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ACUTE COMPLICATIONS AND MORTALITY SPECTRUM IN BACTERIAL MENINGITIS

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Abstract:
Aim: *The aim of the study was to obtain data on the incidence of acute complications and mortality associated with bacterial meningitis in children.*
Patients and Methods: *This was a descriptive observational study conducted at the Pediatric department of Sir Ganga Ram Hospital, Lahore for period of 6 months from January 2020 to June 2020. All patients aged 1 month to 10 years with probable bacterial meningitis were included in the study. The information was saved in a pre-designed proforma form and the data was analyzed using SPSS version 16.*
Results: *Sixty patients were enrolled in the study. There were 48 (80%) men and 12 (20%) women with an M: F ratio of 4: 1. About three-quarters of patients (76.67%) were under the age of 1 year (46/60). Complications occurred in 21 (35%) patients during hospitalization. The most common complication was convulsions after four days of illness (21.7%), followed by subdural effusion (11.9%), hydrocephalus (10%), palsy of the cranial nerve (8%), hemiplegia (7%), increased intracranial pressure (3%). Ten patients had more than one complication. There was only one death (1.67%) and one patient missed a doctor. In this study, the history of more than 7 days before the hospital visit was significantly associated with an increased incidence of acute complications of meningitis (p = 0.002).*
Conclusion: *Seizures, subdural effusion, and hydrocephalus are the most common acute complications in patients with meningitis in this study. There is an increased risk of acute complications in patients with long-term symptoms.*
Key words: *bacterial meningitis, meningitis, convulsions.*

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INTRODUCTION:

Bacterial meningitis remains an important problem in pediatric practice, with sustained significant mortality and morbidity despite appropriate treatment[1-2]. The pathogens responsible for the majority of childhood meningitis in developing countries are Streptococcus pneumonia and Hemophilus influenza type b (Hib). Bacterial meningitis was almost exclusively a fatal disease before the age of antibiotics[3-4]. The main cause of mortality and the sequelae of bacterial meningitis are intracranial complications arising in the acute phase of the disease, causing secondary brain damage. The most common acute complications include increased intracranial pressure (ICP), seizures, hydrocephalus, subdural effusion, cranial nerve palsy, and hemiplegia[5-6]. Complications in developing countries are sometimes caused by parental ignorance, delayed diagnosis by local doctors, or delayed arrival in hospital for appropriate treatment[7-8]. Knowing the entire clinical spectrum of complications and finding them quickly is a prerequisite for better treatment of the disease[9]. According to the World Health Organization (WHO) case definition, bacterial meningitis is classified into three groups:

Bacterial meningitis causes a wide range of acute complications leading to childhood morbidity and mortality. Any person with a sudden onset of fever (> 38.5 ° C in the anus or 38.0 ° C in the armpit) and any of the following symptoms: neck stiffness, altered consciousness or other meningeal symptoms. Suspected case with CSF test showing one or more of the following: cloudy appearance; leukocytosis (> 100 cells / mm3); leukocytosis (10-100 cells / mm3) and elevated protein levels (> 100 mg / dL) or decreased glucose levels (<40 mg / dL). A case that is laboratory confirmed by culturing or identifying (i.e., Gram staining or antigen detection) of a bacterial pathogen (Hib, pneumococcal or meningococcus) in the cerebrospinal fluid or blood of a child with a clinical syndrome compatible with bacterial cerebral meningitis.

The Hib vaccine reduced the infection, which is one of the most important causes of bacterial meningitis in developed countries. This is now being put on the immunization schedule through Pakistan's Extended Immunization Program (EPI). Theoretically, pneumococcal meningitis is a preventable disease with vaccines[10]. The widespread use of the pneumococcal conjugate (PCV) has resulted in a significant reduction in invasive pneumococcal disease. Consequently, if Hib and pneumococcal vaccines become part of common immunization, the incidence of acute bacterial meningitis in early childhood could be reduced by more than 60%, while significantly reducing the financial and emotional burden of the disease. The aim of the study was to determine the frequency and types of acute complications related to meningitis. In addition, we identified any factors associated with the increased complication rate of meningitis.

