AFGHAN MEDICAL JOURNAL
KABUL UNIVERISITY OF MEDICAL SCIENCES ABU ALI IBN SINA
Vol 1, Issue 2 | November 2024 AMJ e-ISSN: 3007-0805

PREVALENCE OF BACTERIAL MENINGITIS AT INFECTIOUS DISEASE HOSPITAL IN KABUL AFGHANISTAN

Abdulhafiz Rahmati [*] [1], Ahmad Wali Ataye [2], Ershad Akbari [3]

[1] Department of Behavioral Science and Health Education, Kabul university of medical sciences "Abu Ali Ibn Sina", Kabul-Afghanistan.

[2] Department of Microbiology, Kabul University of medical sciences "Abu Ali Ibn Sina", Kabul-Afghanistan.

[3] Volunteer research assistant at the Department of Behavioral Science and Health Education, Kabul University of Medical Sciences "Abu Ali Ibn Sina", Kabul-Afghanistan.

Abstract

Background: Bacterial meningitis is a bacterial infection that causes inflammation of the membranes that surround the brain and spinal cord. This study aims to investigate the prevalence of bacterial meningitis in infectious disease hospital in Kabul Afghanistan.

Methods and materials: This is a descriptive cross-sectional study that used medical records of the diagnosed bacterial meningitis patients from the Infectious Disease Hospital in Kabul, Afghanistan, between September 2021 and March 2022.

Results: Among 331 diagnosed patients with bacterial meningitis, (69.8%) were female and (30.2%) were male. The largest age group comprised young adults, making up (59.5%), followed by those aged 26 to 35 years at (20.8%), 36 to 45 years at (8.5%), 46 to 55 years at (5.7%), 56 to 65 years at (3.0%), 66 to 75 years at (1.5%), and 76 to 90 years at (0.9%). In terms of residence, the majority lived in Kabul (35%), followed by Ghazni (9.4%), Parwan (4.8%), and Ghor (3.9%). Other provinces included Baghlan and Takhar at (3.6%), Kapisa, Logar, Wardak, and Balkh at (3.3%), Samangan and Kunduz at (2.7%), Bamyan and Faryab at (2.4%), Sarpul at (2.1%), and Badakhshan and Paktika at (1.8%). Additionally, Paktya, Zabul, and Daikundi each accounted for (1.5%), Helmand for (1.2%), Badghis and Khost for (0.9%), Nangarhar for (0.6%), and Herat, Nimruz, Laghman, Urozgan, Kandahar, Panjshir, and Juzjan each for (0.3%).

Conclusion: The current hospital-based study found that the majority of patients with bacterial meningitis were female, followed by males, with most of the patients fell within the young adult age group. Additionally, the majority of these patients resided in Kabul. Further research is needed to find the related factors of the meningitis among patients.

Keywords: Meningitis, Hospital, Bacterial, Kabul

1. Introduction

Bacterial meningitis (BM) poses a significant global health threat, characterized by inflammation of the meninges that protect the brain and spinal cord. If untreated, bacterial infections can progress to bacteremia, evade the immune system, and disrupt the blood-brain barrier (BBB) and nervous system (1). Common signs of BM include fever, headache, and neck stiffness observed among BM patients (2). The commonly known causative agents of BM are Streptococcus pneumonia, Haemophilus influenza type b, Streptococcus group B, Staphylococcus aureus, Listeria monocytogenes and Neisseria meningitides (1).

BM has a high case-fatality rate, which fluctuates based on factors such as location, time, and patient characteristics, including age and gender (3). Underdeveloped countries often report higher rates of morbidity and mortality. Untreated, BM's fatality rate can rise to 70%, with one in five survivors potentially facing neurological disabilities (4). Early pathogen detection and treatment are crucial to reduce fatalities and complications. Antibiotics are essential in lowering death rates from infections, but despite healthcare advancements, mortality rates remain concerning (5). Traditionally, penicillin, cephalosporins, fluoroquinolones, and aminoglycosides were used to treat BM, but resistance to these drugs has emerged (6). For instance, third-generation cephalosporins are ineffective in treating Escherichia coli meningitis, leading to higher mortality and morbidity rates, and causing complications in 25 to 50% of survivors. The rapid rise of antimicrobial resistance (AMR) has become a significant health issue, especially in developing and underdeveloped countries. While bacterial culturing remains the gold standard for diagnosing bacterial meningitis (7).

