

Original Article

## **Bacterial meningitis in children**

Sameer Marji

From Department of Pediatrics, Prince Rashid Bin El-Hassan Hospital, Royal Medical Services, Irbid, Jordan.

Correspondance: Dr Sameer Marji PO Box 2240, Irbid, Jordan 21110.

Email:sameermarji@hotmail.com

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### **ABSTRACT**

**Objective:** To demonstrate the epidemiology, clinical manifestations and bacteriological profile of bacterial meningitis in children beyond the neonatal period in our hospital.

**Methods:** This was a retrospective descriptive study conducted at Prince Rashid Hospital in Irbid, Jordan .The medical records of 50 children with the diagnosis of bacterial meningitis during 4 years period, were reviewed.

**Results:** The main cause of infection was streptococcus pneumoniae, followed by Haemophilus influenzae and Niesseria meningitides. Mortality was higher in infants and meningococcal infection, while complications were more encountered in cases of streptococcus pneumoniae. Cerebrospinal fluid culture was positive in 11 cases and Latex agglutination test in 39.

**Conclusion:** There is a significant reduction of the numbers of bacterial meningitis caused by Haemophilus influinzae type B species. (Rawal Med J 2007;32:109-111).

**Key Words:** Meningitis, hemophilis, CSF, neonatal sepsis.

## **INTRODUCTION**

Bacterial meningitis is a life threatening infection caused by bacterial invasion of the meninges<sup>1,2</sup> and its incidence and mortality rates are much higher in the third world countries.<sup>3</sup> Between 10-20% of those who survive bacterial meningitis suffer permanent damage.<sup>4</sup> Diagnosis may be difficult as clinical features are often nonspecific, especially in young children.<sup>5</sup> There are three common etiologic organisms namely, Haemophilus influenza type B, Streptococcus pneumonia and Meningococcal meningitides depending on age, sex, race, season and immunologic status of the child.<sup>6</sup> Cerebrospinal fluid (CSF) is very helpful in diagnosis.<sup>7</sup>

In the previous few years H. influenza type B was the major cause of bacterial meningitis in children<sup>8,9</sup> however, the introduction of the conjugate vaccine for H. influenza type B in many countries and the occurrence of epidemic meningococcal disease, make the epidemiology of childhood meningitis a moving target. Traditionally, the length of treatment for bacterial meningitis varies from 10-14 days depending on the etiologic agent.<sup>10-12</sup>

## **PATIENTS AND METHODS**

The medical records of all children admitted to Prince Rashid Hospital with the diagnosis of bacterial meningitis in a 4 year period between 2000-2005 were reviewed. The study included 50 children [26 males, 24 females] ranged in age between 2 months and 14 years. Diagnosis was established depending on the clinical picture and one of the following criteria: Positive CSF culture, CSF leukocytosis regardless the type of cells as well as high protein and low sugar levels and Positive latex agglutination test, to detect H. influenza type B. S. pneumonia, N. meningitides A, B, C, W135 and E coli k1 antigen.

Children with debilitating illnesses such as malignancies or those on steroids were excluded.

The clinical picture, the findings of the investigations, the course of the disease and the outcome were recorded. Third generation cephalosporin [ceftriaxone or cefotaxime] plus vancomycin was the standard treatment for the usual recommended period for each organism. Dexamethasone was given 30 minutes before the start of antibiotics and continued for 2 consecutive days. Vancomycin was discontinued according to the cerebrospinal fluid culture and sensitivities. Visual and hearing assessment was performed at the conclusion of treatment and brain CT scan was done if indicated.

## RESULTS

There were no sex predilection but those below one year were mostly affected (table 1). The most common presenting symptom was fever in 46 patients [92%] followed by vomiting, poor appetite, drowsiness, nuchal rigidity, headache, Kerning's Sign, convulsions and bulging anterior fontanel respectively (table 2). The overall prevalence of agents was 40% for *Streptococcus pneumoniae* followed by *Haemophilus influenzae* (24%) and *Neisseria meningitidis* (14%).

Table 1. Age distribution of children with bacterial meningitis.

Age	Number of children	Percentage
2-12 months	29	58
1-5 years	15	30
5-14 years	6	12
Total	50	100

Organisms were isolated from 11 [22%] CSF samples, and latex agglutination test was positive in 39 [78%] patients including those with positive CSF cultures while 11 [22%] children showed negative cultures and negative latex tests (table 3). CSF glucose level was less than 40 mg % in 41 [82%] patients, while serum glucose level was in the range of 85 to 125 mg % in all children. CSF cells were predominantly polymorph nuclear in 40 [85%] children and the total number was between 60 to 1650 cells/cu mm. CSF protein was more than 40 mg % in 38 [76%] children.

