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Etiologies and Outcome of Children with Purulent Meningitis at the Pediatric unit at a Tertiary Medical Centre, West Bengal

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Abstract

Background: *Bacterial meningitis is one of the most severe infections in infants and children. It is associated with high mortality and neurological sequelae. In order to improve the prognosis of infants and children with purulent meningitis, we decided to conduct this study whose main objective was to identify the main pathogens responsible and describe the outcome in infants and children aged 2 months to 8 years admitted for purulent meningitis at a tertiary medical centre..*

Method: *This was a cross-sectional study with retrospective data collection and consecutive sampling. Our study was conducted from 1 January 2007 to 31 December 2013. The patients included in the study were infants and children aged from 2 months to 8 years who were admitted for bacterial meningitis at the BSMCH, Bankura, confirmed by bacteriological examination of cerebrospinal fluid (CSF) with identification of the pathogen by culture. The data was analyzed using SPSS Version 18.0 and Excel 2007. The Chi-square test was used to determine the association of various variables. The significance threshold was set as $P < 0.05$.*

Results: *We selected 182 cases of purulent meningitis who represented 1.62% of admitted patients. The sex ratio was 1.3. We noted that 45% of our patients were aged 2 months to 1 year. The main presenting*

complaints were fever, seizures, irritability and vomiting in respectively 97.8%, 50.5% , 41.2% and 39.5% of patients. Streptococcus pneumoniae was found in 72 children (39.56%), followed by Haemophilus influenza in 54 children (29.67%) and Group B Streptococcus in 20 children (10.98%). Acute complications (status epilepticus, coma) were seen in 48.35% of patients. The statistically significant (P < 0.05) factors for poor prognosis were aged from 2 months to 1 year (P < 0.001), GCS Score<8 (P < 0.02), the pathogen (P < 0.001 Pneumococcus), a delay of more than three days between the onset of the disease and the treatment (P < 0.01). We identified 44 deaths (24.1%) and 22 cases (12%) with neurological sequelae before discharge. **Conclusion:** *Streptococcus pneumoniae and Haemophilus influenzae are found to be most common pathogen causing meningitis in our study. Age below one year, pneumococcal infection, delayed treatment > 3 days, the Glasgow coma scale <8 are poor prognostic factor. Wide immunization with pneumococcal conjugate and Haemophilus influenza type-b conjugate vaccines can reduces the incidences of meningitis as well as its outcome.*

Keywords: *Meningitis, Outcome, Etiology, children*

INTRODUCTION

Meningitis is one of the most severe infections in infants and children, prevalent worldwide with an incidence of 25 per 100,000 children in [1]. In 2012, in the course of the surveillance of meningitis in Africa the World Health Organization (WHO) [2] identified 22,000 meningitis cases in 14 countries in the meningitis belt. Meningitis is different from other diseases because of its high rates of acute complications, death and the risk of long-term morbidity. With the advent of good antibiotics along with those of vaccines, improved the incidence and outcome of the disease [3] [4] . Although morbidity, mortality and occurrence of sequelae have decreased at a remarkable level, these continue to be important in the pediatric population of developing countries, and their severity is highest in infants and children [4]. In order to improve the incidence and outcome of bacterial meningitis in infants and children in our environment, we decided to conduct this study with an aim to determine the etiology and describe the prognosis in infants and children aged 2 months to 8 years who had been admitted for purulent meningitis at the pediatric unit at Bankura Sammilani Medical College, a tertiary medical centre in West Bengal

METHODS

This was a descriptive cross-sectional study, with retrospective data collection for the period from 1 January 2007 to 31 December 2013. Sampling was consecutive. All patients aged 2 months to 8 years admitted in the pediatric ward with the diagnosis of bacterial meningitis based on the clinical and bacteriological criteria were sampled. Only CSF culture proven cases were included in this study. We excluded patients in whom the diagnosis of meningitis was established but the pathogen was not identified. Data collected included: gender, age, weight of the child, the clinical signs of the child at the time of admission,

the findings of the physical examination including GCS Score, the results of the cytology and bacteriology CSF analysis, acute complications (death, altered level of consciousness, status epilepticus), sequelae at the time of discharge (psychomotor changes, motor deficit, hearing deficit, hydrocephalus).

