

Retrospective Study on The Prevalence of Different Types of Meningitis in Bangladesh

Mohammad Mahbubul Haque^{1*}, Raihan Rotap Khan², Mohammad Mushahidul Islam³, Mohammad Shamsul Alam⁴, Nur Faysal Ahmed⁵, Mohammad Mahmudul Hasan⁶, Abu Hayat Mohammad Waliur Rahman⁷, Jesmin Zahan Tuli⁸, Kamruzzaman⁹

¹Associate Professor, Department of Medicine, Sheikh Hasina Medical College, Jamalpur, Bangladesh

²Assistant Professor, Department of Medicine, Sheikh Hasina Medical College, Jamalpur, Bangladesh

³Assistant Professor, Department of Medicine, Sheikh Hasina Medical College, Jamalpur, Bangladesh

⁴Assistant Professor, Department of Medicine, Sheikh Hasina Medical College, Jamalpur, Bangladesh

⁵Assistant Professor, Department of Medicine, Sheikh Hasina Medical College, Tangail, Bangladesh

⁶Assistant Professor, Department of Respiratory Medicine, Sheikh Hasina Medical College, Jamalpur, Bangladesh

⁷Assistant Professor, Department of Medicine, Sir Salimullah Medical College, Dhaka, Bangladesh

⁸Associate Professor, Department of Biochemistry, Sheikh Hasina Medical College, Jamalpur, Bangladesh

⁹Senior Consultant, Department of ENT, 250 Bedded General Hospital, Jamalpur, Bangladesh

Abstract

Introduction: Meningitis is a potentially fatal infection of the meninges, which are the membranes that surround the brain and spinal cord. Meningitis is classified into three types: bacterial, viral, and fungal. The most frequent type is bacterial meningitis, which can be caused by several bacterial infections such as pneumococcus, meningococcus, and haemophilus influenza. Viral meningitis is less common and usually less severe, but it can still have catastrophic consequences. Fungal meningitis is uncommon and usually occurs in those who have weakened immune systems. Early diagnosis and treatment are critical for improving meningitis outcomes. The aim of the study was to observe the prevalence and mortality rate of different types of meningitis in Bangladesh.

Method: This hospital-based descriptive cross-sectional study was carried at the department of Medicine in Sheikh Hasina Medical College, Jamalpur, Bangladesh during the period from August 2020 to April 2022. Analytical software SPSS used for analysis.

Result: 32.22% of the participants had been from the youngest age group of 16-20 years, while another 32.22% had been from the age group of 31-40 years. 67.78% were male, all patients had a fever, 97.78% had a headache, 93.89% had vomiting, and 80% had altered consciousness. A majority (87.78%) had altered mental status, 41.67% had neck stiffness, and 37.78% had a seizure. 66.11% had bacterial meningitis, 23.89% had tuberculous meningitis and the remaining had viral meningitis. The recorded mortality rate was 5.88% in bacterial meningitis, 32.56% in tuberculous meningitis cases, and 0% in viral meningitis cases.

Conclusion: The present study observed a higher incidence of meningitis among the younger male population, and the prevalence of bacterial meningitis, followed by tuberculous meningitis. Tuberculous meningitis had the highest recorded mortality, and bacterial meningitis had the highest recorded cure rate among the participants. Viral meningitis had no recorded mortality.

Keywords: Meninges, Meningitis, Spinal, Bacterial, Viral

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I. Introduction

Acute meningitis is an infection of the meninges, the membranes that surround the brain and spinal cord. It is a medical emergency and can be caused by several different viruses and bacteria.[1] Symptoms of acute meningitis include fever, headache, stiff neck, and a rash. It can be treated with antibiotics, but it can be very serious and even fatal if not treated promptly. It is a global health problem with a high case-fatality rate, and can greatly impact the daily life of the survivors.[2],[3] The global severity of acute meningitis can vary depending on the specific cause of the infection and the individual's overall health. In general, however, acute meningitis can be a very serious and life-threatening condition, especially if it is not diagnosed and treated

