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Neurological Complications of Childhood Bacterial Meningitis as seen in Enugu

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Summary

Ojinnaka NC, Iloeje SO. Neurological Complications of Childhood Bacterial Meningitis as seen in Enugu. *Nigerian Journal of Paediatrics* **1998; 25:53.** A review of 9,967 admissions to the paediatric wards of the University of Nigeria Teaching Hospital, Enugu, over a 10-year period revealed 312 cases of pyogenic meningitis. Of this number, 35 children aged between 3 and 168 months (mean, 31 months) had post-meningitic neurological complications. The major deficits identified included visual and hearing loss, generalised hypertonia, ataxia, dyskinetic movements and impaired speech. The occurrence of convulsion and long duration of symptoms before presentation had significant association with the development of complications. Some of the deficits, such as visual loss were transient and resolved during follow-up, often as early as during the first six months after discharge.

Introduction

STUDIES from different parts of the world show that pyogenic meningitis remains a serious disease in children.[1-4] Despite recent advances in diagnosis and chemotherapy, neurological sequelae have been estimated to be between 15 and 45 percent.[5,6] Various factors have been associated with the development of these sequelae. This retrospective study was carried out in order to determine the pattern of neurological deficits in the patients admitted with pyogenic meningitis to our institution and also to identify possible clinical factors relating to the development of these deficits.

Patients and Methods

Records of children, aged three months and above, with post-meningitic neurological deficits, referred to the Paediatric Neurology Unit of University of Nigeria Teaching Hospital, Enugu from January 1987 to December 1996 were analysed. Patients included in the study were those in whom the diagnosis of meningits was based on positive cerebrospinal fluid (CSF) bacterial culture or Gram stain, pus cells in the CSF and biochemical changes consistent with those of pyogenic meningitis. Excluded from the study were patients with any chronic neurological disorder prior to the development of meningitis. Information extracted from the records included age, sex, duration of illness prior to presentation, clinical features at presentation, results of laboratory investigations, treatment, neurological deficits documented at discharge, details of management and progression of deficits during follow-up. Routine antibiotics in all cases consisted of intravenous crystalline penicillin alone or in combination with chloramphenicol. The antibiotics were changed to ceftriaxone in two patients with organisms that were resistant to the routine antibiotics. The duration of treatment ranged from 10 to 16 days. Statistical analysis of data obtained was done, using chi-square test and Student's 't' test, where applicable.

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Results

During the 10-year period, 9,967 patients were admitted into paediatric wards; 312 (3.1 percent) of these had clinical and laboratory features that were consistent with those of meningitis. Thirty-five (11.2 percent) of these 312 had post-meningitic

neurologic deficits, and were referred to the Neurology unit for their management. They consisted of 24 males and 11 females (M:F = 2.1:1) with age ranging from 3 months to 168 months (mean, 31 months).

Clinical Features

Fever was the commonest clinical feature and occurred in 31 (88.6 percent) patients. This was followed by convulsions in 26 (74.3%) patients and loss of consciousness in 19 (54.3%) patients.

Table I

Complications of Meningitis in 35 Patients

Complications	*No of Patients*	*Percent of Total*
Visual loss	10	28.6
Generalised hypertonia	9	25.7
Hearing loss	9	25.7
Ataxia	9	25.7
Dyskinetic movements	6	17.1
Impaired speech	6	17.1
Head lag	5	14.3
Floppiness	3	8.6
6th nerve palsy	3	8.6
7th nerve palsy	2	5.7
Seizure	2	5.7
Hemiparesis	2	5.7
Ptosis	1	2.9
Hydrocephalus	1	2.9

Note: Twenty-one patients had multiple deficits.

Nine (34.6 percent) of the 26 who presented with convulsions had protracted episodes before presentation. In 23 (88.5 percent) of them, the convulsions stopped within the first 48 hours of commencement of specific antibiotics; three patients continued to have seizures for up to four days despite treatment, while two patients who presented with no convulsions developed seizures after admission. Nineteen (54.3%) patients were unconscious on admission. One of them had been unconscious for nine days in another health institution before presentation. Bacterial isolates were obtained from the CSF in 27 (77.1%) patients with *Streptococcus pneumoniae. Hnemophitus influenzae and Neisseria meningitides* accounting for 40%, 20% and 14.3%, respectively. *Staphylococcus aureus* was isolated from one (2.9%) patient. In the remaining 8 (22.3%) patients organisms were identified by Gram stain.

