



## **Outcomes of Bacterial Meningitis Treatment and its Associated Risk Factors among the Children of Nawabshah, Pakistan**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author SAS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors ABL, AAJ, LK, DK, QUA and AA managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Background: Meningitis happens all the more ordinarily during the main month of life than during some other ensuing period and it is related with high horribleness and mortality.

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**Objective:** The objective of this study is to assess the outcomes of meningitis treatment and its associated risk factors among the children.

**Methodology:** A cross-sectional retrospective study was conducted on 400 children, sample size was calculated by using Slovin's Formula " $n=N/(1+Ne^2)$ " at 0.05 margin of error and by using convenience sampling. Patients who were diagnosed with bacterial meningitis aged from 0 to 18 years were included in the study. Data was collected by well-structured questionnaire. SPSS version 23.0 was used to analyze the data. Multivariate logistic and Bivariate regression analyses was performed to analyze the data. P value  $\leq 0.05$  was considered as statistical significant.

**Results:** 262 (65.5%) males were reported and females were 138 (34.5%). Sepsis was found in 24 (6%) patients due to meningitis. Outcomes of the treatment of meningitis patients were found good among 308 (77%) patients.

**Conclusion:** It was concluded that adjustments of starting anti-toxin routine, level of obviousness at hospitalization and season of show to the medical care office from indication beginning altogether affected therapy results of intense bacterial meningitis in youngsters.

*Keywords: Children; bacterial meningitis; risk factors; treatment outcomes; nawabshah.*

## 1. INTRODUCTION

Meningitis happens all the more ordinarily during the main month of life than during some other ensuing period and it is related with high horribleness and mortality [1,2]. Meningitis is a typical irresistible reason for dreariness and mortality in pediatric age-gatherings. Every year, it influences about 2.81 million youngsters, of which a third are <5 years old [3]. In the event that intense bacterial meningitis isn't as expected treated, its death rate can be pretty much as high as half, and in this manner it has been marked one of the main ten bacterial reasons for mortality overall [4]. The frequency of neonatal meningitis in western nations changes from 0.2-0.5 cases per thousand live births however a lot higher paces of 1.1-1.9 per 1000 have been accounted for from non-industrial nations [5-8]. The causative microorganism for intense bacterial meningitis fluctuates with age, immune function, vaccination status, and geographic district. In any case, Haemophilus influenzae type B, Streptococcus pneumoniae, and Neisseria meningitidis are the three commonest etiologic specialists [9]. When a contamination is contracted, clinical highlights differ with the phase of the infection. Aspecific manifestations, like fever, cerebral pain, and disquietude, show in the beginning phase of the infection, while neck solidness, photophobia, and indications of meningeal bothering (Kernig's and Brudzinski's signs) show later throughout the illness and are normal person in more seasoned youngsters [10]. Suspected bacterial meningitis is a health related crisis, and fitting observational antimicrobial treatment ought to be started straightaway, at that point changed to complete treatment dependent on set up research facility

examination results [11]. In any case, in non-industrial nations case the executives depends principally on experimental treatment, which adds to the development of antimicrobial protection from regularly utilized medications, influencing treatment results [12]. Pervasiveness paces of neonatal sepsis have been high at KNH; an associated sepsis rate with 56% (300 of 532 neonatal confirmations) was recorded in a new review of infant unit and affirmed sepsis in 16.7% of 716 children [13].

The objective of this study is to assess the outcomes of meningitis treatment and its associated risk factors among the children.

## 2. METHODOLOGY

A cross-sectional retrospective study was conducted on children at Medicine Ward of Peoples Medical College Hospital Nawabshah, Sindh Pakistan during the period from May 2020 to May 2021. A total of 400 sample size was calculated by using Slovin's Formula " $n=N/(1+Ne^2)$ " at 0.05 margin of error and by using convenience sampling. Patients who were diagnosed with bacterial meningitis aged from 0 to 18 years were included in the study. Cases were defined as meningitis if the cerebrospinal fluid (CSF) was positive for bacteria by Gram stain, aerobic bacterial culture or latex particle agglutination assay. Data was collected by well-structured questionnaire administered to pediatric patients or their guardians through which socio-economic and study related data was gathered. SPSS version 23.0 was used to analyze the data. Multivariate logistic and Bivariate regression analyses was performed to

analyze the data. *P value*  $\leq 0.05$  was considered as statistical significant.

### 3. RESULTS

Table 1 shows the demographic and clinical characteristics of the meningitis patients.

Table 2 shows the outcomes of the treatment of meningitis patients.

Table 3 shows the factors in relation with outcomes of the treatment of meningitis patients.