RESULT

The average number of days of hospitalization was 18.25 days ± 6.35 days, ranging from 7 day to 28 days. The period of time between onset of fever and that of antibiotics ranged from 1 to 12 days giving an average of 3.6 days ± 4 days. Eighty eight patients (48.35%) had complications during hospitalization. It also had noted the same patient had several complications simultaneously. Altered sensorium (GCS<8) and Status epilepticus were the main complications during hospitalization The mortality rate observed in our study was 24.1% (44 deaths); 116 patients (63.73%) recovered without immediate sequelae and 12% had recovered with immediate sequelae (Table 4). We found a statistically significant association ($P < 0.05$) between GCS Score<8 at admission and progression to neurological sequelae (9/22) and death(17/44). We equally found a statistically significant association ($P < 0.05$) between Streptococcus pneumoniae, Haemophilus influenzae and poor clinical outcome. We recorded 26 deaths (59%), and 47.3% of the sequelae were due pneumococcal infection, thus it found to be the most virulent pathogen. Other poor prognostic factors ($P < 0.05$) were age less than 12 months and the delayed admission above 3 days after onset of symptoms. We found 32 deaths below 12 months age group with mortality of 45%.we also noted that

Table-1 Distribution of patients according to the symptoms at the time of presentation

Symptoms	Number	Percentage (%)
Fever	178	(97.8)
Seizures	92	(50.5)
Irritability	75	(41.2)
Vomiting	72	(39.5)
Head ache	72	(39.5)
Agitation	27	(14.8)
Grunting	14	(7.7)
Refuse to breast feed	14	(7.7)
Photophobia	12	(6.6)
Excessive Crying	8	(4.4)
Somnolence	5	(2.7)
Constipation	4	(2.2)

Table 2. Distribution of pathogens according to age

Germs	2 month - 1 yr	1 yr - 2 yr	2 yr - 5 yr	>5 yr	Total(%)
S. pneumoniae	15	21	22	14	72(39.56)
H.influenze	34	8	7	5	54(29.67)
Group B Streptococcus	14	5	1	0	20(10.98)
N. meningitidis	2	3	3	10	18(9.89)
E. coli	4	4	0	0	8(4.39)
Klebsiella pneumoniae	2	1	1	1	5(2.74)
Staphylococcus aureus	0	2	1	0	3(1.64)
Pseudomonas aeruginosa	0	1	0	0	1(0.54)
Citrobacter sp	0	0	1	0	1(0.54)
Total	71	45	36	30	182(100)

Table 3. Acute Complications found during hospitalization.

Complications	Number	Percentage (%)
Altered Sensorium(GCS<8)	42	23.07
Status Epilepticus	21	11.53
Motor deficits	12	6.6
Subdural Effusion	8	4.4
Cerebral abscess	4	2.2
G.I. haemorrhage	1	0.54
Total	88	48.35

Table 4. Distribution of patients according to sequelae at time of hospital discharge

Sequelae	Number	Percentage (%)
Psychomotor Changes	6	3.3
Hemiparesis	5	2.7
Deafness	4	2.2
Hydrocephalus	3	1.6
Quadra paresis	2	1.1
Facial palsy	1	0.54
Focal seizure	1	0.54
Total	22	12

DISCUSSION

The incidence of bacterial meningitis in our study is 1.62% of total admissions. This statistics may be low because we excluded patients in whom the pathogen was not identified. The average age of our patients was 30.2 months with a standard deviation of 38.6, close to the average age of most authors [5] [10] [11] . The sex ratio of 1.3 is similar to Faye [6] in Ivory Coast who found a sex ratio of 1.3 in 2003. Meanwhile Sile [9] in northern Cameroon found a sex ratio of 1.6 in 1999. We do not find any reason for this male predominance clinically; the study noted that the major symptoms to suggest meningitis in infants and children were fever, seizures, irritability and vomiting in respectively 97.8%, 50.5%, 41.2% and 39.5% of patients (Table 1). In our study, Streptococcus pneumoniae was the most common pathogen, found in 39.56% of the patients, followed by and Haemophilus influenza, Group B Streptococcus and Neisseria meningitidis with respectively 29.67%, 10.98% and 9.89% of the patients.

