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## ORIGINAL ARTICLE

# Clinical Spectrum and Outcome of Meningoencephalitis in Children Less Than 5 Years, Managed in a Tertiary Care Hospital Rawalpindi 2018-19

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### ABSTRACT

**Objective:** To assess the clinical spectrum and outcome of meningoencephalitis in children less than five years old who presented to Benazir Bhutto Hospital (BBH) Rawalpindi.

**Study Design:** Prospective hospital-based descriptive case series study.

**Place and Duration of the Study** The study was conducted at Benazir Bhutto Hospital, Rawalpindi for a period of eighteen months from January 2018 to June 2019.

**Material and Methods:** Children between the ages of 1 month and 5 years, admitted with the diagnosis of meningitis/encephalitis on the basis of clinical findings and positive CSF, were included. A pre-designed proforma was used to collect data. The data was presented in the form of frequencies and percentages.

**Results:** 689 children were hospitalized with provisional diagnosis of meningo+encephalitis [male 416 (60.4%), female 273 (39.6)]. The mean age of children was 11.3 months  $\pm$ 11 months. The most common presenting symptom was fever 96%, 81% had seizures, 56.5% had vomiting 23.2% presented with poor feeding, and 26.2% had impaired consciousness. 122 of 689 children (17%) died of complications. The complications of meningoencephalitis showed a significant association (p=0.002) with CSF positivity (p=0.037) and malnutrition (p=0.003).

**Conclusion:** The mostly affected children are under one year of age with males being more commonly affected. Moreover meningoencephalitis can result in serious neurological complications. Mental state alteration, long duration of symptoms and malnutrition are associated with increased risk of complications. Most of the children who died were under one year of age.

**Key Words:** *Meningitis, Encephalitis, Clinical features, Children, Mortality.*

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### INTRODUCTION

A wide range of clinical presentations can occur after brain infection and inflammation. The clinical

presentation can include a change in behavior, headache, fever and seizures. Serious illness can result after meningoencephalitis with significant

risk of death.<sup>1</sup> Meningoencephalitis is therefore a medical emergency that needs to be diagnosed early and treated with appropriate therapy. Neurological sequelae and death can result even with preventive measures and recent advances in treatment.<sup>2</sup> Infectious agents vary according to geographical location.<sup>3</sup> The various agents responsible for meningoencephalitis are viruses, bacteria, parasites and fungi.<sup>4-6</sup>

In infants and children meningitis has a mortality of 10-25% and 3% respectively. The sequelae that can occur after meningoencephalitis are behavior and learning disorders, epilepsy, hydrocephalus, and cranial nerve palsies. Pneumococcal and meningococcal meningitis are severe forms of meningitis, primarily affecting children under 2 years of age.<sup>4</sup>

Viral or aseptic meningitis can be caused by herpes simplex, varicella zoster, measles, mumps, influenza and HIV with the most common agent being enterovirus.

The most common fungal meningitis is caused by *Cryptococcus neoformans* especially affecting immunocompromised patients. Cerebral malaria and cysticercosis are parasitic infections that can involve brain. Amebic meningitis can also result after fresh water swimming and can be fatal.<sup>6</sup>

The clinical features of encephalitis include seizures, decreased consciousness, focal neurological signs and personality change. With the progress of infection mixed features (meningoencephalitis) can occur.<sup>7</sup>

Meningitis can be insidious or fulminating in onset. The clinical features include fever, headache, vomiting, irritability and lethargy. In around 30% of the children seizures can occur.<sup>8</sup> Infants can present with a bulging fontanel, however papilledema is rarely seen.<sup>9</sup> In meningococemia there are petechial or hemorrhagic rash. Irritation of meninges causes neck stiffness with pain on flexion of neck and limitation of mobility. Except in tuberculosis or in complicated cases (for example, abscess) focal neurological signs are unusual.<sup>10</sup>

It is important to make an early diagnosis and start treatment early for a good outcome. In this article, we did a review of clinical presentation and outcome of meningoencephalitis in infants and

children who presented to Benazir Bhutto hospital Rawalpindi

## MATERIAL AND METHODS

A hospital-based descriptive study was conducted at Benazir Bhutto Hospital, Rawalpindi for a period of eighteen months from January 2018 to June 2019. Children between the ages of 1 month and 5 years, admitted with meningoencephalitis on the basis of clinical findings were included in this study. Inclusion criteria included fever, seizures, excessive crying, poor feeding, neck stiffness, altered consciousness, bulging fontanelle (in children aged <12 months). The exclusion criteria were children with known CNS morbidities and acute head trauma.