**Table 1. Baseline characteristics and demographic of pediatrics treated for acute bacterial meningitis**

| Variable                                    | Frequency (%) <2 months (n=32) | Frequency (%) $\geq 2$ months (n=368) | General (n=400) |
|---|--------------------------------|---------------------------------------|-----------------|
| <b>Sex</b>                                  |                                |                                       |                 |
| Male  | 20 (62.5%)                     | 242 (65.8%)                           | 262 (65.5%)     |
| Female                                      | 12 (37.5%)                     | 126 (34.2%)                           | 138 (34.5%)     |
| <b>Duration of illness before admission</b> |                                |                                       |                 |
| <72 hours                                   | 22 (68.75%)                    | 122 (33.15%)                          | 144 (36%)       |
| $\geq 72$ hours                             | 10 (31.25%)                    | 246 (66.85%)                          | 256 (64%)       |
| <b>Fever</b>                                |                                |                                       |                 |
| Yes   | 18 (56.25%)                    | 344 (93.5%)                           | 362 (90.5%)     |
| No  | 14 (43.75%)                    | 24 (6.5%)                             | 38 (9.5%)       |
| <b>Unconsciousness</b>                      |                                |                                       |                 |
| Yes   | 6 (18.75%)                     | 178 (48.37%)                          | 184 (46%)       |
| No  | 26 (81.25%)                    | 190 (51.63%)                          | 216 (54%)       |
| <b>Seizures</b>                             |                                |                                       |                 |
| Yes   | 4 (12.5%)                      | 72 (19.6%)                            | 80 (20%)        |
| No  | 28 (87.5%)                     | 296 (80.4%)                           | 324 (81%)       |
| <b>Vomiting</b>                             |                                |                                       |                 |
| Yes   | 8 (25%)                        | 248 (67.4%)                           | 256 (64%)       |
| No  | 24 (75%)                       | 120 (32.6%)                           | 148 (37%)       |
| <b>Neck stiffness</b>                       |                                |                                       |                 |
| Yes   | 16 (50%)                       | 268 (72.8%)                           | 284 (71%)       |
| No  | 16 (50%)                       | 100 (27.5%)                           | 116 (29%)       |
| <b>Medical comorbidity</b>                  |                                |                                       |                 |
| Yes   | 24 (75%)                       | 228 (62%)                             | 252 (63%)       |
| No  | 8 (25%)                        | 140 (38%)                             | 148 (37%)       |
| <b>Malaria</b>                              |                                |                                       |                 |
| Yes   | 8 (25%)                        | 42 (38.6%)                            | 50 (12.5%)      |
| No  | 24 (75%)                       | 326 (61.4%)                           | 350 (87.5%)     |
| <b>Sepsis</b>                               |                                |                                       |                 |
| Yes   | 20 (62.5%)                     | 4 (1.1%)                              | 24 (6%)         |
| No  | 12 (37.5%)                     | 364 (98.9%)                           | 376 (94%)       |
| <b>Pneumonia</b>                            |                                |                                       |                 |
| Yes   | 18 (56.25%)                    | 22 (6%)                               | 40 (10%)        |
| No  | 14 (43.75%)                    | 346 (94%)                             | 360 (90%)       |
| <b>Anemia</b>                               |                                |                                       |                 |
| Yes   | 22 (68.75%)                    | 10 (2.7%)                             | 32 (8%)         |
| No  | 10 (31.25%)                    | 358 (97.3%)                           | 368 (92%)       |
| <b>Acute gastroenteritis</b>                |                                |                                       |                 |
| Yes   | 12 (37.5%)                     | 86 (23.4%)                            | 96 (24%)        |
| No  | 20 (62.5%)                     | 282 (76.7%)                           | 304 (76%)       |
| <b>Tetanus</b>                              |                                |                                       |                 |
| Yes   | 10 (31.25%)                    | 6 (1.6%)                              | 16 (4%)         |
| No  | 22 (68.75%)                    | 362 (98.4%)                           | 384 (96%)       |

**Table 2. Outcomes of treatment of acute bacterial meningitis among the pediatric patients**

|  |                  | <2 months<br>(n=32) | ≥2 months<br>(n=368) | Total (n=400) |
|--|------------------|---------------------|----------------------|---------------|
| <b>Good</b>                            | Improved         | 20 (62.5%)          | 288 (78.3%)          | 308 (77%)     |
| <b>Poor</b>                            | Death            | 4 (12.5%)           | 40 (10.9%)           | 44 (11%)      |
|  | "Self"-discharge | 8 (25%)             | 40 (10.9%)           | 48 (12%)      |
| Median time to improvement, days (IQR) |                  | 10 (4–6)            | 8 (3–5)              |               |