Table 2. Clinical features in children with bacterial meningitis

Clinical features	Number of patients	Percentage
Fever	46	92
Vomiting	39	78
Poor feeding	36	72
Drowsiness	34	68
Nuchal rigidity	28	56
Headache	18	36
Kerning's sign	15	30
Convulsions	10	20
Bulging fontanel	8	16
Diarrhoea	6	12
Skin rash	3	6

The overall mortality was 4 [8%], all of them were below one year of age. Thirty [60%] children recovered without complications and 16 [32%] were left with one or more of the complications, most occurring in those below one year of age (table 4).

## DISCUSSION

Fever was the most common presenting symptom followed by vomiting, drowsiness and nuchal rigidity, as reported by other workers.<sup>13</sup> These results showed no sex predilection in the attack rate of bacterial meningitis among children, which is in agreement with other studies in the region.<sup>14</sup> *Streptococcus pneumoniae* was the causative organism in 40% of cases followed by *Haemophilus influenzae* type B (24%) and *Neisseria meningitidis* (14%) respectively, which was similar to published studies.<sup>15</sup> This new pattern of infection observed mostly reflects the impact of Hib conjugate vaccine which was introduced in Jordan in July 2001.

Table 3. Types of organism and method of identification.

Type of organism	+ ve C.S.F culture	%	+ ve latex test	%	- ve C.S.F culture, positive latex	%	- ve culture and negative latex	%
Streptococcus pneumoniae	5	10	20	40	15	30	-	-
Haemophilus influenzae type b	5	10	12	24	7	14	-	-
Neisseria meningitides	1	2	7	14	6	12	-	-
Non identified organism	-	-	-	-	-	-	11	22
Total	11	22	39	78	28	56	11	22

Abbreviations: +ve; positive, -ve; negative, C.S.F; cerebro spinal fluid, %; percentage

Significant reduction in the incidence of bacterial meningitis caused by Haemophilus influenzae type B was reported from United Kingdom following routine infant immunization program with Hib conjugate vaccine which began in 1992.<sup>16</sup> A report from WHO in 2004 stated that Hib conjugate vaccine is safe, immunogenic in young infants and offer long-term protection.<sup>4</sup> A study showed that the efficacy of the heptavalent pneumococcal conjugate vaccine in preventing invasive pneumococcal disease including meningitis to be 97.4%.<sup>17</sup> However, in our country, a multi-central prospective study recruiting a considerable number of children is needed for appropriate evaluation of the impact of this vaccine.

Table 4. The complications and cure rate according to age, sex and microorganism.

Outcome	Numb	%	Mean age in months	Sex		No organism			
				M	F	Sp	HIB	NM	No organism
Cure	30	60	20	15	15	11	7	4	8
Death	4	8	7	2	2	2	1	1	-
Complication	16	32	9.9	9	7	7	4	2	3
Subdural effusion	7	14	7	4	3	3	3	-	1
Recurrent convulsions	4	8	10	2	2	2	1	-	1
Hydrocephalus	3	6	6	2	1	2	1	-	-
Deafness	2	4	12	-	2	-	1	1	-
Cerebral atrophy	2	4	6	1	1	1	1	-	-
Facial palsy	1	2	8	1	-	1	-	-	-
Cortical blindness	1	2	8	-	1	-	-	-	1
Hemi paresis	2	4	11	2	-	1	-	1	-

Abbreviations: Numb; number, M; male, F;female,  
S.P; streptococcus pneumoniae, HIB; haemophilus influenzae, NM; neisseria meningitides

The low number of positive CSF culture, 11 (22%), compared with a higher number of positive latex test, 39 (78%), could be attributed to the indiscriminate use of antibiotics before admission to hospital. Our data showed a direct relation between morbidity, mortality and the young age of onset of infection and is consistent with earlier reports.<sup>18</sup> Despite appropriate treatment, there were a significant number of complications (32%), which occurred mostly in those infected with *Streptococcus pneumoniae*. In conclusion, we showed that bacterial meningitis is continued to be a major cause of mortality and morbidity in our region and there is a change in etiologic agents.

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