In our study, Streptococcus pneumoniae was the most common pathogen, found in 39.56% of the patients, followed by Haemophilus influenzae , Group B Streptococcus and Neisseria meningitidis with respectively 29.67 and 10.98% and 9.89% of the patients (Table 2). In a study done in the same unit between 2004 and 2009 Haemophilus influenzae was the most commonly identified pathogen followed by Streptococcus pneumoniae and Neisseria meningitidis, respectively, in 40.3%, 34.2% and 5.4% [5]. Our results are also similar to those reported in [7] [8][17]who found (42.3%) Streptococcus pneumoniae fallowed by Haemophilus influenzae and Neisseria meningitidis. Almuneef [13] in Saudi Arabia also identified Haemophilus influenzae as the first pathogen in bacterial meningitis in persons younger than 5 years followed by pneumococcus and meningococcus. Ahmed al Khorasani [14] in Yemen found (30.1%) *Streptococcus pneumoniae* (15%) *H. influenzae* (52.9) *Neisseria meningitidis* (1.3%) *Staphylococcus aureus* (*S. aureus*), and (0.7%) *Escherichia coli*.How- ever other studies [12] [15] [16] [20] [1] [18] [19] done in different places reported, with some variation in the relative frequencies, a predominance of Haemophilus influenzae, followed by Streptococcus pneumoniae and Neisseria meningitis. In 1995, the Centers for Disease Control and Prevention [21] performed a multistage surveillance study of bacterial meningitis and reported *S. pneumoniae* as the most commonly identified agent (47%), followed by Neisseria *meningitidis* (25%) and group B streptococci (12%). Massenet [22] in a study in the northern part of Cameroon found a high prevalence of Neisseria meningitidis with 70.2%, followed by 19.5% with Streptococcus pneumoniae and Haemophilus influenzae with 10.3%. This predominance of Streptococcus pneumoniae in this study can be explained by the fact that the poor vaccination coverage against Streptococcus pneumoniae and introduction of H influenzae vaccine since 2008 gradually reducing the incidence of meningitis caused by H influenzae. The study of Wall [18] in Malawi that showed a significant decline in Haemophilus

influenzae meningitis after the introduction of the vaccine.

The mortality rate observed in our study was 24.1%. This rate is comparable with the mortality rate of 21.8% presented by Gervaix [8] in Cameroon in 2012 and the 20.3% of deaths found by Gomes [22]. Other studies [7] [10] in Cameroon which were respectively 27.4% and 29.8% reported lower mortality. This mortality rate is also lower than the 24% found by Roca [15] and Nandita Chinchankar [32]. Nandita Chinchankar [32] found mortality only 19% but significant amount morbidity, about 55%of long term sequlae.The most vulnerable age group is that of two months to one year, which represented 54.5.7% of deaths and 40.9% of sequelae. The vulnerability of children under one year was also found by other authors [7] [8].

Streptococcus pneumoniae was the pathogen responsible for most of the deaths and sequelae in our study as supported by several other studies [7] [8] [24] - [26] . Twenty two patients had sequelae ,out of them seventeen had at least one sequela at the time of discharge representing of 12%. This rate is similar to that found by Moufdi [27] who reported 10.2% of sequelae at time of discharge. This frequency of sequelae is probably underestimated because all patient did not turn up for fallow up after discharge.

The poor prognostic factors were age < 12 months, pneumococcal infection, delayed admission > 3 days, the Glasgow coma scale <8. Pelkonen [16] in Angola found as poor prognostic fac- tors coma and delayed care, while Gervaix [8] found as poor prognostic factors: age < 2 years and pneumo- coccal infection. Farag [28] found age < 12 months, and Kirimi [29] in Turkey had coma as a factor of poor prognosis. Arditi M[30] ,Kornelisse RF[31] found Decreased level of consciousness and seizures occurring during hospitalization have been associated with increasedmortality and neurologic sequelae. Prativa Singhi found[20] GCS score <8, presence of infarct or cranial nerve palsy at admission is associated with poor outcome.

CONCLUSION

Streptococcus pneumoniae and Haemophilus influenzae are found to be most common pathogen causing meningitis in our study. Age below one year, pneumococcal infection, delayed admission > 3 days, the Glasgow coma scale <8 are poor prognostic factor . Wide immunization with pneumococcal conjugate and Haemophilus influenza type-b conjugate vaccines can reduces the incidences of meningitis as well as its outcome.

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