A proforma was used to record age, gender, clinical findings, complications, duration of hospital stay and the outcome. SPSS version 24 was used to analyse the results. Frequencies and percentages for categorical variables were calculated. The Chi-square test/Fisher's exact test was used for statistical analysis. A p-value of <0.05 was considered statistically significant. Only those cases who were resident of district Rawalpindi were included in this study.

## RESULTS

A total of 689 patients were admitted with provisional diagnosis of meningoencephalitis during the eighteen months of study. The total number of male patients were 416 (60.4%) while females accounted for 273 (39.4%) patients, with a male to female ratio of 1.5:1. The mean age of children was 11.3 months  $\pm$  11 months. About half of the patients (54%, n=375) were <1 year of age. Average length of hospital stay (LOS) was 10.98  $\pm$  4 days. 60% of the children belonged to the urban population. 38%, (n=263) were severely malnourished at the time of admission according to WHO z-scoring Charts. The patients who were stable clinically were discharged with treatment.

**TABLE 1: Demographic details**

Demographic profile	Number (n = 689)	Percentages
<b>Age in months</b>		
Mean (SD)	11.3 Months ( $\pm$ 11 m)	
Age in categories		
Up to 12 m	375	54.5
1 – 3 years	176	25.5
3 – 5 years	138	20

<b>Gender</b>		
Male	416	60.4
Female	273	39.6
<b>Duration of Hospital Stay (Mean 8.8days ±4)</b>		
< 7 days	95	13.8
7-10 days	245	35.6
10-14 days	221	32.1
> 14 days	128	18.5
<b>Area of residence</b>		
Urban	413	60
Rural	276	40
<b>History of malnutrition</b>		
Yes	263	38.2
No	426	61.8
<b>Parents socioeconomic class</b>		
Lower	365	53
Middle	289	42.0
Upper	35	5

The most common presenting symptom was fever 96%, 81% had seizures, 56.5% had vomiting 33.2% presented with poor feeding, and 26.2% had impaired consciousness.

**TABLE 2: Clinical feature**

Clinical features	Frequency	Percentage
Fever	662	96
Fits	558	81
Vomiting	389	56.5
Irritability	432	62.8
Breathing difficulties	276	40.1
Reluctance to feed	228	33.2
Drowsiness	180	26.2
Rash	91	13.3

Complete Blood count (CBC), serum electrolytes, blood sugar were sent to the lab in all patients. CSF was done in 29% of the patients while CT scan was obtained for 59 patients.

**TABLE 3: Test performed**

Test performed	Number	Percentage
CBC	675	98
Serum electrolytes	447	65
CSF	199	29
CT SCAN	59	8.5

567 children improved with management and were discharged. One hundred and twenty two of 689 children (17.7%) died. Septicemia/Septic shock and respiratory failure accounted for most of deaths while one child died of measles encephalitis. At presentations refusal to take feed

(p=0.008) and impairment of consciousness were independent predictors of death (p=0.002). CSF positivity and severe malnutrition also had statistically significant p-values of 0.003 and 0.037 respectively in development of complications and death.

**TABLE 4: Factors associated with outcome**

	Outcome		p-value
	Discharged	Died	
<b>Age</b>			
<1 year	228	87	0.65
1-3 years	153	23	
>3 years	126	12	
<b>Gender</b>			
Male	328	88	0.038
Female	239	34	
<b>Duration of illness</b>			
<7 days	180	15	0.04
>7 days	387	107	
<b>Altered mental status</b>			
Yes	332	95	0.002
No	235	27	
<b>Reluctance to feed</b>			
Yes	107	89	0.008
No	269	33	
<b>Severe malnutrition</b>			
Yes	227	101	0.003
No	340	21	
<b>CSF culture</b>			
Not performed	490	37	0.039
Positive	199	85	

