

Pneumococcal Meningitis in Childhood

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Summary

Nottidge VA. Pneumococcal Meningitis in Childhood. *Nigerian Journal of Paediatrics* 1981; 8: 65. A retrospective review of 114 children, aged between two weeks and ten years, with pneumococcal meningitis, has revealed a mortality of 30.6% and a significant morbidity in 42.7% of the survivors. Recurrent meningitis occurred in two children, neither of whom had any overt predisposing factor. Important factors indicating a poor prognosis included the presence of coma, low blood leukocyte count, low serum sodium level, low CSF glucose as well as the presence of anaemia. Two children, one with Hb SC and the other with metastatic endophthalmitis, recovered without sequelae.

Introduction

PYOGENIC meningitis in childhood is a serious illness which has a particularly poor prognosis in under-developed communities.¹⁻³ The literature on pneumococcal meningitis in childhood is scanty.^{4,5} Previous workers have studied either all the childhood meningitides as a group⁶⁻⁸ or reviewed pneumococcal meningitis in all age groups together.⁹⁻¹¹ Among the organisms which commonly cause meningitis in Nigeria, *Strep. pneumoniae* has a much worse prognosis than *H. influenzae*.¹² The present study was undertaken to further assess the problem of pneumococcal meningitis in childhood in Ibadan.

Materials and Methods

The records of children, aged 10 years and below, who were admitted to the University College Hospital (UCH), Ibadan, between

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August, 1969 and July, 1978, because of pneumococcal meningitis, were reviewed. Patients were included in the study if the diagnosis was confirmed by a positive culture of *Strep. pneumoniae* from the cerebrospinal fluid (CSF). Analysis included age, sex, presenting complaints, duration of symptoms before admission, laboratory data, course of the illness, therapy, and associated diseases.

Statistical analysis was by the chi-square method but the Student's t test was employed for comparing sample means.

Results

Age and sex distribution

One hundred and fourteen records were available for analysis. There were 71 boys and 43 girls, a male to female ratio of 1.7 to 1. Ages ranged between two weeks and ten years with a mean of 2 years and 10 months.

Clinical Features

Table I lists the presenting complaints. Fever was the commonest complaint and occurred in 104 (91%) of the subjects. There was however, no fever throughout the illness in five children. Convulsion was the next common symptom. Neck stiffness was a presenting complaint in only 11 cases but was found on physical examination in 54 patients (47.4%). It was absent in all the neonates as well as in 34 (55.7%) of 61 infants. Twenty-three children were comatose on admission but in only one of these was loss of consciousness a presenting complaint. There were 15 other children who were conscious on admission but became comatose later. One child presented with unilateral metastatic endophthalmitis. Two children had recurrent meningitis but came into the study during the second illness; neither of these two children had any obvious predisposing factors. Respiratory signs were present in 25 cases and a radiological diagnosis of bronchopneumonia was made in 13. Six children were transferred to other treatment centres during therapy for various reasons. They were therefore excluded from further analysis.

Laboratory Findings

The mean values for various laboratory data were as follows: serum sodium 128 mmol/L (128 mEq/L), serum bicarbonate 18 mmol/L (18 mEq/L), B erythrocytes vol. 0.3 (PCV 29.6%), B leukocytes $12.972 \times 10^9/L$ (Blood WBC 12,972/c.mm), CSF leukocytes $639 \times 10^6/L$ (639/c.mm), CSF glucose 0.66 mmol/L (11.9mg/dl), CSF protein 3.01g/L (300.8mg/dl). Hb electrophoresis performed in 51 of the patients revealed the distribution shown in Table II. The incidence of haemoglobin genotype SS in 19.6% of the patients was significantly higher ($p < 0.001$) than in the general population of Ibadan (Luzzatto 1969, personal communication).

Treatment

All patients received intravenous antibiotics, usually comprising penicillin either alone or in

combination with sulphadiazine or chloramphenicol. Some patients were given ampicillin as the initial therapy. Blood or intravenous fluids was also given when indicated.

TABLE I
Presenting Complaints in 114 Children with Pneumococcal Meningitis

Complaint	No. of Patients	% of Total
Fever	104	91.2
Convulsion	74	64.9
Loss of appetite	27	23.7
Cough	25	21.9
Vomiting	21	18.4
Irritability	16	14.0
Excessive crying	12	10.5
Neck stiffness	11	9.6
Headache	4	3.5
Diarrhoea	3	2.6
Sluggishness/Lethargy	2	1.8
Coma	1	0.9

TABLE II
Haemoglobin Genotype in 51 Children with Pneumococcal Meningitis

Hb Genotype	Percentage
AA	58.8 (66.0)†
AS	9.8 (25.6)†
AC	9.8 (5.8)†
*SS	19.6 (1.7)†
SC	2.0 (0.8)†

† Hb genotype in the general population in the Ibadan area from a sample size of 3000 (Luzzatto, 1969, personal communication).

* $p < 0.001$

Outcome

Thirty-three patients (27.7%) died, while significant morbidity occurred in 32 (42.7%) of the survivors or 29.6% of the total number of cases with verifiable outcome.

TABLE III

Relationship between Interval before Treatment, Coma and Outcome

Day	1	2	3	4	5	6	7	>7	Total
No. of Patients	26 ^{†1}	18	29 ^{†3}	14	10 ^{†1}	5	6	6 ^{†1}	114 ^{†6}
Mortality	10	4	9	2	2	1	3	2	33
Morbidity	8	4	7	4	5	1	2	1	32
Coma	13(6)	2(1)	10(5)	4(2)	5(1)	1(1)	1(1)	2(1)	38(18)

† = Number of patients who were transferred to other centres.
 Figures in parenthesis represent the number of deaths in each group.

