

## Bacterial Meningitis in Children at Enugu

EO OKOROMA\* AND GI IZUORA\*

### Summary

**Okoroma EO and Izuora GI. Bacterial Meningitis in Children at Enugu.** *Nigerian Journal of Paediatrics* 1986; 13:35. A retrospective study of bacterial meningitis in 107 children seen at the University of Nigeria Teaching Hospital, Enugu, over a 4½-year period has revealed that although the clinical features were not different from those previously described, the pattern of causative organisms was. *Streptococcus pneumoniae* was the most common organism, accounting for 28 (41%) of the 69 positive bacterial growths. *H influenzae* and *N meningitides* were recovered in 11 patients each. *E Coli* was the causative organism in 4 of 8 positive cultures in neonates. Mortality and morbidity were high and were probably related to non-availability of appropriate drugs and also delay in seeking proper medical attention. From our experience and a review of the literature, we would recommend that initial antibiotic therapy for neonates with meningitis should consist of a combination of an aminoglycoside and ampicillin and for children older than one month, a combination of penicillin and chloramphenicol.

### Introduction

ACUTE bacterial meningitis is recognised worldwide as a paediatric emergency. From several reviews, 1-5 a definite profile has emerged with regard to its clinical presentation and the general outcome. However, in Nigeria as in most developing countries where all classes of drugs including antibiotics, are readily available to patients and where the incidence of self medication is very high, the typical features of the disease may be

modified. In addition, even in the best of the medical centres in Nigeria, diagnostic facilities necessary for prompt and correct diagnosis of this disease may not always be available. Periodic reviews of the disease from different parts of the country, are therefore necessary to highlight changes if any, in its clinical pattern. This paper reviews our experience with 107 cases of bacterial meningitis seen between June 1979 and December 1983 at the University of Nigeria Teaching Hospital (UNTH), Enugu.

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University of Nigeria Teaching Hospital, Enugu

Department of Paediatrics

\*Reader

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Correspondence : Dr EO Okoroma

### Patients and Methods

The medical records of children with a clinical diagnosis of meningitis seen at the paediatric wards and out-patient clinics of the UNTH,

Enugu, were reviewed. Patients whose initial cerebrospinal fluid (CSF) was grossly purulent or clear but subsequently grew organisms on culture, were selected for this study. Their records were analysed for age at the time of presentation, sex, presenting symptoms, physical signs, causative organisms, treatment and outcome.

**Results**

During the period under review, there were 107 children aged between 9 days and 14 years. Sixty-one were males and 46 females, giving a male to female ratio of 1.3:1. The period of follow-up after discharge ranged from 3 months to 48 months (average 25 months).

Figure shows the age and sex distribution of the 107 patients. Fifty-seven (53.3%) of the patients were aged 1 year or less. Beyond this age,

there was a marked decrease in the number of cases. Analysis of the months of presentation showed no significant seasonal or monthly variations.

*Clinical features*

The presenting symptoms and signs are summarized in Table 1. As expected, fever was the most common presenting symptom, occurring in 95 (89%) of the 107 patients. There was a history of irritability and/or excessive crying in 43 patients. Thirty-nine patients mainly under 2 years of age, had generalized convulsions at presentation. History of refusal to eat or decreased appetite was noted in 29 patients while 28 patients presented with vomiting. Cough and headache were noted in 15 and 14 patients respectively. These two latter symptoms occurred mainly in patients older than 5 years of age.

