CEREBROSPINAL FLUID PATHOGENS PROFILE AND ITS ANTIBIOTIC RESISTANCE PATTERN IN CHILDREN WITH ACUTE BACTERIAL MENINGITIS IN BIKANER, NORTHWESTERN INDIA

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Background

Acute bacterial meningitis remains a major health problem in children worldwide with higher mortality and serious potential morbidity. The prevalence and etiologies of meningitis pathogens may vary regarding different seasonal times, geographical regions, and according to the age of the patients. However early diagnosis and appropriate antibiotic treatment are necessary to avoid further complications, the effectiveness of treatment may be limited due to antibiotic-resistant bacterial strains. Thus far, this comprehensive study was executed to investigate the etiological profile and antimicrobial resistance patterns of bacterial isolates causing meningitis in admitted children in Bikaner, Northwestern India from January 2016 to December 2017. This study may help facilitate decision making regarding the vaccination of children against causative bacteria and improve evidence-based therapeutic strategies.

Materials and Methods

Case definition of acute bacterial meningitis was taken as clinical meningeal syndrome and a positive bacterial agent isolated by cerebrospinal fluid culture (CSF) and/or positive CSF latex agglutination results. In this study, we investigated culture-positive bacterial meningitis in children with bacterial meningitis symptoms, and those with negative culture results were excluded.

Patient information, including age, sex, and clinical symptoms, was recorded at the time of admission. Only one representative CSF sample from each patient was included and analysed for microbiology culture. A total of 209 children (≥ 29 days to ≤ 15 years age), whose parent or legal guardian provided written informed consent, were enrolled in the study. Isolated pathogens were identified using the Vitek-32 system. Gram stain results were used to guide subcultures and susceptibility testing, which was performed using the disc diffusion method. The antimicrobial susceptibility of isolates was determined using the disc diffusion method.

Results

These meningitis children included 137 males (65.6%) and 72 females (34.4%) ranging from ≥ 29 days to ≤ 15 years age old (mean age = 4.8 years). Fever, vomiting, and meningeal irritation were the most prevalent symptoms. All children (100%) had fever. Across all age groups, 52.8% were Gram-positive bacteria, and 47.2% were Gram-negative bacteria (Table 1). *Streptococcus pneumoniae* (27.8%) was the most frequently isolated Gram-positive strain followed by *S. epidermidis*, Group B *Streptococcus*, *S. haemolyticus*, Group D *Streptococcus* and *Staph. aureus*. Among the Gram-negative stains, *E. coli* (30.5%) was most frequently isolated followed by *H. influenzae* type b, *Kleb. pneumoniae* and *P. aeruginosa*.

Table 1: Distribution of meningitis pathogens

Pathogen	Prevalence (%)
Gram Positive Organisms	52.8
<i>Streptococcus pneumoniae</i>	27.8
<i>Staphylococcus epidermidis</i>	11.1
Group B <i>Streptococcus</i>	5.2
<i>Staphylococcus haemolyticus</i>	4.2
Group D <i>Streptococcus</i>	2.1
<i>Staphylococcus aureus</i>	1.3
<i>Listeria monocytogenes</i>	1.1
Gram Negative Organisms	47.2
<i>E. coli</i>	30.5
<i>Haemophilus influenzae</i> type b	7.9
<i>Klebsiella pneumoniae</i>	4.9
<i>Pseudomonas aeruginosa</i>	3.9

Antimicrobial susceptibility tests indicated that for *E. coli* isolates, the susceptibility rates to aminoglycosides ranged from 66.8% to 100.0% among them, amikacin was identified as the most effective against *E. coli*. As for cephalosporins the susceptibility rates ranged from 39.4% to 77.4%; and for piperacillin/tazobactam and imipenem were 93.3% and 100% respectively. Meanwhile, the susceptibility rates of *Streptococcus pneumoniae* isolates to penicillin G and ceftriaxone were 68.8% and 92.5% respectively. Gentamycin, ofloxacin, linezolid and vancomycin were identified as the most effective antibiotics for *Streptococcus pneumoniae*, each with susceptibility rates of 100%.