**Table 3. Factors associated with outcomes of treatment among pediatric patients with acute bacterial meningitis**

|   | Outcome         |                | OR (95% CI)      |                   | P-value |
|---|-----------------|----------------|------------------|-------------------|---------|
|   | Good<br>(n=308) | Poor<br>(n=92) | COR              | AOR               |         |
| <b>Age</b>                                  |                 |                |                  |                   |         |
| <2 months                                   | 24              | 8              | 1.12 (0.36–3.56) | 11.21 (0.35–3.69) | 0.792   |
| ≥2 months                                   | 184             | 84             |                  |                   |         |
| <b>Fever</b>                                |                 |                |                  |                   |         |
| Yes   | 278             | 84             | 1.21 (0.35–3.52) | 1.16 (0.34–3.58)  | 0.899   |
| No  | 30              | 8              |                  |                   |         |
| <b>Vomiting</b>                             |                 |                |                  |                   |         |
| Yes   | 202             | 54             | 0.76 (0.34–1.39) | 0.77 (0.39–1.48)  | 0.389   |
| No  | 106             | 38             |                  |                   |         |
| <b>Neck stiffness</b>                       |                 |                |                  |                   |         |
| Yes   | 218             | 66             | 1.12 (0.49–2.21) | 1.11 (0.48–2.21)  | 0.901   |
| No  | 90              | 26             |                  |                   |         |
| <b>Seizure</b>                              |                 |                |                  |                   |         |
| Yes   | 64              | 32             | 0.79 (0.33–1.91) | 0.79 (0.32–1.89)  | 0.601   |
| No  | 144             | 76             |                  |                   |         |
| <b>Unconsciousness</b>                      |                 |                |                  |                   |         |
| Yes   | 98              | 86             | 3.12 (1.31–7.29) | 3.31 (1.32–8.68)  | 0.03    |
| No  | 210             | 6              | 2                | 2                 |         |
| <b>Comorbidity</b>                          |                 |                |                  |                   |         |
| Yes   | 214             | 38             | 1.59 (0.79–3.21) | 1.69 (0.79–3.38)  | 0.146   |
| No  | 94              | 54             |                  |                   |         |
| <b>Pneumonia</b>                            |                 |                |                  |                   |         |
| Yes   | 32              | 8              | 2.89 (1.31–7.21) | 3.58 (0.31–6.22)  | 0.38    |
| No  | 212             | 148            | 2                | 2                 |         |
| <b>AGE</b>                                  |                 |                |                  |                   |         |
| Yes   | 44              | 52             | 0.41 (0.21–0.89) | 1.41 (0.52–3.89)  | 0.56    |
| No  | 184             | 120            | 2                | 2                 |         |
| <b>Duration of illness before admission</b> |                 |                |                  |                   |         |
| Less than 72 hours                          | 112             | 64             | 0.21 (0.12–0.33) | 3.68 (1.69–7.89)  | 0.02    |
| 72 hours and above                          | 196             | 60             | 2                | 2                 |         |
| <b>Antibiotic-regimen change</b>            |                 |                |                  |                   |         |
| Yes   | 28              | 36             | 4.49 (2.28–8.79) | 4.7 (2.22–10.11)  | 0       |
| No  | 284             | 56             | 2                | 2                 |         |

#### 4. DISCUSSION

Bacterial meningitis of neonatal is a major clinical problem in People's Medical College Hospital. This is a lot higher than the already privately revealed predominance paces of 4.4% (7) and

5.4%. Notwithstanding, lumbar penetrates were not performed on all children with suspected sepsis in both past investigations, which likewise depended only on CSF culture developments for case ID of meningitis. The high pervasiveness rate is likely with regards to the 10 to 100 crease

higher rate paces of neonatal meningitis detailed from non-industrial nations when contrasted with that found in the more evolved locales [1,2,6,14,15].

Most of members introduced to the medical care office ahead of schedule (inside 1 hour of manifestation beginning) in an investigation directed in Italy [16]. A potential clarification for this conflict could be the way that the medical services arrangement of Ethiopia is generally delicate, where reference linkage between essential consideration and tertiary focuses is poor. In addition, contrasts in wellbeing looking for conduct and framework (streets and transport) may be different clarifications. Be that as it may, in accordance with our examination discoveries, generally (70%) subjects had introduced late to a medical services office in another investigation done in Ethiopia [17].

## 5. CONCLUSION

It was concluded that adjustments of starting anti-toxin routine, level of obviousness at hospitalization and season of show to the medical care office from indication beginning altogether affected therapy results of intense bacterial meningitis in youngsters.

Locally relevant diagnostics and rules that upgrade early and precise determination of patients with suspected meningitis are fundamental to improve patient results.

## CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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