Bacterial culturing of cerebrospinal fluid (CSF) can sometimes be insensitive due to prior antibiotic use before a lumbar puncture (LP) and issues with the quantity and quality of the CSF, which can hinder the identification of pathogens. Molecular methods are crucial for confirming the presence of pathogens in biological samples. By targeting 16S rRNA genes, which are evolutionarily conserved, bacteria can be detected more quickly. Additionally, analyzing 16S rRNA for phylogenetic relationships can reveal the evolutionary connections between different bacterial strains. Monitoring the molecular epidemiology and genetic variations of pathogens is essential for tracking resistance patterns and preventing future infectious disease outbreaks (8).

For the past forty years, Afghanistan has endured civil conflict and natural disasters, which have significantly weakened its economic development (9).

[*] **Corresponding author:** Abdulhafiz Rahmati, Department of Behavioral Science and Health Education, Kabul university of medical sciences "Abu Ali Ibn Sina", Kabul-Afghanistan.
abdulhafiz.rahmati@gmail.com

Received 22 Sep 2024; Received in revised form 22 Oct 2024; Accepted 06 Nov 2024; published Online 17 Nov 2024.

This has led to inadequate health infrastructure and poor health indicators. Afghanistan faces significant public health challenges, including ineffective management of infectious diseases and limited access to safe water and waste disposal (10). There is no published data regarding bacterial meningitis in adults in Afghanistan. Therefore, the aim of this study is to investigate the prevalence of bacterial meningitis at infectious disease hospital in Kabul Afghanistan.

2. Methods and materials

2.1 Study setting: Infectious disease hospital located in the center of Kabul city in Afghanistan which serves as a public, referral, and tertiary hospital for infectious disease treatment and diagnosis.

2.2 Study design: This is a descriptive cross-sectional study that used medical records of the diagnosed bacterial meningitis patients from September 2021 to March 2022.

2.3 Sample size and Data: During above mentioned time total of 10333 patients visited the hospital and among them, 331 patients were diagnosed with bacterial meningitis, we used the census method and included all diagnosed patients in our study for better results. Data is extracted upon permission from the HMIS department of the hospital from the patient's registry book. The variables such as age, gender, and place of residence as independent and meningitis as dependent variables were used for the current study.

2.4 Statistical analysis: Data were entered and coded by CSPRO, MS. Excel, and variables such as age categorized by seven, place of residence, and gender were analyzed descriptively by SPSS version 24.

3. Results

The prevalence of bacterial meningitis of 331 diagnosed patients from 10333 individuals who visited infectious disease hospitals from September 2021 to March 2022 is 3.20%.

Prevalence: 331/10333*100 = 3.20%.

Following is the descriptive analysis of 331 patients who were diagnosed with bacterial meningitis:

Table 1 shows the gender distribution of patients diagnosed with bacterial meningitis, indicating that the majority were female at 69.8%, while males accounted for 30.2%.

Gender	Frequency	Percentage %
Male	100	**30.2%**
Female	231	**69.8%**
Total	331	**100**

Table 1: Gender distribution of patients diagnosed with bacterial meningitis.

Table 2 presents the age distribution of patients diagnosed with bacterial meningitis. The largest group, making up 59.5%, was aged between 15 and 25 years, followed by those aged 26 to 35 years at 20.8%. Patients aged 36 to 45 years accounted for 8.5%, while 5.7% were in the 46 to 55 age range. Additionally, 3.0% were aged 56 to 65 years, 1.5% were between 66 and 75 years, and 0.9% were aged 76 to 90 years.

Age categories	Frequency	Percentages
15-25	197	59.5%
26-35	69	20.8%
36-45	28	8.5%
46-55	19	5.7%
56-65	10	3.0%
66-75	5	1.5%
76-90	3	0.9%
Total	331	100