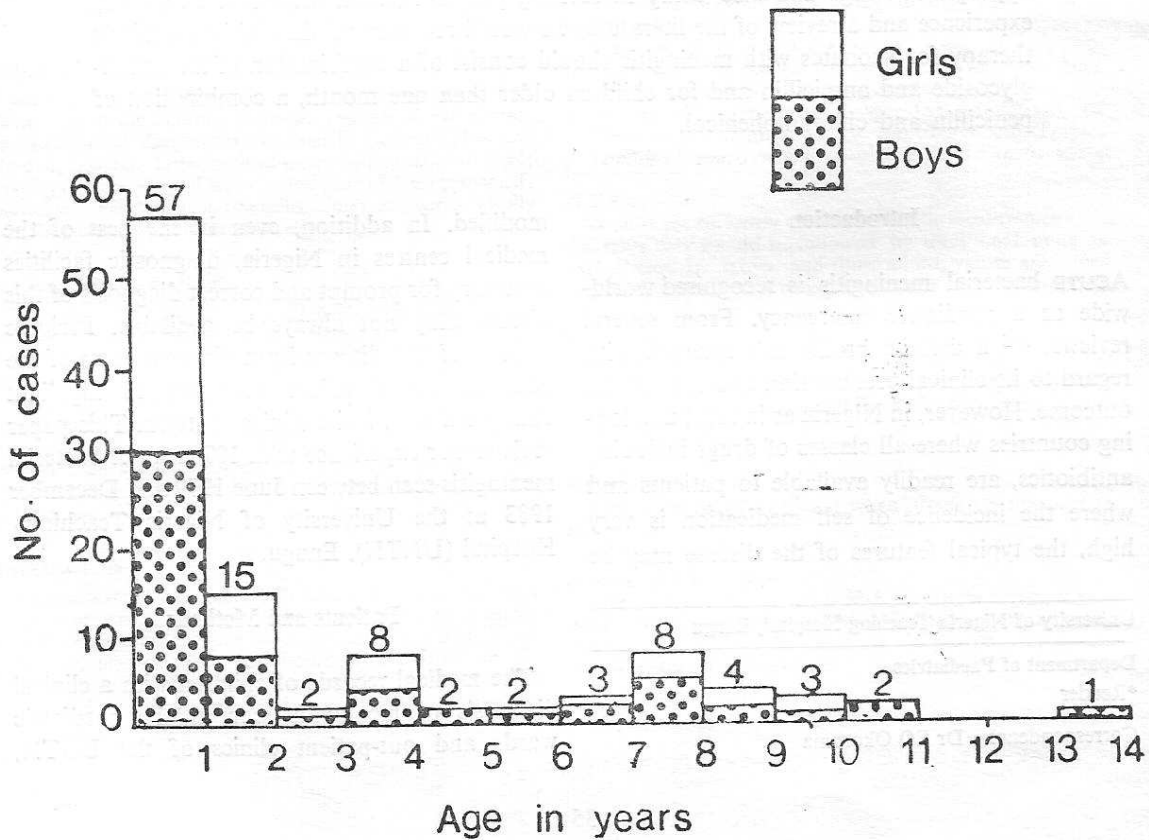


Fig. Age and sex distribution in 107 children with bacterial meningitis.

TABLE I

Clinical Features in 107 Cases of Meningitis

Features	No of Cases	% of Total
<i>Symptoms</i>		
Fever	95	88.8
Irritability/Excessive crying	43	40.2
Convulsion	39	36.4
Decreased appetite	29	27.1
Vomiting	28	26.2
Cough	15	14.0
Headache	14	13.1
<i>Signs</i>		
Neck stiffness	42	39.3
Positive Kernig's	27	25.2
Bulging anterior fontanelle	26	24.3
Positive Brudzinski's	24	22.4
Impaired sensorium	19	17.8

The most common presenting sign, neck stiffness, was present in 42 patients while twenty-six patients, all of whom were below 2 years of age, had bulging anterior fontanelle. Positive Kernig's and Brudzinski's signs were elicited in 27 and 24 patients respectively. In 19 patients, there was impaired sensorium ranging from delirium to coma.

#### Associated illnesses

Associated illnesses noted in 18 of the 107 patients are shown in Table II. Bronchopneumonia was the most common, being present in 6 patients. Three patients each had pyoarthritis, tonsillitis and trauma to the head. The three patients with tonsillitis had undergone "tonsillectomy" by traditional healers prior to presentation. Two patients had otitis media while one

TABLE II

Associated Illnesses on Admission in 107 Cases of Meningitis

Illness	No of Cases	% of Total
Pneumonia	6	5.6
Pyoarthritis	3	2.8
Tonsillitis	3	2.8
Trauma to the head	3	2.8
Otitis media	2	1.9
Pericardial effusion	1	0.9
Measles	1	0.9

other patient had pericardial effusion. Four patients had sickle-cell anaemia.

#### Bacteriology

Positive bacterial cultures were obtained from the CSF in 69 (64%) of the 107 patients. Table III shows the organisms and their distribution according to the ages of the patients. No patient had more than one organism cultured from the CSF. Because of lack of facilities, blood cultures were not routinely obtained in patients, so it was not possible to correlate the culture results in both blood and CSF. *Streptococcus pneumoniae* was the most common organism recovered in this study. Except in patients less than one month of age, it was recovered in all age groups (Table III). *H influenzae* and *N meningitides* were the next most common organisms; they were recovered in 11 patients each. *H influenzae* was isolated in children aged one month-5 years only, while *N meningitides* was recovered in children aged 1 month-14 years, only one of whom was less than 6 months. In children less than one month of age, *E coli* was responsible for 4 (50%) of the 8 positive cultures. Tuberculous meningitis was seen in two children who were both 7 months of age. In 4 patients, organisms were seen on gram stain of the CSF but the

