



OBSERVATIONAL STUDY ON CLINICAL FEATURES AND PROGNOSTIC FACTORS OF MENINGITIS IN A TERTIARY HEALTH CARE CENTRE IN NORTH INDIA

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ABSTRACT

Meningitis is a worldwide prevalent disease with great adversity and mortality. It exists in different types and varies from region to region. Many studies have been conducted on meningitis especially in pediatric age group, but the exact data in terms of regional information regarding trends, early diagnosis of prognostic factors and prompt treatment patterns is inadequate in adults. Hence, this study was conducted in a tertiary care hospital in North India to study the various prognostic factors of meningitis. It was an observational, retrospective study. The data was collected from the previous medical records of the hospital and all the details regarding demography, clinical presentations, etiology, CSF findings and outcomes were recorded and analyzed statistically. A total of 238 cases were recorded and studied. Majority of the cases were diagnosed with viral/aseptic meningitis followed by pyogenic, tuberculous and fungal meningitis. Diabetes mellitus and smoking were the most significant risk factors predisposing the patients to meningitis in our study. majority of the patients (32%) presented with the classical triad of altered mental sensorium, headache with fever and neck stiffness according to the records. A higher incidence of CSF protein was found in pyogenic meningitis. ADA value was significantly elevated in tuberculous meningitis. Eighty six patients suffering from viral/aseptic meningitis improved whereas 11 patients suffering from pyogenic meningitis succumbed to the disease. The early identification of various prognostic factors, early diagnosis and prompt initiation of treatment would reduce the serious complications and mortality.

KEYWORDS : meningitis, outcome, prognostic factors, outcome

INTRODUCTION

Meningitis is an infectious disease of the meninges which can be potentially fatal. Etiology of meningitis may vary from region to region. It mostly presents with the classical signs and symptoms like headache, fever, vomiting and neck stiffness. Some patients may also present with more serious symptoms like agitation, seizures and even coma. Meningitis is also an important cause of death.

Although it is a life threatening disease worldwide, its exact incidence remains unknown.

However, meningitis was associated with approximately 4,20,000 deaths globally in the decades from 1990 to 2010.⁽¹⁾ In India there are very few studies of prognostic indicators of meningitis in adults. Majority of the studies have been conducted in pediatric age group in whom the etiology and the risk factors are different than those in adults. Given the adverse complications or death resulting from meningitis, the identification of the clinical signs and laboratory investigations on admission to the hospital would contribute in minimizing the occurrence of these sequelae.

MATERIALS AND METHODS

It was an observational, descriptive, record-based study conducted at a tertiary care hospital in North India. The approval was taken from the Ethics Committee of the hospital before conducting the study. The medical records of all the patients suffering from meningitis were collected and reviewed. The data was obtained for the time duration from January 2015 to January 2018. Information like details of demographic data, clinical presentation and other laboratory investigation such as CSF reports of each patient was recorded. The complete course, treatment and outcomes were also noted. The records of the patients which did not have all the details were excluded from the study.

The statistical analysis of the obtained data was conducted. P value < 0.05 was considered significant wherever required. The chi-square test was used to compare the risk of meningitis in the diabetic population versus the nondiabetic population; and, the association between the type of meningitis and the occurrence of seizures and the smokers. Mantel-Haenszel chi-square test was used to determine the association between the type of meningitis and the adenosine deaminase levels (ADA) levels.

RESULTS

Total cases of meningitis evaluated in the study were 238. Higher preponderance of meningitis was seen in the male patients (75.21%) as compared to the females (24.78%). The maximum number (46.2%) of patients suffering from meningitis was within the age group of 21 to 40 years. (Table 1)

Table 1: Demographic profile of the patients

Demographics	No. of patients (n=238)
Gender	
Male	179 (75.21%)
Female	59 (24.78%)
Age groups (years)	
<20	07 (2.94%)
21-40	110 (46.2%)
41-60	81 (34%)
61-80	32 (13.44%)
>80	08 (3.42%)

Propensity of developing meningitis was significantly more (P<0.05) with the patients suffering from diabetes mellitus and smoking. The other risk factors associated with the disease were alcoholism, respiratory tract infections, head trauma and tuberculosis. (Table 2)

