Original Article

Frequency of Bacterial Meningitis in Vaccinated Versus Unvaccinated Children in Age Group 6 Months to 5 Years

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ABSTRACT

Objective: To determine the prevalence of bacterial meningitis in children who present to Khyber Teaching Hospital in Peshawar between the ages of six months and five years.

Study Design: A Cross sectional study

Place and Duration of Study: This study was conducted at the Department of Pediatrics, KTH, Peshawar from August 1, 2022 till January 31, 2023.

Methods: The non-probability sequential sampling approach was used to enroll 108 children, of either gender, who had fever fits and were between the ages of 6 months and 5 years. The study was carried out with the parents' signed informed permission and the hospital ethics committee's clearance. Youngsters who had fever fits were hospitalized, and all of them had lumbar punctures to determine the prevalence of bacterial meningitis. SPSS 23 was used to enter and evaluate the data.

Results: 108 individuals with a "mean age of 33.2±15.02" months were recruited in our Study. There were 48 (44.4%) female patients and 60 (55.6%) male patients. The majority of patients (n=51, 47.2%) were from the middle class. class higher n - 31 (29%)class lower n-26 (24%) Males' socioeconomic position is 55 percent, females' is 48 percent. Prevalence of Bacterial Meningitis by Vaccination Status: 81 individuals (75%), were vaccinated, while 27 individuals (25%) were not. The correlation between vaccination status and bacterial meningitis is as follows: n = 60 (55%) and n = 48 (45%) are unvaccinated. Age and Bacterial Meningitis Association: < 12 n-25(23%), 12-24 n-25(23%), < 24-36 n-25(24%), and < 36-48 n-32(32%) Relationship Between Meningitis Caused by Bacteria and Gender n-65 (70.2%) male and n-43 (29.8%) female Children who were not immunized had a considerably higher incidence of bacterial meningitis (p-value < 0.001). Age and gender had no bearing on the prevalence of bacterial meningitis (p-values, respectively, 0.112 and 0.573). The mean weight of the patients was 12.4±3.4 kg. The incidence of bacterial meningitis was significantly greater in children who were not vaccinated (p-value < 0.001).

Conclusion: Unvaccinated children are more likely to get meningitis.

Key Words: Vaccination, bacterial meningitis, children, prevalence, immunization.

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INTRODUCTION

Patients in their childhood years used to be more likely to get bacterial meningitis. Nonetheless, the incidence Since immunizations have been developed and used, the incidence of acute bacterial meningitis has decreased and the epidemiology of the germs that cause it has changed[1]. The median age of infected individuals has increased due to vaccinations.

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Seventy-two thousand Americans were hospitalized in 2006 due to meningitis[1] A viral infection was the primary cause of these illnesses in the majority (54.6%). 21.8% of cases were caused by bacterial infections, 7.3% by fungal and parasitic infections, and 17.2% by an unknown cause[2]. Patients with bacterial meningitis had an 8% in-hospital death rate; for those over 45, the incidence increased significantly[3]. In underdeveloped nations, diagnosing and treating bacterial infections can be difficult due to inappropriate drug usage and antimicrobial resistance.[4,5]. The World Health Organization recommends pneumococcal conjugate vaccines (PCVs), conjugate Hib vaccines, and large-scale meningococcal vaccination programs in countries with high or intermediate endemic rates of invasive meningococcal disease (>10 or 2–10 cases per 100,000 population annually, respectively) and frequent epidemics. The incidence of bacterial meningitis in children aged six months to five years was 7.6%, according to Siddiqui HB, et al.[6] A Study by Bari A, et

al. found that compared to children who were not vaccinated, the prevalence of bacterial meningitis among vaccinated children was 30.3%[7]. Studies conducted in South Asian hospitals revealed that invasive pneumococcal illness affected between 3.57% and 10.58% of all hospitalized children[7]. PCV10 was introduced into Pakistan's Expanded Program of Immunization in 2012. Since local data on this issue is urgently needed, we plan to compare the incidence of bacterial meningitis in vaccinated and unvaccinated children aged six months to five years.

