

Original Research Article

Etioclinical profile and outcome of acute bacterial meningitis in post neo natal U-5 children: a study from tertiary care center of coastal Odisha, India

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ABSTRACT

Background: Acute bacterial meningitis (ABM) continues to remain an important cause of morbidity, mortality and handicap in children despite availability of wide range of antimicrobials. The microorganisms vary according to age, socio economic condition and geographical area along with other factors.

Methods: A prospective study was conducted over 2.5 years from October 2012 to April 2015 in the department of pediatrics, SVP Institute of Pediatrics, SCB Medical College, Cuttak, Odisha, India. Total 104 subjects were included after taking meticulous inclusion criteria.

Results: Out of 104 cases, majority (70.2%) were infants. 60.6% were male with M:F ratio 1.5:1. Fever was the commonest symptom in 69.2% followed by convulsion 61.5%, vomiting 36.5%, altered sensorium 33.7%. On examination 69.2% children were febrile, having bulging fontanelle in 34.6%, pneumonia 31.7%, positive meningeal sign 29.8%, cranial nerve palsies 14.4%, papilledema 12.5% and hemiplegia 11.5% cases. GCS were poor (<7) in 26.9% cases. 33.6% had high CSF cell count (>100/cumm). In 82 cases (78.8%) etiological agents were identified consisting of *H. influenzae* in 46.4%, *S. pneumoniae* in 36.6%, *E. coli* in 8.6% and others in 8.4%. CT scan of brain revealed brain edema in 29.4% followed by subdural effusion 19.6%, hydrocephalus 17.6% and infarction in 5.9%. 63.5% children were recovered completely. Mortality was 16.3% with sequelae in 20.2% cases.

Conclusions: Hib and *Pneumococci* were two most common organisms causing ABM in U-5 children with high mortality and sequelae which can be prevented by early diagnosis, optimum lab diagnostic facility and mass vaccination. There is urgent need to include Pneumococcal vaccine in NIP for substantial reduction of infant mortality.

Keywords: ABM, *H. influenzae*, Mortality, *S. pneumoniae*, Sequelae, U-5 children

INTRODUCTION

Acute bacterial meningitis (ABM) is an important preventable cause of U-5 child deaths and long term neurological sequelae specifically in developing countries with limited resources like ours.¹ The community incidence of ABM in India varies from 0.5% to 2.6%.²

Despite the availability of a wide range of antibiotics, mortality rate remains significantly high in India and other developing countries, ranging from 16-32%.³ In a recent study it is stated that pneumonia and meningitis are responsible for 22% of U-5 deaths and Hib as the leading cause of purulent meningitis.⁴⁻⁸ The organisms associated with ABM are different in neonatal and older

children group. They vary according to geographical area. But the prevalence of organisms in neonatal group are mainly Gr-B *Streptococcus*, *E coli*, *Listeria* and in older children are *H. influenza*, *S. pneumoniae* and *N. meningitides*.⁹ Immune suppressed conditions increase the risk of meningitis from less common pathogens viz. coagulase negative *Staph aureus*, *Pseudomonas* and *Salmonella* etc. The identification of causative organisms of ABM chiefly depends on the method used and standard of the laboratory. Acute complications and long-term sequelae of ABM are not infrequent. The rate of residual abnormality after meningitis ranges from 10-30%.¹ The most distressing handicap are hearing and visual impairment, developmental delay, mental retardation and persistent seizure. The median risk of sequelae is quite high (approx. 25%) for both Hib and Pneumococcal meningitis.¹⁰ In this context it can be reiterated that though Hib vaccine has been incorporated in NIP of India, there is urgent need for inclusion of Pneumococcal vaccine for rapid reduction of U-5 mortality and handicap in children.

METHODS

A prospective study was done over a period of 2.5 years from October 2012 to April 2015 in the department of

Pediatrics, SVPPGIP, SCB Medical College, Cuttack, Odisha, India. Total of 104 cases were selected after taking in view of the inclusion criteria. Further the cases were subjected to detailed clinical probing and lab investigations like CSF study and C/S, blood C/S, latex agglutination test and other appropriate test as required and the final data was analysed. CSF was tested for bacterial antigens by LPAT using Biorad Pastorex meningitis kit.