PATIENTS AND METHODS:

This study was conducted at Pediatric department of Sir Ganga Ram Hospital, Lahore for period of 6 months from January 2020 to June 2020. All patients 1 month to 10 years of age who met the criteria for probable bacterial meningitis according to the WHO case definition they were included in science. Likely meningitis is defined as the suspected case where examination of the cerebrospinal fluid shows at least one of the following: cloudy appearance; leukocytosis (> 100 cells / mm3); leukocytosis (10-100 cells / mm3) and elevated protein levels (> 100 mg / dL) or decreased glucose levels (<40 mg / dL). The demographics of these patients has been recorded. Interviews and oral or intravenous treatment before visiting the hospital were also noted. Ultrasound and computed tomography (CT) of the head were performed as needed. Other laboratory parameters, such as cerebrospinal fluid cultures, were not analyzed in this study. After diagnosis, patients were treated with antibiotics depending on age: (i) patients aged 1 to 3 months: cefotaxime or ceftriaxone with amikacin; (ii)> 6 months: cefotaxime or ceftriaxone with benzylpenicillin. Intravenous dexamethasone was administered at a dose of 0.15 mg / kg / dose every 6 hours for two days (the first dose was given with or before the first dose of antibiotics). Antibiotics were changed (as needed) according to clinical response or persistent infection in the CSF study. The second-line antibiotics were vancomycin or meropenem. These patients were monitored during their hospital stay for acute complications of bacterial meningitis and the associated mortality. All data was recorded in the pre-designed proforma format and the results were analyzed in percent using SPSS version 16. The chi-square test was used for statistical analysis.

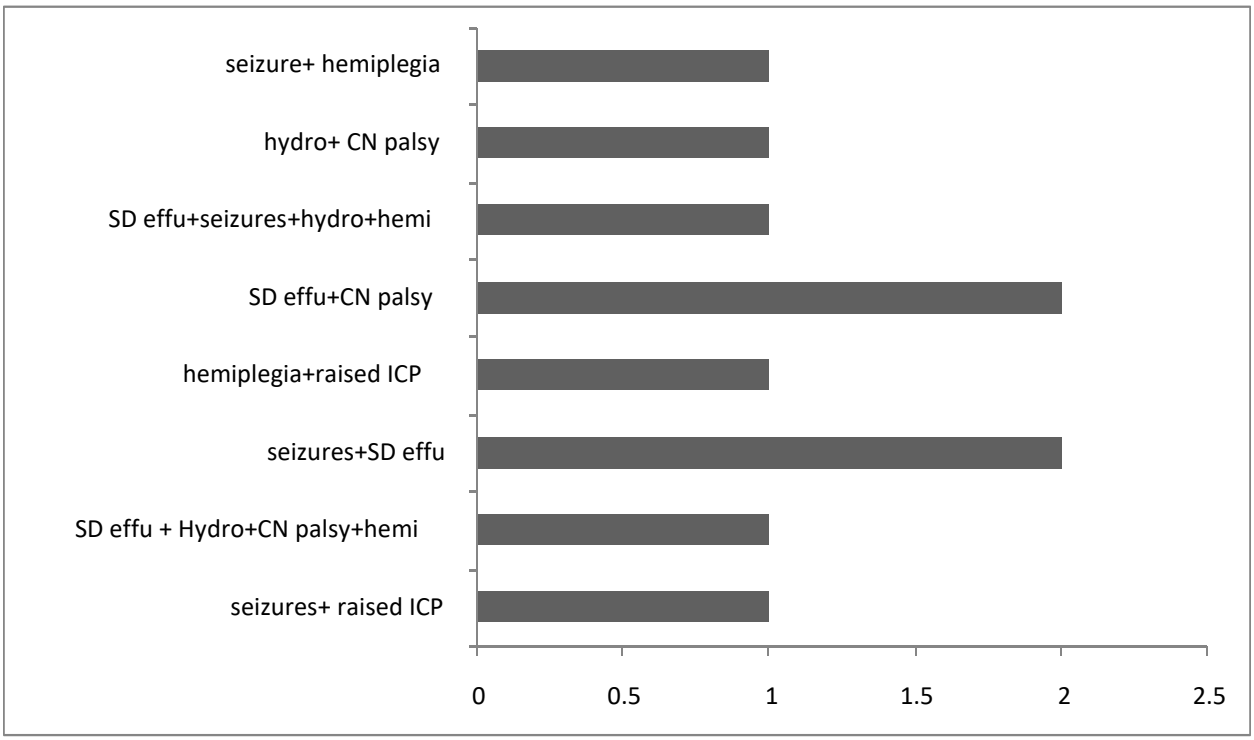
RESULTS:

Of the sixty patients enrolled in this study, 48 (80%) were men and 12 (20%) women with an M: F ratio of 4: 1. Nine patients (15%) were 1-3 months old, 15 (25.0%)) were aged between 3 and 6 months, 22 (36.7%) were aged between 6 months and 1 year, 10 (16.7%) were aged between 1 and 5 years and 4 (6.7%) were over the age of 5. On the first day of admission, all children underwent a lumbar puncture.