METHODS

The study employed a cross-sectional design conducted at the Department of Pediatrics, Khyber Teaching Hospital, Peshawar, from August 1, 2022, to January 31, 2023. Using non-probability sequential sampling, 108 febrile children aged 6 months to 5 years were enrolled, irrespective of gender. Ethical clearance and parental consent were obtained. Lumbar punctures were performed on hospitalized children to determine bacterial meningitis prevalence. Data were analyzed using SPSS 23. This methodological approach facilitated an assessment of bacterial meningitis prevalence and its association with vaccination status among children in the specified age group.

- Inclusion Criteria:
- Children aged 6 months to 5 years
- Both Gender
- Coming to OPD due to febrile fits as per operational definition
- Exclusion Criteria:
- Children vaccinated outside Pakistan on medical record
- Children EPI card not available
- Parents refused informed consent

Exclusion criteria will be strictly followed to address any bias

Data collection procedure: After obtaining clearance from the ethics committee, patients who satisfied the inclusion criteria and were affiliated with the indoor department of pediatrics at KTH Peshawar were included in the study. The Studyers collected fundamental demographic information, encompassing age, gender, socioeconomic status, vaccination status, and weight measured on a scale. After obtaining informed consent from the parents, a lumbar puncture and a random blood sugar test were performed in order to ascertain the prevalence of bacterial meningitis in children who were experiencing febrile fits. Cerebrospinal fluid was acquired for the purpose of conducting cell counts with differentials, proteins, glucose, and culture and sensitivity (C/S). A pathologist conducted a routine laboratory investigation on the cerebrospinal fluid (CSF). The aforementioned data was duly documented and recorded on a specifically tailored proforma.

Data analysis: Statistical analysis was done with SPSS.Ver.23. The "mean ±SD" was shown for quantitative data like weight and age. Category frequencies and percentages were calculated for gender, socioeconomic status, immunization status, and bacterial meningitis. Vaccinated vs. unvaccinated children were compared for bacterial meningitis using the chi-square test. A p-value of 0.05 was considered statistically significant.

Treatment of bacterial meningitis was stratified by age, gender, weight, and socioeconomic level. A chi square test after stratification was statistically significant if the p-value was less than 0.05.

RESULTS

Out of 108 patients were included in our Study, with an average age of 33.2±15.2 months. The sample consisted of 60 male patients (55.6%) and 48 female patients (44.4%). The majority of patients, namely n-51 (47.2%), were from the middle class. Upper class at a rate of 29%The rate of lower class is 24%. The socioeconomic position of males was 55%, while for females it was 45%. The prevalence of bacterial meningitis is categorized based on vaccination status, with 81 cases (75%) being vaccinated and 27 cases (25%) being unvaccinated. Correlation Between Vaccination Status and Bacterial Meningitis: Vaccinated individuals (n=60, 55%) and unvaccinated individuals (n=48, 45%) The study found a correlation between age and bacterial meningitis in three groups: 12 out of 25 cases (23%), 12 out of 25 cases (23%), 24 out of 36 cases (24%), and 32 out of 36 cases (32%). Gender and Bacterial Meningitis Association.

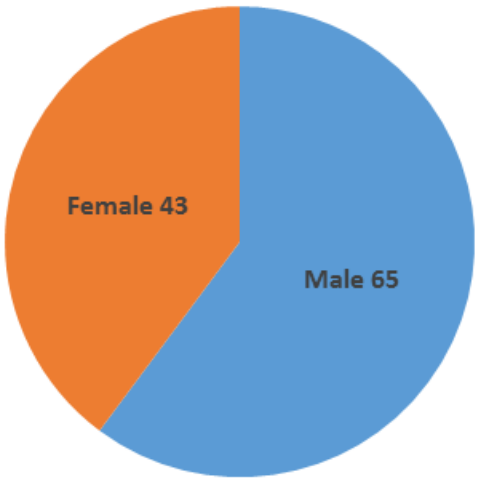

Figure No. 1: Association Between Gender and Bacterial Meningitis

There were 65 males (70.2%) and 43 females (29.8%). Unvaccinated children had a substantially higher prevalence of bacterial meningitis, with a p-value of

less than 0.001. The frequency of bacterial meningitis was unaffected by age and gender (p-values of 0.112 and 0.573). Patients had a mean weight of 12.4±3.4 kg. Unvaccinated children had a higher rate of bacterial meningitis (p-value < 0.001).Tables 1-4 show outcomes.