Table 2: Age distribution of patients diagnosed with bacterial meningitis

Table 3 illustrates the places of residence for patients diagnosed with bacterial meningitis. The largest group came from Kabul, accounting for 35%, followed by Ghazni at 9.4%, Parwan at 4.8%, and Ghor at 3.9%. Baghlan and Takhar each represented 3.6%, while Kapisa, Logar, Wardak, and Balkh comprised 3.3%. Samangan and Kunduz accounted for 2.7%, and Bamyan and Faryab made up 2.4%. Additionally, Sarpul represented 2.1%, Badakhshan and Paktika each accounted for 1.8%, and Paktya, Zabul, and Daikundi comprised 1.5%. Helmand represented 1.2%, while Badghis and Khost each accounted for 0.9%, Nangarhar for 0.6%, and Herat, Nimruz, Laghman, Urozgan, Kandahar, Panjshir, and Juzjan each made up 0.3%

Provinces	Frequency	Percentages
Kabul	116	35.0%
Ghazni	31	9.4%
Parwan	16	4.8%

Ghor	13	3.9%
Baghlan	12	3.6%
Takhar	12	3.6%
Kapisa	11	3.3%
Logar	11	3.3%
Wardak	11	3.3%
Balkh	11	3.3%
Samangan	9	2.7%
Kunduz	9	2.7%
Bamyan	8	2.4%
Faryab	8	2.4%
Sarpul	7	2.1%
Badakhshan	6	1.8%
Paktika	6	1.8%
Paktya	5	1.5%
Zabul	5	1.5%
Daikundi	5	1.5%
Helmand	4	1.2%
Badghis	3	0.9%
Khost	3	0.9%
Nangarhar	2	0.6%
Herat	1	0.3%
Nimruz	1	0.3%
Laghman	1	0.3%
Urozgan	1	0.3%
Kandahar	1	0.3%
Panjshir	1	0.3%
Juzjan	1	0.3%
Total	331	100.0

Table 3: Residence distribution of patients diagnosed with bacterial meningitis.

4. Discussion

The current study is conducted in a major referral public infectious disease hospital in Kabul Afghanistan and consists of 331 patients diagnosed with bacterial meningitis. The prevalence of bacterial meningitis of 331 diagnosed patients from 10333 individuals who visited infectious disease hospitals from September 2021 to March 2022 was 3.20%. Among 331 diagnosed patients with bacterial meningitis, (69.8%) were female and (30.2%) were male. The largest age group comprised young adults, making up (59.5%), followed by those aged 26 to 35 years at (20.8%), 36 to 45 years at (8.5%), 46 to 55 years at (5.7%), 56 to 65 years at (3.0%), 66 to 75 years at (1.5%), and 76 to 90 years at (0.9%). In terms of residence, the majority lived in Kabul (35%), followed by Ghazni (9.4%), Parwan (4.8%), and Ghor (3.9%). Other provinces included Baghlan and Takhar at (3.6%), Kapisa, Logar, Wardak, and Balkh at (3.3%), Samangan and Kunduz at (2.7%), Bamyan and Faryab at (2.4%), Sarpul at (2.1%), and Badakhshan and Paktika at (1.8%). Additionally, Paktya, Zabul, and Daikundi each accounted for (1.5%), Helmand for (1.2%), Badghis and Khost for (0.9%), Nangarhar for (0.6%), and Herat, Nimruz, Laghman, Urozgan, Kandahar, Panjshir, and Juzjan each for (0.3%).

A similar study was conducted in Ethiopia among bacterial meningitis in adult patients from hospitals, results showed that the prevalence of bacterial meningitis was higher in males than females and the majority of patients age were between 18-27 years old (11). The current study is not consistent

with that study which in the present study the prevalence of bacterial meningitis is higher in female patients than males, this may be due to not properly treating or diagnosing previous related infection to meningitis in females. According to age categories, the majority of patients in the present study were between 15-25 years old which is slightly consistent with that study in Ethiopia.

Furthermore, findings of another study in the area of Zenica-Doboj Canton of Bosnia Herzegovina revealed that most of the meningitis patients were males and followed by females, and most of them were between ages 0-18 followed by those over 18 years old (12). The current study is not consistent with that study which in the present study the prevalence of bacterial meningitis is higher in female patients than males. According to age categories majority of the patients in the present study were between 15-25 years' which is slightly consistent with the second age group of that study it's because our study is conducted in a referral public hospital and most of the patients were adults.

Moreover, another hospital-based study from Finland results showed most of the bacterial meningitis were males followed by females and the median age group was 57 years old (13). In the present study, most bacterial meningitis patients were female followed by men and most of the age categories were between 15-25 years old, and patients aged more than 56 years old were less.

