FREQUENCY OF IMMEDIATE COMPLICATIONS OF MENINGITIS IN PEDIATRIC POPULATION OF DISTRICT PESHAWAR: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To find the frequency of immediate complications of meningitis in the pediatric population

Methodology: A cross-sectional study was conducted in a hospital in the district of Peshawar from 1st September 2022 to 31st August 2023. The sampling technique was a non-probability convenience sampling technique. The sample size was 197 which was calculated by using the EPI calculator. Patients with a diagnosis of meningitis as well as those who agreed to participate in our study were included. A suspected case of meningitis and those Parents who did not provide consent for their children were excluded from our research. A structured questionnaire was used which was filled out by the authors themselves after reviewing all those reports and examinations. For statistical analysis, we use SPSS v.20 was used.

Results: The total number of patients was 197. The mean age, weight, and occipital frontal circumference of our patient were 2.84±2.33 years, 13.06±7.65 kilograms, and 47.51±5.54 centimeters. Male were 107(54.3%) while female were 90(45.7%). 58.88% of the 197 cases of meningitis that were confirmed had an immediate complication which Hydrocephalus has been recorded as one of the most prevalent complications, accounting for 19.8%.

Conclusion: In our study Notably, the highest incidence of complications was observed among patients diagnosed with tuberculosis meningitis, as 90% of TBM developed complications. Among the complications assessed in our study, overall hydrocephalus emerged as the most frequently reported one.

Keywords: Meningitis, Meningitis complication, CNS infection, Pediatric population

INTRODUCTION

According to United States statistics from 2006 to 2007, the meningitis incidence rate was 81 cases per 100,000 in under two months. In children aged 11–17, the incidence was 0.4 per 100,000. Simply put, inflammation of the meninges by pathogens is known as meningitis. Bacterial meningitis is more common in third-world countries whose incomes are low or average compared to developed countries. According to South Sudan, which is a developing or low-income country, and Australia, which is a high-income country, in the 2016 survey, the incidence rate was 270 per 100,000 and 0.5 per 100,000 [1-4].

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The most common bacterial central nervous system infection in neonates and infants is acute bacterial meningitis. The fatality rate is up to 30%, and more than 50% of survivors later develop complications[5-7]. In the last three decades after the introduction of vaccines against Neisseria meningitis, Streptococcus pneumonia, and Haemophilus influenza type b, the incidence rate of bacterial meningitis graph in the neonatal period started to decline drastically; however, there are no such changes in the graph of the case fatality rate [4, 8, 9].

According to the WHO Statistics report, in 2018, about 10 million people were affected and 1.5 million were killed from tuberculosis. In 2017, around one million were estimated to have this disease. Out of all the tuberculosis, 1–5% got tuberculous meningitis, which is the most fatal form of tuberculosis. Children under 5 years old, those who are immune compromised and HIV-infected, are the highest-risk population to get tuberculosis, which can be in any form[10, 11, 13]. The mortality rate of tuberculous meningitis is 20% in children, despite advancements in the health

sector in the form of drugs and anti-TB chemotherapy[12]. The mortality rate in adults is 50%, which is very high compared to the mortality rate of children, but children are more prone to complications because of their developing brains[13].

20–39% of bacterial meningitis develop subdural effusion as a complication; this is more commonly seen in infants below one year as compared to older children. The subdural effusion caused by Haemophilus influenza type b, Neisseria meningitis, and Streptococcus pneumonia has no such differences. The good point about subdural effusion in bacterial meningitis is that in the majority of cases, they resolve spontaneously and very rarely require intensive treatment that can be intervened with, as they only need follow-up in patients with effusion because of the very low incidence reported according to literature [4, 15].

In bacterial meningitis, around 10% of children develop unilateral or bilateral sensorineural hearing loss as a long-term complication, while about 5% develop severe hearing loss[16]. There is a 14–32% chance of hearing loss if the bacterial meningitis is due to S. pneumoniae, as well as 4–23% and 20% when it is caused by N. meningitis and H. influenzae [17]. Those children who develop these complications are at higher risk of speech and language delay, which leads to behavioral problems[18, 19].

Bacterial meningitis can also present with seizures as a complication. During illness, if the seizures develop, they can be easily controlled, as compared to those cases who present with seizures after the illness. The majority of such cases lead to permanent neurological deficits [4, 20-22]. We are therefore interested in the frequency of complications of meningitis in children. The primary objective of this study was to compare our and international statistics and to know about the percentage of our population getting affected.

METHODOLOGY

It was a Cross-Sectional Study using a Non-probability convenience sampling technique, in which we targeted the Pediatric population presenting to the pediatric department for treatment in selected tertiary care hospitals of District Peshawar. These are Nasser Teaching Hospital, Lady Reading Hospital, Khyber Teaching Hospital, and Hayatabad Medical Complex. From 1st September 2022 to 31st August 2023 Only those patients who fulfilled our inclusion criteria that is The patient presented to the Pediatric department with a Diagnosed case of meningitis and Patients who are willing to be a part of our study. Those patients who are immune-compromised or have any co-morbid conditions did not give consent to the part of our study, or if the age of the child is more than 14 were excluded.

The sample size was calculated using EPI Info, assuming a prevalence of 50% of diagnosed meningitis in children below 14 years of age since there are no estimates available for children in Pakistan. With a 95% confidence level and a precision of ± 6.99% to get the targeted data on time, The estimated sample size calculated was found to be 197 for the last five years.