RESULTS

Out of 104 cases, 70.2% were infants and 29.8% were of age group 1-5 years and 60.6% were male and female ratio was 1.5:1 (Table 1).

Table 1: Age and sex wise distribution.

Age	Male	Female	Total and percentage
Infants (29 days-1year)	46	27	73 (70.2)
>1 year-2 years	3	6	9 (8.6)
>2-5 years	14	8	22 (21.2)
Total	63	41	104

Table 2: Clinical profile.

Symptoms	No of cases	Percentage	Signs	No. of cases	Percentage
Fever	72	69.2	Fever	72	69.2
Vomiting	38	36.5	Meningeal sign	31	29.8
Headache	14	13.6	Bulging fontanelle	36	34.6
Convulsion	64	61.5	Hemiplegia	12	11.5
Altered sensorium	35	33.7	Cranial nerve palsy	15	14.4
Ear discharge	4	3.8	GCS<7	28	26.9
Visual disturbance	2	1.9	Papilledema	13	12.5
Refusal to feed	13	12.5	Hepatomegaly	36	34.6
Lethargy	35	33.7	Splenomegaly	19	18.3
Irritability	45	43.2	Pneumonia	33	31.7

Table 3: Distribution of isolated organism (n=82).

Organism	CSF LPAT	CSF C/S	Blood C/S	No of case (%)
<i>S. pneumoniae</i>	30	7	6	30 (36.6)
<i>H. influenzae</i>	36	4	6	38 (46.4)
<i>E. coli</i>	0	5	2	7 (8.6)
<i>Klebsiella</i>	0	0	2	2 (2.4)
<i>N. meningitidis</i>	1	0	1	1 (1.2)
<i>S. aureus</i>	0	0	1	1 (1.2)
<i>B. cereus</i>	0	0	3	3 (3.6)
Total	67 (64.4%)	16 (15.4%)	18 (17.3%)	82 (78.8%)

Fever was the commonest symptom with total incidence of 69.2% followed by convulsion 61.5%, irritability 43.2%, vomiting 36.5% altered sensorium 33.7% and

lethargy 33.7%. On examination 69.2% children were febrile. Bulging fontanelle were 34.6%, hepatomegaly 34.6%, splenomegaly 18.3%, pneumonia 31.7%, positive

meningeal sign 29.8%, cranial nerve palsies 14.4%, papilledema 12.5% and hemiplegia 11.5%, GCS were poor (<7) in 26.9% cases (Table 2).

Table 4: CT scan of brain findings (n=51).

Findings	No. of cases	Percentage
Normal	14	27.5
Subdural effusion	10	19.6
Hydrocephalus	9	17.6
Brain edema	15	29.4
Infarction	3	5.9
Total	51	100

In 82 cases (78.8%) etiological agent were identified and among them 46.4% were due to *H. influenza*, 36.6% *S. pneumoniae*, 8.6% due to *E. coli* and 8.4% were due to others (Table 3). CT scan brain was done in total 51 cases, among them brain edema was found in 29.4% followed by subdural effusion 19.6%, hydrocephalus 17.6% and 5.9% infarction (Table 4). In present study 63.5% children were recovered completely and 16.3% children died. 20.2% children had sequelae in the form of seizure disorder, deafness, cranial nerve palsy and behavioral disorder on one year follow up (Table 5). Out of total death, 82.4% was due to Hib and Pneumococcus with a higher case fatality rate of Pneumococcus 26.7% (Table 6).

Table 5: Outcome of the patients according to etiology.

Outcome	Hib	Pneumococcus	Others	No. of cases (%)	P-value
Recovery	20	16	30	66 (63.5)	0.0193
Death	6	8	3	17 (16.3)	
Sequelae	12	6	3	21 (20.2)	
Sequelae	Seizure disorder	7	6	5	18 (17.3)
	Spasticity	2	3	1	6 (5.8)
	Deafness	3	2	1	6 (5.8)
	Behavioral disorder	1	1	0	2 (1.9)
	Cranial nerve palsy	4	2	0	6 (5.8)

Table 6: Mortality related to Hib and Pneumococcus.