The majority of patients in the current study were from Kabul, likely due to the presence of the infectious disease hospital in the city, where this study was conducted. Patients from Kabul have better access to this hospital compared to those from other provinces. The present study was conducted in a public hospital among admitted patients in Kabul, and its findings may not accurately represent the situation across the entire country.

5. Conclusion

The current hospital-based study found that the majority of patients with bacterial meningitis were female, followed by males, with most of the patients fell within the young adult age group. Additionally, the majority of these patients resided in Kabul. Further research is needed to find the related factors of meningitis among patients.

Ethical consideration: This study is conducted anonymously and poses no risk of harm or identification to any patients. Permission has been obtained from the hospital director to extract data from hospital registers and records. It has been ethically approved by the research committees at Kabul University of Medical Sciences.

Conflict of interest: The authors have declared no conflict.

Authors' contributions: Conceptualization, manuscript writing, and correction of analysis were carried out by Abdulhafiz Rahmati. The final revision of the manuscript was performed by Ahmad Wali Ataye. Data collection and analysis were conducted by Ershad Akbari. All authors contributed to the data analysis and reviewed and approved the manuscript.

References

1. Basarab M, Ihekweazu C, George R, Pebody R. Effective management in clusters of pneumococcal disease: a systematic review. The Lancet Infectious Diseases. 2011 Feb 1;11(2):119-30.

2. Chang CJ, Chang HW, Chang WN, Huang LT, Huang SC, Chang YC, Hung PL, Chang CS, Chuang YC, Huang CR, Tsai NW. Seizures complicating infantile and childhood bacterial meningitis. Pediatric neurology. 2004 Sep 1;31(3):165-71.

3. Jiang H, Su M, Kui L, Huang H, Qiu L, Li L, Ma J, Du T, Fan M, Sun Q, Liu X. Prevalence and antibiotic resistance profiles of cerebrospinal fluid pathogens in children with acute bacterial meningitis in Yunnan province, China, 2012-2015. PloS one. 2017 Jun 29;12(6):e0180161.

4. Kim KS. Acute bacterial meningitis in infants and children. The Lancet infectious diseases. 2010 Jan 1;10(1):32-42.

5. Michael CA, Dominey-Howes D, Labbate M. The antimicrobial resistance crisis: causes, consequences, and management. Frontiers in public health. 2014 Sep 16;2:145.

6. Kim KS. Neonatal bacterial meningitis. NeoReviews. 2015 Sep 1;16(9):e535-43.

7. Okike IO, Ribeiro S, Ramsay ME, Heath PT, Sharland M, Ladhani SN. Trends in bacterial, mycobacterial, and fungal meningitis in England and Wales 2004–11: an observational study. The Lancet infectious diseases. 2014 Apr 1;14(4):301-7.

8. Foxman B, Riley L. Molecular epidemiology: focus on infection. American journal of epidemiology. 2001 Jun 15;153(12):1135-41.

9. Wagner AL, Mubarak MY, Johnson LE, Porth JM, Yousif JE, Boulton ML. Trends of vaccine-preventable diseases in Afghanistan from the Disease Early Warning System, 2009–2015. PloS one. 2017 Jun 1;12(6):e0178677.

10. Mubarak MY, Wagner AL, Asami M, Carlson BF, Boulton ML. Hygienic practices and diarrheal illness among persons living in at-risk settings in Kabul, Afghanistan: a cross-sectional study. BMC Infectious Diseases. 2016 Dec;16:1-9.

11. Tigabu A, Jember A, Nega T, Wubishet G, Misganaw H, Goshu T, Negash M. Bacterial meningitis among adult patients at university of Gondar comprehensive specialized referral hospital. Infection and Drug Resistance. 2021 Feb 15:565-74.

12. Alickovic I, Calkic L, Tandir S, Sivic S. Epidemiological Characteristics of Meningococcal Meningitis in the Area of Zenica-Doboj Canton in Period from 2008 to 2012. Medical Archives. 2014 Jun;68(3):200.

13. Niemelä S, Lempinen L, Löyttyniemi E, Oksi J, Jero J. Bacterial meningitis in adults: a retrospective study among 148 patients in an 8-year period in a university hospital, Finland. BMC Infectious Diseases. 2023 Jan 23;23(1):45.