promptly.[4] The incidence of acute meningitis is ever-increasing, as the incidence rate increased from 1.2 million in 2010 to 2.82 million in 2016.[5],[6] Bacterial meningitis is the most common and well-known infection of the central nervous system. It can be fatal or permanently debilitating. Not unexpectedly, this infection provokes strong emotional reactions and, hopefully, prompts medical attention. The development and widespread use of antibacterial medicines in the treatment of meningitis has significantly lowered the disease's mortality.[7] It is a neurological emergency that can evolve into a more severe version of the disease, reducing the chances of complete recovery. Fever, headache, stiff neck, and a rash are all symptoms of bacterial meningitis. It is treatable with medications, but if not treated soon, it can be very dangerous, even fatal. *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Neisseria meningitidis* are some of the bacteria that can cause meningitis.[8],[9] These germs can be passed from person to person by respiratory secretions like saliva or mucus. Blood culture and lumbar puncture are the primary diagnostic procedures for bacterial meningitis.[10] Much has been discovered about the pathogenesis of meningitis in recent years. At any given time, the following is a concise summary of current subject knowledge. Some bacteria that cause meningitis feature pili, which allow the germs to connect to specific mucosal cells and colonize nasopharyngeal mucosal surfaces. The distribution of particular mucosal and epithelial cell receptors most likely determines colonization sites. This theory has been most convincingly advocated for *Haemophilus influenzae* and *Neisseria meningitidis*. [11]-[15] Another very common type of meningitis is viral meningitis, which is caused by a variety of viruses such as enterovirus, herpes simplex virus, mumps virus, and so on.[16] Because of the frequency and nature of the symptoms, many cases of viral meningitis go undetected. Furthermore, without a lumbar puncture, it is extremely difficult to distinguish between viral and bacterial meningitis. The Japanese encephalitis (JE) virus is the leading cause of meningitis in Asia, accounting for around 68,000 cases per year.[17] Children aged 5 to 15 are the most vulnerable, with a death rate of 20%-30% and one-third of survivors experiencing neuropsychiatric sequelae.[18],[19] The portals of entrance for bacteria capable of producing meningitis, as well as the mechanisms by which they acquire entry, are poorly understood. The portals of entry are likely places where bacteria infiltrate subepithelial tissues and then enter the bloodstream, either actively (through direct invasion with or without host cell injury) or passively (by phagocytosis). Distinct kinds of meningitis might result in varied treatment protocols and, as a result, different outcomes. There has been no current research on the prevalence of various kinds of meningitis in the Bangladeshi population. The current study aims to offer information on which types of meningitis are more common in the Bangladeshi population, as well as the prospective outcomes of these meningitis cases.

II. Methods

This hospital-based descriptive cross-sectional study was carried at the department of Medicine in Sheikh Hasina Medical College, Jamalpur, Bangladesh during the period from August 2020 to April 2022. During this period, recorded data of a total of 180 meningitis cases visiting the study hospital were collected from the hospital archives and inputted into an SPSS database. Prior to data collection, proper ethical clearance was obtained from the ethical review committee of the study hospital. All collected data were analyzed using the SPSS software.

Inclusion Criteria

- Patient records with detailed history, physical examination, and neurological examination
- Patient records with complete data

Exclusion Criteria

- Patient records with incomplete data
- Patients affected with other chronic diseases.

III. Results

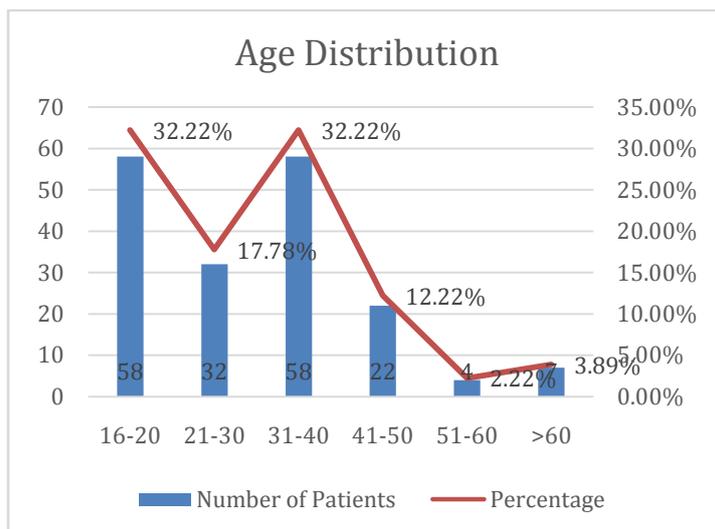


Figure 1: Distribution of participants by age groups (n=180)

The majority of the participants (32.22%) had been from the age group of 16-20 years, while another 32.22% had been from the age group of 31-40 years. 17.78% of participants had been between the age of 21-30 years, while 12.22% were between the age of 41-50 years, 2.22% were between the age of 51-60 years and 3.89% were over 60 years of age.