Table 2: Risk factors for meningitis

Risk factor	No. of patients (n=238)
Diabetes Mellitus	76 (31.92%)*
Smoking	81 (34.02%)*
Neurosurgery/Ventriculoperitoneal shunt	09 (3.78%)
Alcoholism	42 (17.64%)
Respiratory tract infection Immunocompromised status Hydrocephalus	33 (13.86%)
Head trauma	11 (4.62%)
Stroke	04 (1.68%)
Migraine	08 (3.36%)
Cerebrospinal fluid rhinorrhea, otorrhea Tuberculosis	03 (1.26%)
High dose steroids	12 (5.04%)
None	03 (1.26%)
	35 (14.7%)

* Statistically significant at P<0.05; #Chi-square test

In our study the most common type of meningitis observed was viral/aseptic meningitis (53.76%), followed by the occurrence of pyogenic (24.78%) and tuberculous meningitis (18.48%). We could record only 4 cases of fungal meningitis. (Table 3)

Table 3: Categorization based on the etiology

Type	Total no (n=238)
Viral/aseptic meningitis	128 (53.76%)
Pyogenic meningitis	59 (24.78%)
Tuberculous meningitis	44 (18.48%)
Fungal meningitis	04 (1.68%)
Others (cancer-related, chemical)	03 (1.26%)

Amongst the observed clinical signs and symptoms, majority of the patients (32%) presented with the classical triad of altered mental sensorium, headache with fever and neck stiffness according to the records. At least two out of the three symptoms were present in the majority (88%) of the patients. Other commonly recorded symptoms were vomiting, seizures, excessive drowsiness and irritability. Some patients also reported photophobia and petechiae or purpuric rashes whereas few landed up in coma. (Table 4)

Table 4: Clinical features according to the types of meningitis

	Viral/Aseptic (n=128)	Pyogenic (n=59)	TBM (n=44)	Fungal (n=04)	Others (n=03)
AMS	102*	38	11	03	03
Fever	110*	40	10	03	01

Table 5: Mean values of abnormal CSF fluid biochemistry

Type of meningitis	Protein (>45mg/dl)	Glucose (<50mg/dl)	WBC (>5cells/mm ³)	Lymphocytes (>70%)	ADA (>10U/L)
Viral/aseptic (n=128)	86.05 (35-329)	60.1 (10-120)	91.2 (5-483)	86% (0-100%)	6.7 (0.5-18)
Pyogenic (n=59)	212 (44-989)*	44.3 (8-112)	881.3 (6-5300)*	55% (0-100%)	9.1 (1-33)
TBM (n=44)	126.7 (40-314)	45.6 (11-95)	174.4 (4-811)	94% (80-100%)	18.1 (2-51.1)*
Fungal (n=04)	135 (120-150)	37.3 (14-51)	83.3 (56-150)	91% (0-100%)	8.3 (5-25)
Others (n=03)	141.3 (46-460)	40.5 (21-75)	331 (15-991)	62% (0-100%)	7.3 (5-15)

* Statistically significant at P<0.05; #Chi-square test; TBM: Tuberculous meningitis; WBC: White blood cell; ADA: Adenosine deaminase

Eighty six patients suffering from viral/aseptic meningitis improved out of the total 128 suffering from the disease, whereas 11 patients out of 59 suffering from pyogenic meningitis succumbed to the disease. (Table 6)

Table 6: Outcomes according to the types of meningitis

Type of meningitis	Improved	Worsened/ No improvement	Death
Viral/aseptic (n=128)	86*	38	04
Pyogenic (n=59)	25	23	11
TBM (n=44)	28	10	06
Fungal (n=04)	01	02	01
Others (n=03)	01	01	01

*Statistically significant at P<0.05; #Chi-square test; TBM: Tuberculous meningitis

DISCUSSION

We evaluated the presenting signs and symptoms and various prognostic factors of the patients suffering from different types of meningitis. We observed that number of male cases were higher as compared to female gender. Our finding was similar to that done by Yerammilli, et al.^[2] In our study, the maximum number of patients were in the age group of 21-40 years which is in contradiction with many other studies which conclude that the most commonly affected is the pediatric one.^[3] This difference was because our hospital is a preferred centre for treating the adult patients.