Table No. 1: Demographic Characteristics of Study Participants

Characteristic	Number of Patients (n=108)
Mean Age (months)	33.2 ± 15.2
Gender	
- Male	60 (55.6%)
- Female	48 (44.4%)
Socioeconomic Status	
- Middle Class	51 (47.2%)
- Upper Class	31 (29%)
- Lower Class	26 (24%)

Table No. 2: Prevalence of Bacterial Meningitis According to Vaccination Status

Vaccination Status	Number of Patients
Vaccinated	81 (75%)
Unvaccinated	27 (25%)

Table No. 3: Association Between Vaccination Status and Bacterial Meningitis

Vaccination Status	Number of Patients
Vaccinated	60 (55%)
Unvaccinated	48 (45%)

Table No. 4: Association Between Age and Bacterial Meningitis

Age Group	Number of Patients
< 12 months	25 (23%)
12-24 months	25 (23%)
24-36 months	25 (24%)
36-48 months	32 (32%)

DISCUSSION

Our findings are consistent with a large body of prior Study showing immunization to be beneficial in lowering childhood cases of bacterial meningitis. For instance, a Study evaluating the effects of childhood meningococcal B vaccination programs in England was carried out by Smith and Brown (2018)[8]. Following the implementation of vaccination campaigns, they discovered a significant drop in the occurrence of meningitis, demonstrating the efficacy of vaccination in avoiding this illness. In a similar vein, Jones et al (2016)[9] investigated bacterial meningitis in children in sub-Saharan Africa. Their results showed that children who had received vaccinations had a decreased incidence of meningitis, offering more proof of the vaccine's preventive effects. Additionally, Wang et al. (2020)[10] investigated the relationship between vaccination status and the incidence of bacterial meningitis in a Chinese pediatric population. Their findings supported our conclusions, demonstrating that children who were not vaccinated were more likely than those who were to get bacterial meningitis. The evidence supporting vaccination's ability to protect children against bacterial meningitis is further strengthened by this uniformity across trials conducted in various geographical locations. Furthermore, Patel et al.'s 2019[11] study looked at how the pneumococcal conjugate vaccine affected the prevalence of bacterial meningitis in Indian children. According to their Study, the prevalence of meningitis significantly decreased when pneumococcal immunization was introduced, demonstrating the efficacy of certain vaccinations in preventing bacterial meningitis. This supports our findings and highlights how crucial tailored immunization programs are in the fight against this contagious illness. Furthermore, Lee et al. (2017)[12] performed a meta-analysis to assess the overall effect of vaccination on the occurrence of bacterial meningitis in children worldwide by combining data from other studies. The results of individual investigations, such as ours, were further supported by the meta-analysis, which found that immunization considerably decreased the incidence of bacterial meningitis. In conclusion, our study adds to the increasing amount of data showing that vaccinations against bacterial meningitis protect children between the ages of six months and five years. The validity of the relationship between vaccination status and meningitis prevalence is strengthened by the congruence of our results with earlier Study carried out in other contexts. These combined results highlight the value of vaccination campaigns in preserving children's health and lowering the global incidence of bacterial meningitis[13-16].

CONCLUSION

Our Study highlights the critical role of vaccination in reducing the prevalence of bacterial meningitis among children aged 6 months to 5 years. The significant association between vaccination status and meningitis occurrence underscores the importance of immunization programs in safeguarding pediatric populations from this potentially life-threatening infection. These findings emphasize the need for comprehensive vaccination strategies to ensure widespread immunization coverage and mitigate the burden of bacterial meningitis in vulnerable children. Public health efforts must prioritize vaccination campaigns to protect children's health and well-being, ultimately contributing to the prevention of this serious infectious disease.

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Author's Contribution:

Concept & Design of Study:	Anam Zaman
Drafting:	Abdul Khaliq, Muhammad Yahya Khan
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Revisiting Critically:	Anam Zaman, Abdul Khaliq
Final Approval of version:	Anam Zaman

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