Of the 23 patients who were comatose on admission, 12 (52.2%) died, while 7 (30.4%) recovered with sequelae. Fifteen other children were conscious on admission, but became comatose later; of these, 6(40%) died and 6 others recovered with sequelae. Coma had no effect when considered in association with the duration of symptoms neither was the duration of symptoms on its own of prognostic significance ($P > 0.05$). However, the presence of coma at anytime during the illness had a significant independent effect ($P < 0.01$). These relationships between coma, duration of symptoms before treatment, and outcome are summarized in Table III.

The age and sex of the patients had no significant effect on the outcome. Although 17(51.5%) of the deaths and 22 (68.8%) of the patients with serious sequelae were among children who

TABLE IV

Age Incidence and Outcome in 108 Children with Pneumococcal Meningitis

Age	0-28 days	1-12 months	13-48 months	49-120 months	Total
No. of Patients	4	61	22	21	108
No Dead	2 (50)	15 (24.6)	7 (31.8)	9 (42.9)	33
No. with Sequelae	1 (25)	21 (34.4)	6 (27.3)	4 (19.0)	32

Figures in parenthesis represent the % of deaths in each age group.

TABLE V

Morbidity among 32 Children with Sequelae of Pneumococcal Meningitis

Sequelae	No. affected	% of Total Number of Cases
Mental Retardation	17	15.7
Paralysis: (Quadriplegia 8) (Hemiplegia 6)	14	13.0
Seizure Disorder	12	11.1
Deafness	11	10.2
Severe Brain Damage	10	9.3
Subdural Effusion	7	6.5
Blindness	6	5.6
Aphasia (all had hearing loss)	6	5.6
Cranial Nerve Lesions	6	5.6
Hydrocephalus	4	3.7
Abnormal Movements	3	2.8
Behaviour Disorders	2	1.9

Note: Many affected children had more than one sequela.

were 12 months old or less (Table IV), the effect of age was not found to be significant. Similarly, there was no significant association between outcome and the occurrence of seizures ($P > 0.5$), or the antibiotic treatment regimen ($P > 0.05$).

One (7.7%) of the 13 patients with bronchopneumonia died while 6 others (46.2%) recovered with serious sequelae.

Significant complications encountered in the present study are listed in Table V. Subdural effusion was not considered significant if it occurred alone and the patient subsequently recovered completely as occurred in two of the cases. Among the aphasic children, two recovered hearing and speech during follow-up, one at two months and the other at two years, and these were therefore not included in the Table. The child with metastatic endophthalmitis recovered completely from both meningitis and endophthalmitis.

The following laboratory data were significantly associated with mortality and morbidity: serum sodium < 130 mmol/L (130 mEq/L) ($P < 0.025$), CSF glucose < 0.56 mmol/L (10mg/dl) ($P < 0.0001$); B erythrocytes vol. 0.3 (PCV $< 30\%$) ($P < 0.025$); B leukocytes $< 5 \times 10^9$ /L (total blood WBC < 5000 /c.mm) ($P < 0.001$). Factors which had no influence on outcome included: CSF leukocytes $< 1000 \times 10^6$ /L (CSF leukocytes < 1000 /c.mm) ($P > 0.05$), CSF Protein > 2.5 g/L (250 mg/dl) ($P > 0.2$), serum bicarbonate < 15 mmol/L (15mEq/dl) ($P > 0.05$). Mean CSF glucose concentration for children who died was 0.22 mmol/L (4mg/dl) and for those who survived, 0.98 mmol/L (17.7mg/dl) ($P < 0.001$). CSF protein and cell count did not show any difference between the means for children who died and those who survived ($P > 0.05$).

Discussion

The most common presentation of pneumococcal meningitis in the present series was fever followed by convulsion. This mode of presentation thus supports the practice of excluding meningitis in all children who present with "febrile" convulsions. The incidence of convulsion in our series was far in excess of 31% previously reported.⁵

The findings in the present study agree with previous observations that the duration of symptoms before treatment does not determine the prognosis in pneumococcal meningitis.^{5 11} Morbidity and mortality therefore probably depend mainly on the dose and virulence of the infecting organisms and the host defences, rather than the interval before treatment. The influence of coma on outcome emphasises the need for a careful clinical assessment of the state of consciousness, as only one parent complained of loss of consciousness.

The severity of the disease in all the age groups in the present series, may explain why age was not significant in the outcome, although 60.2% of the cases were in the first year of life. This contrasts with other studies.^{4 5 13} Weiss *et al*¹¹ who studied the disease in all age groups and obtained a significant association, noted that age was not significant if separated from associated disease. A low serum sodium indicates the need to exclude inappropriate secretion of anti-diuretic hormone.⁸ Other significant data have been previously noted.^{11 14}

Metastatic endophthalmitis is an unusual finding in pneumococcal meningitis but is known to occur with meningococcal meningitis.¹⁵ The condition is reversible, but is potentially dangerous as the patient is at the risk of developing a vitreous abscess with retinal detachment and blindness. The present study included one child with haemoglobin SC who recovered completely from the meningitis. Pneumococcal meningitis in patients with Hb SC disease is rare and only 4 cases have been reported in the literature.¹⁶⁻¹⁸ This emphasises the need to study host defence factors in this haemoglobinopathy. The unacceptably high mortality and morbidity in the present study indicate a need for predictive indices in the selection of children who should have intensive care.

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