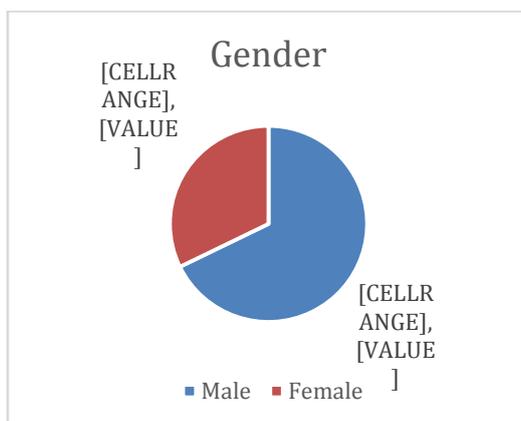


Figure 2: Distribution of participants by gender (n=180)

Male prevalence was observed among the participants, with 67.78% male and 32.22% female prevalence.

Table 1: Distribution of participants by associated clinical presentations (n=180)

Presentations	Number of Patients	Percentage
Fever	180	100.00%
Headache	176	97.78%
Vomiting	169	93.89%
Altered consciousness	144	80.00%
Focal neurological deficit	18	10.00%
Seizure	18	10.00%
Skin rash	15	8.33%

Among the recorded participants, fever was a common presentation among all participants, 97.78% had headaches, 93.89% had vomiting, 80% had altered consciousness, 10% had focal neurological deficits, another 10% had seizures and 8.33% had skin rashes.

Table 2: Distribution of participants by the presence of primary signs

Signs	Frequency	Percentage
Altered mental status	158	87.78%
Neck stiffness	75	41.67%
Seizure	68	37.78%

The participants had multiple signs of meningitis, but the majority (87.78%) had altered mental status, 41.67% had neck stiffness, and 37.78% had seizures.

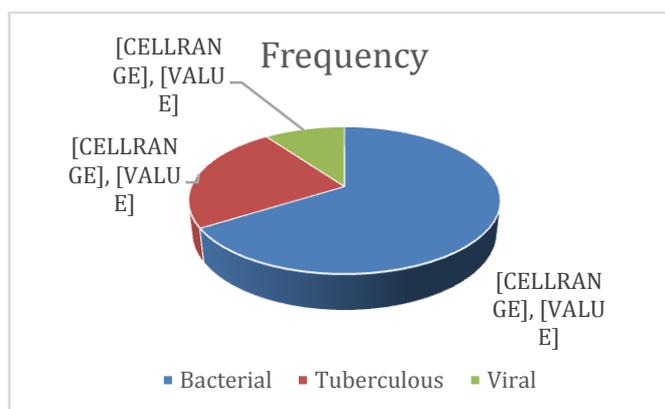


Figure 3: Distribution of participants by type of meningitis (n=180)

Bacterial meningitis was the most common, with 66.11% prevalence, 23.89% had tuberculous meningitis, and 10% had viral meningitis.

Table 3: Physical findings of the participants according to type of meningitis (n=180)

Physical Findings	Bacterial (n=119)	Tuberculous (n=43)	Viral (n=18)
Mean Glucose (mg/dl)	33.78	39.6	80
Mean Protein (mg/dl)	197.6	164.5	89.9
Mean Cell Count (mm ³)	4142 (mostly neutrophilic)	236 (Mostly lymphocytes)	162 (Lymphocytes)

Among the 119 bacterial meningitis cases, the mean glucose was 33.78 mg/dl, the mean protein was 197.6 mg/dl, and the mean cell count was 4142, with mostly neutrophilic cells. Among the 43 tuberculosis patients, the mean glucose was 39.6 mg/dl, the mean protein was 164.5 mg/dl, and the mean cell count was 236 with mostly lymphocyte cells. Among the 18 viral meningitis cases, the mean glucose was 80mg/dl, while the mean protein was 89.9 mg/dl, and the mean cell count was 162 with mostly lymphocytes.