Diabetes and smoking were the major risk factors associated with meningitis in our study. Diabetes mellitus has been known to be a major risk factor as it affects the immunity and predisposes the person to various infections. Diabetes affects the functions of leucocytes such as leucocytic adherence, chemotaxis and phagocytosis. Antioxidant system which contributes to the immune system also gets affected in diabetes.^[4] Smoking also increases the

Nuchal rigidity	86*	31	21	01	-
Headache	98*	36	18	02	02
Brudzinski's sign	11	06	02	-	01
Kernig's sign	13	06	03	-	01
Seizures	89*	11	04	-	-
Chills	76*	36	02	01	01
Vomiting	98*	42	15	02	02
Photophobia	10	05	03	-	-
Drowsiness	68	18	09	01	01
Irritability	56	11	03	02	01
Petechia, Purpuric lesions	31	03	01	-	-
Coma	21	03	02	01	-

*Statistically significant at P<0.05; #Chi-square test; AMS: Altered mental sensorium; TBM: Tuberculous meningitis

CSF biochemical parameters were also found abnormal in different types of meningitis. A higher incidence of CSF protein was found in pyogenic meningitis. The CSF glucose values were significantly lower in pyogenic, TBM and fungal meningitis. The total leucocytic count was increased more in pyogenic meningitis as compared to the other types. ADA value was significantly elevated in tuberculous meningitis. (Table 5)

risk of meningitis from two to fourfold as compared to the non-smokers.^[5] Bagaikar et al., also reported the different infections including meningitis which are at a higher risk in smokers in a dose-dependent manner. The finding in our study is in consensus with the other authors.^[5,6]

In this study more than half of the patients (53%) suffered from viral/aseptic meningitis. This finding is in contradiction to the finding of Borade et al., where tuberculous meningitis was the commonest type followed by pyogenic and viral meningitis.^[3]

We found that CSF protein levels were although increased in all the types, it was significantly higher in pyogenic meningitis. Our finding is similar to that stated by Ageuda et al.^[7] who conducted a similar study in children. WBC count was elevated with an obvious significance in pyogenic meningitis. Adenosine deaminase (ADA) found mainly in the T lymphocytes is an indicator of cell-mediated immunity. ADA levels were elevated significantly in TBM explained by the role of cell-mediated immunity in TBM. Our findings are in consensus with the other studies as well.^[8,9]

A significant improvement was observed in a majority of patients suffering from viral/aseptic meningitis (P<0.05) when compared to those with pyogenic, tuberculous, fungal and other types. The total fatality rate according to our records was 9.6%.

Limitations of the study

- As the cases were included retrospectively by the records, the long-term follow-up was not possible.
- Better diagnostic tests like enzyme-linked immunosorbent assay (ELISA), an automated immunoassay analyzer (AIA), and a latex fixation agglutination test could not be used.
- The exact status of the initiation of antibiotics prior to the CSF investigation could not be studied.

CONCLUSION

Although meningitis is a life threatening disease, its actual incidence and prevalence varies from region to region, and is less studied especially in adult population. Most of the studies are conducted on pediatric age group. The various types of meningitis needs to be distinguished on the basis of various clinical features and CSF and other lab investigations as there are different treatment strategies involved in the different types of meningitis. The early identification of various prognostic factors, early diagnosis and prompt initiation of treatment would reduce the serious complications and mortality.

REFERENCES

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;380:2095-128.
2. Yerramilli A, Mangapati P, Prabhakar S, Sirimulla H, Vanam S, Voora Y. A study on the clinical outcomes and management of meningitis at a tertiary care centre. *Neuro India* 2017;65:1006-12.
3. Borade PV, Haralkar SJ, Bennishirur WA, Mulje SM. Study of morbidity and mortality pattern of cases of meningitis admitted in tertiary health care centre in India. *Int J Recent Trends SciTech* 2014;10:213-7.
4. Joshi N, Gregory M, Caputo, Michael R, Weitekamp, A.W. Karchmer. Infections in patients with diabetes mellitus. *N Eng J Med* 1999;341:1906-12.
5. Gold R. Epidemiology of bacterial meningitis. *Infect Dis Clin North Am.* 1999;13(3):515-525.
6. Bagaitkar J, Demuth DR, Scott DA. Tobacco use increases susceptibility to bacterial infection. *Tob Induc Dis* 2008;4:1-10
7. Ageuda S, Campos T, Maia A. Prediction of bacterial meningitis based on cerebrospinal fluid pleocytosis in children. *Braz J Infect Dis* 2013;17(4):401-404
8. Agarwal AK, Bansal S, Nand V. A hospital based study on estimation of adenosine deaminase activity in cerebrospinal fluid (CSF) in various types of meningitis. *J Clin Diagn Res* 2014;8:73-6.
9. Cho BH, Kim BC, Yoon GJ, Choi SM, Chang J, Lee SH, et al. Adenosine deaminase activity in cerebrospinal fluid and serum for the diagnosis of tuberculous meningitis. *Clin Neurol Neurosurg* 2013 Sep;115(9):1831-6