TABLE III

*Causative Organisms according to Age Groups in 69 Patients with Meningitis*

<i>Organism</i>	<i>&lt;1 month</i>	<i>1 - 6 months</i>	<i>7 months-4 years</i>	<i>5-15 years</i>	<i>Total</i>	<i>% of Total</i>
Strep pneumoniae	-	12	13	3	28	40.6
H influenzae	-	4	7	-	11	16.0
N meningitides	-	1	4	6	11	16.0
E coli	4	2	1	-	7	10.1
Staph aureus	2	-	3	2	7	10.1
Myc tuberculosis	-	-	2	-	2	3.0
Salmonella species	1	-	-	-	1	1.4
Beta-haemolytic streptococcus	1	-	-	-	1	1.4
Pseudomonas aeruginosa	-	-	-	1	1	1.4
Total	8	19	30	12	69	100.0

cultures yielded no growth. All four patients had received antibiotic treatment prior to presentation.

#### *Treatment and Outcome*

The patients were managed under different units, consequently, the choice of initial antibiotics varied. However, there was uniformity in the selection of drugs for patients under 1 month of age; they generally received a combination of penicillin or ampicillin and gentamycin or kanamycin depending on which were available at the hospital pharmacy. For the older patients, antibiotics used included ampicillin, chloramphenicol, streptomycin and penicillin. However, the frequent unavailability of certain drugs necessitated the use of the second best available drug. Culture results determined the choice of definitive drugs. In all cases, drugs were given parenterally and for a period of 10 to 14 days, but occasionally, up to 3 weeks in neonates.

Complications were seen in 21 (19.6%) of our patients (Table IV). Deafness was observed in 6 patients. Five others had loss of vision, while a six-month old patient had both loss of vision and

hearing. The patients who became blind were below 2 years of age (mean age, 15 months) while the ages of 5 of the 6 patients with deafness ranged between 3½ and 8 years (mean 5.8 years). Four other patients aged 6 weeks, 3 months, 3½ months and 6 months developed subdural effusion requiring repeated subdural taps while another patient, aged 4 years, developed hydrocephalus. Four patients developed hemiparalysis involving the right side in 3 patients and the left side in one patient, during the course of their treatment.

Twenty-two (20.6%) patients died during hospitalization. Three were under one month of age, 7 were aged between one and 6 months, 11 were between 6 months and 5 years and one was over 5 years of age.

#### **Discussion**

Bacterial meningitis continues to be a serious and common disease among children in Nigeria.<sup>6-8</sup> Our study confirms this observation from other centres in Nigeria. It is a disease of the very young infant; 53% of our cases were less than 1 year of

TABLE IV  
Complications in 107 Children with Meningitis

Complication	No of Cases	% of Total
Deafness	6	5.6
Blindness	5	4.7
Subdural effusion	4	3.7
Hemiparalysis	4	3.7
Cerebral palsy	1	0.9
Hydrocephalus	1	0.9

age while 67.2% were under 2 years of age. After this age, there was a remarkable drop in the number of cases. As reported from other centres in Nigeria and elsewhere,<sup>6-9</sup> there was a slight male preponderance. However, this may reflect the fact that more males than females are usually seen in the clinics and hospital wards rather than showing a true higher incidence among males.

The common presenting symptoms and the physical signs noted in the present series are also similar to the findings by other workers.<sup>4-6,9</sup> Convulsions occurred more commonly in children who were 2 years or less, while headache was experienced by the older children. It can safely be concluded that the signs and symptoms of the child with pyogenic meningitis do not vary much regardless of the geographical location of the patient. However, with regard to the causative organisms, there is a difference in pattern. In the past decade or so, it was generally believed that the commonest causes of bacterial meningitis in children under 10 years of age were *H influenzae*, *Streptococcus pneumoniae* and *N meningitides* in that order.<sup>4-6</sup> This observation noted in developed countries<sup>4-5</sup> was also observed in Nigeria by Seriki.<sup>6</sup> However, Alausa and Osoba<sup>7</sup> and more recently, Babalola and Coker,<sup>8</sup> have observed a change in this pattern, noting that *Strep pneumoniae* was becoming more prevalent than *H influenzae* except among children aged 1-5 years where