Table 4: Distribution of participants by the recorded outcome

Outcome	Bacterial (n=119)	Tuberculous (n=43)	Viral (n=18)
	n (%)	n (%)	n (%)
Cured	108(90.76%)	19 (44.19%)	14 (77.28%)
Expired	7 (5.88%)	14 (32.56%)	0 (0.00%)
Voluntary Discharge	4 (3.36%)	0 (0.00%)	4 (22.22%)

Among the recorded outcomes, 90.76% of bacterial meningitis cases, 44.19% of tuberculous meningitis cases, and 77.28% of viral meningitis cases were cured. Only 5.88% of bacterial cases, 32.56% of tuberculous cases, and none of the viral cases of meningitis had expired during the hospital stay. 3.36% of bacterial meningitis cases and 22.22% of viral meningitis cases had self-discharged from the hospital.

IV. Discussion

The infection of the central nervous system is a medical emergency. Among the various infections of the central nervous system (CNS), meningitis is the most common form of bacterial inflammation.[20] Different types of meningitis can require different types of the treatment process. The present study was conducted to understand the prevalence of different types of meningitis in Bangladesh, so it can help better prepare the doctors for their management scenarios. Among the 180 participants of the present study, the most affected groups were below 40 years of age, comprising a total of 82% of the study population. 32.22% of the present study participants had been from the youngest age group of 16-20 years. This high incidence of meningitis cases among the younger population is not an uncommon finding and has been observed in multiple other international studies.[21]-[23] This high incidence might be due to the increased chance of exposure to various infective agents resulting from their active lifestyle at this age. Male prevalence was also observed in this study, with 67.78% of participants being male. This could also be explained by the increased chance of exposure among the male population due to their more active and outgoing lifestyle. The high male prevalence of our study was also observed in other studies.[24] In regards to clinical presentations, all 180 participants of the study had a fever at admission, which is a common finding in any type of infection. Headache and vomiting were observed in 97.78% and 93.89% of patients respectively. Fever, headache, and vomiting are the most common clinical presentations among meningitis patients, as observed in multiple other studies.[25]-[27] Seizure was observed as a clinical presentation in only 10%, but 37.78% of the study participants had seizures in total as a primary sign of meningitis. Altered mental status was a sign in 87.78% of participants, while 41.67% had neck stiffness. It was observed that the majority (66.11%) of the present study participants had bacterial meningitis or cases. Bacterial meningitis is rare but not uncommon, and the young adult population is at the highest risk of contracting this disease. The most common cause of bacterial meningitis is generally a common skin injury, where bacteria enter the bloodstream and travel to the spinal cord. 23.89% of the participants had tuberculous meningitis, mainly caused by the mycobacterium tuberculosis, and 10% had viral meningitis. The incidence of tuberculous meningitis is generally low in developed countries, but still a major concern in developing countries.[29]-[31] The distribution of the participants by type of meningitis in the present study was similar to the findings of a few other studies in developing nations.[3],[32]-[34] CSF cell count was higher than average among bacterial meningitis cases, with mostly neutrophilic cells. In the case of tuberculous meningitis patients, the mean cell count was 236 with mostly lymphocytes. Among the viral meningitis cases, the mean glucose was 80 mg/dl, while the mean protein was 89.9 mg/dl, and the mean cell count was 162 with mostly lymphocytes. These mean CSF findings of the participants were similar to the findings of other studies as well.[32],[35] Recorded outcomes of the patients revealed higher mortality among tuberculous meningitis cases and higher cure rates among bacterial meningitis cases. This was mainly because bacterial meningitis can be easy to manage after identifying the specific type of bacteria, and can have a better outcome. Tuberculous meningitis has a globally high mortality rate, and similar studies of tuberculous meningitis support the high mortality rate of our study.[25],[36]

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

V. Conclusion

The present study observed a higher incidence of meningitis among the younger male population, and the prevalence of bacterial meningitis, followed by tuberculous meningitis. Tuberculous meningitis had the highest recorded mortality, and bacterial meningitis had the highest recorded cure rate among the participants. Viral meningitis had no recorded mortality.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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