## DISCUSSIONS

There is a significant morbidity and mortality in children with meningoencephalitis. There is a risk of fatal outcome or neurological deficit if the diagnosis and treatment is delayed.<sup>11,12</sup> The disease is 10 times more common in countries with poor resources.<sup>13</sup> In India and other developing countries the mortality is from 16-32%.<sup>14,15</sup>

Our study showed and increased incidence of meningoencephalitis in children less than one year of age. The incidence of encephalitis has in several studies been shown to be highest amongst young children, as high as 18/100,000 child years in children under the age of one, compared to 1-2/100,000 in older children and adults.<sup>16</sup> The higher incidence of acute encephalitis amongst young children might be due

to their relatively inexperienced and immature immune system. In young children, the number of memory cells are low and compared to older children and adults, their ability to produce cytokines as a response to infection is less well developed. Thus, the younger children are both predisposed to viral infections and also less effective in controlling the infection, compared to adults.

In our study male gender accounted for 416 (60.4%) patients. Dhruvajoti et al has reported a male preponderance of 1.8:1.<sup>17</sup> A Pakistani study reported 80% male preponderance<sup>18</sup>. Qazi et al also reported male preponderance (60 %).<sup>19</sup>

Clinical symptoms of acute encephalitis need to include signs of recent or ongoing infection as well as neurological symptoms indicating CNS involvement. These signs are not always easily interpreted and CNS symptoms might initially be vague, especially in young children. In this study, a majority (96%) of the children with acute encephalitis had fever or a recent history of fever at the time of presentation. In contrast, fever at presentation was only seen in 56% of cases in a study by Aneja et al.<sup>20</sup>

Altered level of consciousness was seen in 62% of children with acute encephalitis in study. Altered sensorium might be difficult to assess in a child with high fever, and even more difficult in young children, and repeated evaluations are often necessary. To carefully consider a parents concern of a child behaving differently is also important as this might be a sign of confusion or personality changes. Focal neurological findings and seizures were seen in approximately 40% of the children with acute encephalitis in a study.<sup>20</sup> A similar frequency of these findings have been seen in other studies on children with acute encephalitis. In a study by Misra et al, seizures were present more often compared to encephalitis of other etiologies.<sup>21</sup>

As in many previous studies on meningitis and encephalitis, both in adults and children, the etiology could only be confirmed in a minority of patients.<sup>2</sup> The number of children where the etiology was confirmed by findings in the CSF was only 199/689. Thus, the number of confirmed etiologies can be considered to be 28% in the present study based on CSF examination

When there is a suspicion of a child suffering from acute encephalitis, laboratory workup is usually under taken to try to differentiate between bacterial and viral infections as well as identifying other differential diagnoses.<sup>21</sup> However, none of the tests available are at all specific in discriminating between bacterial and viral infection. In the present studies blood was analyzed for CBC, WBC and electrolytes, with mild to moderate increase. More important in CNS infections is the analysis of the CSF, and lumbar puncture should be performed as early as possible. The low rates of CSF examination in our study were due to non-consent of the parents for lumbar puncture

Outcome after childhood encephalitis varies from full recovery to death or severe sequelae, with a worse prognosis in etiologies causing extensive CNS injury with necrosis.<sup>22,23</sup> Neurological complications were found in 59 patients (17%). Cho *et al* has reported similar figures of 20%.<sup>24</sup> Studies have also reported a higher percentage of neurological complications (43%, 35%, 42%).<sup>24</sup>

Fatal out come in our study was 17.7%, this is close to that detected (19%) by Khan and Kutiet al., in which 27.2% children died.<sup>25</sup> But much higher (6.5%) reported in a Korean study. In our study more than 82.3% of the children were satisfactorily discharged. Long term outcome of sequelae were not monitored. Among the mortalities septicaemia and respiratory failure was predominant

## CONCLUSION

Meningoencephalitis is a severe disease mostly affecting under one year of age with a preponderance of male patients. Most of the mortality occurred in under 1 year of age.

Altered mental state, prolonged duration of symptoms and severe malnutrition were associated with increased risk of complications.

**Conflict of interest:** All authors declare no conflict of interest.

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