*H influenzae* was still the most common organism. In this study, we have observed that *Strep pneumoniae* was more common than *H influenzae* in all age groups. In the neonatal age group, *E coli* still remains the most common organism. *N meningitides* was as common as *H influenzae* although its distribution according to age, was different. It was more common than the other organism in children older than 5 years while *H influenzae* was seen in children younger than 5 years. This study confirms the results of Babalola and Coker<sup>8</sup> and indicates that there is a changing pattern in the organisms that cause childhood meningitis in Nigeria. Again, it was generally believed that *H influenzae* was seen only in children between the ages of 6 months and 5 years; this study has shown that it can occur in children as young as 2 months, a finding that was also noted by Enzenauer and Bass.<sup>10</sup> That tuberculous meningitis is still with us is highlighted by our two cases, both aged 7 months, who died. Both had had primary pulmonary tuberculosis and were moribund on presentation.

Despite the existence of effective antibiotics against the major organisms that cause pyogenic meningitis, namely *Streptococcus pneumoniae*, *H influenzae*, *N meningitides* and *E coli*, they are not readily available. Very often, the drugs were not available for the entire duration of treatment in the present study, thus necessitating a switch to the second best drugs. This must have contributed to our high mortality rate of 20.6%, a figure not much different from the mortality rate of 24.3% reported by Seriki<sup>6</sup> more than a decade ago. Serious complications also occurred in another 21 (19.6%) patients who survived. The most common of these were cortical blindness and deafness. *Streptococcus pneumoniae* was the organism most commonly associated with these complications. However, it may well be that since it was the commonest organism, it was associated with more deaths and morbidity than any other organism. A previous study by Kaplan *et al*<sup>11</sup> also noted its association, along with *H influenzae*, with hearing loss in children with meningitis.

Another possible reason for our high mortality and morbidity may be the indiscriminate use of antibiotics by patients such that the signs and symptoms were modified, thereby preventing early medical intervention. Although the initial cerebrospinal fluids were grossly purulent in most of the 107 patients, 38 had no bacterial growth in their cultures. In another four patients who had received antibiotics prior to presentation, organisms were seen on gram stain but the cultures were sterile.

This study of bacterial meningitis in children, the first from our institution, shows that it is a common childhood disease with a high mortality and morbidity. On the basis of the observations made in the present series, we would agree with the recommendations by Fulginiti<sup>12</sup> that initial therapy for meningitis should consist of ampicillin and an aminoglycoside in the neonatal period and penicillin and chloramphenicol for the child older than 1 month. Definitive therapy could then be selected after the culture results become available.

#### References

1. Carpenter RR and Petersdorf RG. The clinical spectrum of bacterial meningitis. *Amer J Med* 1962; **33**: 262-75.
2. Haggerty RJ and Ziai M. Acute bacterial meningitis. *Adv Pediatrics* 1964; **13**: 129-81.
3. Murray JD, Fleming PC, Anglin CS, Steele JC and Fujiwara MW. Acute bacterial meningitis in childhood: an outline of management. *Clin Pediat* 1972; **11**: 455-64.
4. Bell WE and McCormick WF. Bacterial meningitis: General concepts and management. In: *Neurologic Infections in Children*. Bell WE and McCormick WF, eds. Philadelphia: WB Saunders (Publishers), 1975: 3-25.
5. Wehrle PF, Mathies AW and Leedon JM. The critically ill child: Management of acute bacterial meningitis. *Pediatrics* 1969; **44**: 991-8.
6. Seriki O. Pyogenic meningitis in infancy and childhood. *Clin Pediat* 1970; **9**: 17-21.
7. Alausa KO and Osoba AO. Aetiology of acute bacterial meningitis in Ibadan. *Nig J Paediat* 1971; **1**: 57-63.
8. Babalola AA and Coker AO. Pyogenic meningitis among Lagos children: Causative organisms, age, sex and seasonal incidence. *C Afr J Med* 1982; **28**: 14-8.
9. Kendall AC. Acute bacterial meningitis in childhood. *C Afr J Med* 1971; **18**: 98-101.
10. Enzenauer RW and Bass JW. Initial antibiotic treatment of purulent meningitis in infants 1 to 2 months of age. *Amer J Dis Child* 1983; **137**: 1055-6.
11. Kaplan SL, Catlin FI, Weaver T and Feigin RD. Onset of hearing loss in children with bacterial meningitis. *Pediatrics* 1984; **73**: 575-8.
12. Fulginiti VA. Treatment of meningitis in the very young infant. *Amer J Dis Child* 1983; **137**: 1043.

Accepted 27 January 1986