological profile of patients diagnosed and admitted with meningitis during 18 month period in our hospital. Majority of the patients in our study were diagnosed with tubercular meningitis. Possibly because were excluded patients aged

less than 12 years, the proportion of patients with bacterial meningitis was less. Previous outbreaks of bacterial meningitis in India have shown that it is predominantly a disease of young children with a male preponderance. However, during epidemics, there is a marked shift in the age profile of cases of meningitis, with an increasing proportion of cases occurring in adults [5]. We had higher proportion of male patients in the study, which has been reported earlier as well [6]. Lower health seeking and utilization rates among females in India can also explain lower proportion of female patients in our study [7]. More than half of all patients in our study were anemic. Previous authors have demonstrated anemia as a risk factor for the development of bacterial meningitis [8]. In addition, though not assessed in the present study, crowded houses and smoking also encourage the development of meningitis. Smoking diminishes the protective capacity of epithelial cells covering the respiratory tract.

Table – 2: Clinical information of the patients included in the study.

Variables	n (%)
Clinical symptoms	
Fever	100 (100%)
Neck stiffness	100 (100%)
Headache	97 (97%)
Vomiting	90 (90%)
Altered sensorium	73 (73%)
Convulsions	47 (47%)
Photophobia	02 (02%)
Duration of illness	
Less than 5 days	40 (40%)
More than 5 days	60 (60%)
Cranial nerve (CN) involvement	
CN 3, 6	02 (02%)
CN 3, 4, 6	01 (01%)
CN 6	07 (07%)
CN 6, 7	01 (01%)
Computed tomography findings	
Hydrocephalus	08 (08%)
Basal meningeal enhancement	89 (89%)
Tuberculoma	26 (26%)
Infarct	10 (10%)
Pre-contrast basal hyperdensity	32 (32%)
Cerebrospinal fluid appearance	
Clear	62 (62%)
Cloudy	11 (11%)
Haziness	01 (01%)
Straw colored	02 (02%)
Turbid	24 (24%)
Raised erythrocyte sedimentation rate	74 (74%)

Table – 3: Cerebrospinal fluid adenosine deaminase and C-reactive protein in meningitis patients.

Investigation	Mean ± Standard deviation	Range
Adenosine deaminase (IU/L)	7.93 ± 6.24	1 – 43
C-reactive protein (mg/L)	5.83 ± 7.11	0 - 25

Patients with bacterial meningitis are usually quite ill and often present soon after symptom onset. For instance, in a series of 301 adults, the median duration of symptoms before admission was only 24 hours (range one hour to 14 days) [9]. The classic triad of acute bacterial meningitis consists of fever, nuchal rigidity, and a change in mental status, although an appreciable number of patients do not have all three features, which was also the case in 27% of the patients in our study [10]. Moreover, the classic triad has been shown to occur more likely in patients with pneumococcal compared to meningococcal meningitis [10]. It must be noted that older adults, especially those with underlying conditions such as diabetes mellitus or cardiopulmonary disease may present insidiously with lethargy, no fever, and variable signs of meningeal inflammation [11]. CSF ADA and CRP levels were elevated in our patient population. ADA is present mainly in T lymphocytes and is therefore considered to indicate the cell-mediated immunity. ADA plays an important role in lymphocytic proliferation and a cell-mediated immune response, like in tubercular meningitis, tends to result in elevation

of. As the cell mediated immune response is seen in TBM, ADA levels are also elevated.

There are a few limitations in this study. First, this is a cross sectional study of only those cases which were notified and diagnosed as meningitis; thus the true burden of disease in the community may have been under-reported. Secondly, presumed cases of viral meningitis could have represented cases of partially treated bacterial meningitis, thus affecting the results. Finally, our study did not follow up the patients and note the complications including the neurological outcomes and overall survivor rate.

Conclusion

The diagnosis and management of meningitis in the adult patients is complex and varies with their age, as well as by the presence of numerous comorbid conditions. Clinical presentation of the patients can help a physician in clinching the diagnosis and various risk factors present should be factored in while planning the treatment plan.

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