Parameters	Hib	Pneumococcus	P-value
Total death	6	8	0.001
Case fatality rate	15.8%	26.7%	
Sex	Male	3	1
	Female	3	
Age	<1 year	5	0.18
	1-2 year	0	0.005
	2-5 year	1	0.036
Vaccinated	0	0	
Convulsion	4	6	<0.001
GCS<7	3	6	0.248
Bulging fontanelle	2	0	0.002
Papilledema	1	2	0.403
Mean CSF cell count	902.8 confidence interval (CI±1.61)	323.5 (CI)±1.4	
Mean CSF protein	148.3 (CI±1.6)	122.6 (CI±1.39)	
Mean CSF glucose	36.33 (CI±1.7)	22.6 (CI±1.3)	
Abnormal CT	2	4	0.281

DISCUSSION

In present study, out of 104 cases, 70.2% were infants and 29.8% were of age group 1-5 years. High incidence in infancy could be due to low immunity and rapid spread of haematogenous infection which were similar to the study by Kabra SK et al.² In this study 60.6% were male,

M:F ratio being 1.5:1. Male preponderance was also observed in studies by Bhat BV et al and Sahai S et al.^{11,12} Fever was the commonest symptom in 69.2% followed by convulsion 61.5%, irritability 43.2%, vomiting 36.5% altered sensorium 33.7% and lethargy 33.7% which can be comparable with studies by Bhat BV et al and Chinchankar N et al.^{3,11} Chinchankar N et al

observed fever in 96% cases, refusal to feed in 83% cases, convulsion in 81% cases and altered sensorium in 96% cases, which were slightly higher than the observation in this study. Bulging fontanelle were 34.6%, positive meningeal sign 29.8%, cranial nerve palsies 14.4%, papilledema 12.5% and hemiplegia 11.5% cases. GCS were poor (<7) in 26.9% cases. Jain M et al had reported meningeal sign in 26% of cases and GCS<7 22% of cases which is similar to our observations.¹³ Majority of children had high CSF cell count 33.6%, high protein 56.7% and low sugar 68.3%. which was similar with a study by Devianayagam N et al.¹⁴

In present study 82 cases etiological agent were identified and among them 46.4% were due to *H. influenza*, 36.6% *S. pneumoniae*, 8.6% due to *E. coli* and 8.4% were due to others. Viswanath G et al also reported similar observations of Hib (22.5%) Pneumococcus (15%) and Staph. aureus in 10% cases.¹⁵ In the current study 51 patients out of 104 had undergone radiological evaluation, of which brain edema was found in 29.4% cases followed by subdural effusion 19.6% and hydrocephalus 17.6%. Arrumugham R et al documented normal sonographic findings in 36% cases of pyogenic meningitis, whereas ecogenic sulci 26%, ventriculomegaly 26%, brain abscess 18%, subdural effusion 10% and cerebral edema 10% were noted in other cases.¹⁶ Soni JP et al in their study had found that 35.4% patients had normal radiological findings, ventriculomegaly was present in 59%, subdural effusion in 2.2% and brain abscess in 2.2% cases.¹⁷ Both of their study findings were more or less similar to our observations.

In present study 63.5% children were recovered completely, case fatality rate (CFR) was 16.3% and 20.2% had sequelae. A study by Farag HFM et al, also found 78.2% children were fully recovered from meningitis and the case fatality rate was 13.9%.¹⁸ Another study by Singhi P et al¹⁹, observed occurrence of sequelae in 40% of his study population which was little bit higher from our study. The differences in mortality and sequelae depends on the level of health care facility and referral system. All the children who had infarction or hydrocephalus in radiological finding had severe sequelae.

CONCLUSION

Acute bacterial meningitis is found to be a significant cause of mortality and morbidity in this part of India like most other places. The infants were found to be most common victim with a higher case fatality rate, specifically from Hib and Pneumococcus which warrants mass vaccination against these two killer infections. Although clinical identification of ABM can be done by pediatrician and other trained primary care level doctors, the lab detection of organisms is not uniformly available. Latex agglutination test can be a quick and handy method at secondary health care level for an early diagnosis,

treatment or referral whenever required. This process can go a long way to reduce mortality and handicap. Though Hib has been included in NIP, Pneumococcal vaccine need urgent inclusion to limit this preventable cause of U-5 mortality.

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