TABLE 1: Frequency of acute complications in bacterial meningitis. (n=60)

Complications	Number	%tage
Subdural effusion	07	11.7
Seizures after four days	11	18.3
Hemiplegia	04	06.7
Hydrocephalus	06	10.0
Cranial nerve palsies	05	08.3
Raised intracranial pressure	02	03.3

Total leukocyte counts ranged from 70-6,000 / high power field (mean = 440 / hpf) with a mean neutrophil count of 65%, CSF protein ranged from 49-550 mg / dL (mean = 148 mg / dL), and blood sugar in the cerebrospinal fluid in the range of 10-360 mg / dL (mean = 67 mg / dL). The second and third lumbar punctures were performed in 18 (30%) and 7 (12%) patients, respectively, according to clinical indications. Complications occurred in 21 (35%) patients during hospitalization. The most common complications were seizures after four days, followed by subdural effusion and hydrocephalus. (Table 1). Ten patients experienced more than one complication as shown in Fig. 1.



The duration of the pre-visit interview in 50% (n = 30) was 1-3 days, 23% (n = 14) 3-7 days, and 27% (n = 17) more than 7 days. Fifty percent of the patients received treatment before visiting the hospital. Of these patients, 7 were taking intravenous drugs and 23 were taking oral medications. Skull ultrasound was performed in 50 (83.3%) patients, of which 8 (16%) had one of the previously described complications of meningitis. Similarly, computed tomography was performed in 39 (63.3%) patients, of whom 14 (38.8%) had signs of complications. In our study, there is a linear relationship between the incidence of complications and the duration of the interview before the hospital visit (p = 0.002) (Table 2).

TABLE-2. Relationship of acute complications with various parameters

	Complications		P value
	Yes	No	
Age			
1-3 months	3	6	
3-6 months	6	9	
6-12 months	9	13	0.522
1-5 years	2	8	
>5 years	1	3	
Sex			
Male	16	32	0.412
Female	5	7	
Duration of history before hospitalization			
1-3 days	5	25	0.002
3-7 days	5	9	
>7 days	11	5	
Cerebrospinal fluid cell count			
10-500	19	33	0.759
500-100	1	4	
>1000	1	2	
Treatment before hospitalization			
Oral	10	13 3	
Intravenous	4		0.133
No treatment	7	23	

During the treatment, second-line antibiotics were added in 23 (38.3%) children, as clinically indicated. Out of sixty patients, one patient (1.67%) died and one patient failed to see a doctor.

DISCUSSION:

Acute bacterial meningitis is the cause of many deaths and significant long-term morbidity worldwide. In countries with scarce resources, the incidence of the disease is approximately 10 times higher than in countries with adequate resources. In our study, 80% of the sixty patients were male. This could mean male dominance and gender discrimination in Southeast Asia. About three-quarters of our patients (n = 46) were less than 1 year old. In a study by Chinchankar et al. In India, it was shown that 77.7% of their children were under 1 year of age. The study also showed that 39% of patients developed acute neurological complications during hospitalization. This is similar to our results. In our study, the most common symptom was seizures after 4 days of illness (21.70%). This was comparable to various studies. Subdural effusion was the second most common complication in our study. One study from the same continent found that subdural effusion was the most common complication of meningitis. This study shows that a delay in starting effective treatment due to late admission is a predictor of death (p-value = 0.002). This has been confirmed by many studies in the subcontinent. The reason for the delayed presentation was probably a delay in diagnosis by the GP, causing frequent complications. In one study from India, 18.5% of patients required second-line antibiotics per protocol. In our study, during treatment, second-line antibiotics were added in 23 (38.3%) children, which is a large number, possibly the antibiotic was clinically changed prior to culture results and CSF sensitivity. The death rate in India and other developing countries is estimated at 16 to 30%. Even in developed countries, despite the availability of all facilities, early childhood mortality

from bacterial meningitis is as high as 10%. In our study, only one patient died (1.6%). One limitation of our study is that only those patients who were stable enough to undergo a lumbar puncture on the first day of admission were enrolled in the study.

CONCLUSION:

Bacterial meningitis remains a serious disease with significant morbidity and mortality despite advances in the field of antibiotics. Complications most often occur under the age of one. The most common complications are seizures after four days, followed by subdural effusion and hydrocephalus. The length of history beyond seven days is significantly associated with an increased rate of acute complications. Patients with delayed referrals are at increased risk of acute complications. Early referral, timely diagnosis and appropriate treatment reduce the morbidity and mortality associated with bacterial meningitis.

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