Data was collected through a questionnaire that was filled out by the authors after obtaining verbal consent. If consent is not given, the respondent was not included in the study and a refusal was noted without making a second attempt to obtain the consent. This questionnaire took approximately 20 minutes to complete. A standardized, literature-based questionnaire was developed for data collection. It was available in the English language. The questionnaire contained questions on demographics, history of fits, fever, signs of meningeal irritation, lab report findings, culture report, and development of any immediate complication. Overall, there are 20 questions in this questionnaire Data was entered into SPSS (version 22.0) and manually reviewed for discrepancies and missing data. All variables were then coded for analysis. Qualitative data was presented as frequencies and percentages, whereas quantitative data was presented as the mean and standard deviation. The Chi-square test was used for significance. A p-value of less than 0.05 is taken as significant. The study was sent to the Gandhara University Ethics Review Committee (ERC). Approval was given in November 2023, as in Gandhara University ERC the approval was issued after completion. All respondents taking part in this study will be assured of complete confidentiality, and their responses will be kept anonymous, access to which will only be allowed to the principal research team. All persons who are part of this project will have the right to withdraw from participation at any point in time. No incentives will be given to participants for their participation in the study.

RESULTS

The total number of patients was 197. The mean age, weight, and occipital frontal circumference of our patient were 2.84±2.33 years, 13.06±7.65 kilograms, and 47.51±5.54 centimeters. Male were 107(54.3%) while female was 90(45.7%)

Table 1: Showing frequencies of different types of meningitis reported and immediate complications because of meningitis

		Frequency	Percentage
Type of meningitis	Bacterial	123	62.4%
	Tuberculosis	22	11.2%
	Viral	52	26.4%
Immediate Complication	No complication	81	41.1%
	SIADH	16	8.1%
	Seizures	33	16.8%
	Hydrocephalus	39	19.8%
	Stroke	4	2%
	Cranial nerve palsy	11	5.6%
	Any other	13	6.6%

Table 2: showing the relationship between the type of meningitis and immediate complication

Type of meningitis		mmediate Complication							Chi-square	P-Value
		No	SIADH	Seizures	Hydrocephalus	Stroke	Cranial nerve palsy	Any other		
Bacterial	123	48 (39.02%)	6 (4.8%)	15 (12.1%)	31 (25.2%)	3 (2.4%)	9 (7.3%)	11 (8.9%)	52.290	0.000
Tuberculosis	22	2 (9%)	6 (27.27%)	12 (54.54%)	2 (9%)	0	0	0		
Viral	52	31 (59.6%)	4 (7.6%)	6 (11.5%)	6 (11.5%)	1 (1.9%)	2 (3.8%)	2 (3.8%)		

DISCUSSION

Meningitis is considered an emergency because of its high morbidity and mortality. Timely diagnosis of meningitis is very important because of its unwanted outcomes [23]. A study was conducted in Iran in which bacterial meningitis was reported with the most complications; the commonest complication was seizure (37.4%), while in our study the commonest complication reported with bacterial meningitis is Hydrocephalus (25%) [24]. another retrospective study was conducted, in which the bacterial meningitis hydrocephalus complication percentage was 9.4% because of previous use of antibiotics, while in our study it was 25% [25]. Another study was conducted in India in which they were assessing the

commonest complication in patients who are diagnosed with tuberculosis meningitis In this study, 80% of the tuberculosis meningitis patients were reported to have hydrocephalus, while in our study most common complication was seizures (54.5%) [26]. A systemic review was conducted in which they identified that patients with viral meningitis have good outcomes as compared to others and our study also shows that 59.6% of viral meningitis has developed no complication as compared to bacterial (39.3%) and tuberculosis (9.09%) [27]. In our study, the percentage of cranial nerve palsy in bacterial meningitis was 7.3%, with facial nerve palsy and sensory hearing nerves included most heavily, while a local study from Lahore reported hearing loss at 17.2% [28].

Another report was published in 2016 in which they reported that in bacterial meningitis, out of 5, at least 1 patient developed a neurological complication. According to that report, neurological complications include hearing loss, seizures, hydrocephalus, and behavioral problems, while from our results, out of 123 diagnosed cases of bacterial meningitis 60.9% developed complications, It is quite alarming that, instead of a decrease, the ratio increased [29]. Another study was conducted to assess the outcomes of bacterial meningitis, in which they reported 18% of their patients having seizures, and in our study, the percentage of seizures in bacterial meningitis was 12.19%[30]. According to a local study conducted in 2016 at Agha Khan Hospital, the percentage of seizures was 59.4% overall because of the delay in the recognition at Primary and secondary levels hospitals, while in our study, the percentage of seizures was 16.75%[31]. Another study in 2018 was conducted to assess the most common complication in bacterial meningitis. According to that study, the most common complication was seizure with 58.8%, while in our study, the most common complication was hydrocephalus with 25.2%[32].

Our study included several limitations, including a smaller sample size due to inadequate facilities and a short study period. To detect any modest residual effects as they approach school age, we must also observe the long-term results of all the children who had bacterial meningitis. To overcome the aforementioned flaws in our investigation, a larger, longer, and better-structured study is required.

CONCLUSION

In our study, bacterial pathogens emerged as the predominant causative agents of meningitis, with viral and tuberculosis infections following in prevalence. Notably, the highest incidence of complications was observed among patients diagnosed with tuberculosis and meningitis. Among the complications assessed in our study, hydrocephalus emerged as the most frequently reported one.

AUTHORS CONTRIBUTIONS

Irum Naz, Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Final Approval

Farida Sherazi, Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Final Approval

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Rifayat Ullah Afridi, Concept & Design; Critical Revision; Supervision; Final Approval

Aneela Ambareen, Concept & Design; Supervision; Final Approval

Sahar Iqbal, Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision

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