Complications

The neurological deficits on discharge, which prompted referral of the patients to the Neurology Clinic are shown in Table 1.

Visual loss was the most common and occurred in 10 (28.6%) patients. Hemiparesis occurred in two patients who presented with unilateral seizures on admission. One patient had no gross deficit on discharge but developed akinetic seizures with hyperactivity three months after discharge. Twenty-three (65.7%) patients were in the age group, 3-24 months while 4 (11.5%) patients were in the group 49-72 months. Complications reduced remarkably as age increased. Table II shows the age distribution of the children with the nine most common deficits.

There was no significant relationship between age and any of the most common deficits ($P > 0.05$). Further analysis designed to identify factors that were significantly associated with the development of the major deficits, showed that only convulsions and duration of symptoms before presentation (> 6 days) had significant association with development of major deficits ($P < 0.01$).

Table II

Age Distribution of Patients with the most common Neurological Deficits

Age (mon)	*Visual loss*	*Generalised Hypertonia*	*Hearing Loss*	*Ataxia*	*Dyskinetic movement*	*Impaired speech*	*Head lag*	*Floppiness*	*6th nerve palsy*
3-24	6	7	5	5	2	2	4	2	1
25-48	2	1	-	1	1	2	1	1	1
49-72	1	1	1	-	2	1	-	-	-
73-96	1	-	-	1	-	-	-	-	-
97-120	-	-	1	1	-	-	-	-	-
121-144	-	-	1	-	-	-	-	-	-
145-168	-	-	1	1	1	1	-	-	1
Total	10	9	9	9	6	6	5	3	3

Follow-up

Follow-up period ranged from one month to eight years. Six patients were lost to follow-up within the first six months after discharge, while 29 patients were followed up for more than one year. One patient who was followed up for six years, had cerebral palsy (spastic type) and visual impairment, while another, followed up for eight years, had intractable seizures and speech impairment. The pattern of resolution of deficits in the 35 patients is shown in Table III.

Table III

Resolution of Neurological Deficits during Follow-up

Deficits	*No of patients*	*No (%) with resolution*	*Duration of Deficit before Resolution (months)*	*Follow-up period (months)*
Visual	10	9(90.0)	1-6	2-72
Generalised hypertonia	9	6(66.6)	2-12	2-72
Hearing loss	9	7(77.7)	1-36	6-66
Ataxia	9	6(66.6)	2-14	12-60
Dyskinetic movement	6	4(66.6)	1-5	1-12
Impaired speech	6	3(50.0)	2-12	3-48
Head lag	5	5(100)	1-12	3-36
Floppiness	3	3(100)	6-8	14-36
6th nerve palsy	3	3(100)	2-6	6-36
7th nerve palsy	2	2(100)	2-4	2-14
Seizures	2	1(50.0)	1-5	14
Hemiparesis	2	1(50.0)	24	30
Ptosis	1	1(100)	2	3

Nine of the ten patients with visual loss regained their sight within six months. Table III also shows that motor deficits (generalised hypertonia, ataxia, dyskinetic movements and hemiparesis) persisted in nine patients up to their last follow-up visit.

Discussion

The present study has shown the prevalence and range of neurological sequelae seen in childhood pyogenic meningitis in our centre. The low figure of 11.2% compared with 28% reported by Nottidge[6] from Ibadan and 21.6% by Obi and Sugathan[3] in Saudi Arabia is probably due to the exclusion of neonates and other patients aged less than three months from our study. Also being a retrospective study, some neurological deficits may not have been recorded in the case notes. The incidence of convulsion in the present series was higher than the 20% to 30% reported by some workers.[3,7] Prevalence rates ranging from 50-70% have however, been reported from different parts of the country.[6,8,9] More than 50% of the individual deficits in our patients resolved within the first year. Label and McCracken[2] noted that neurological complications such as quadriparesis often occur transiently and resolve during the first year. However, Daoud *et al*,[10] observed only partial resolution in 60% of their patients with motor deficits managed over a three-year period.

Twenty-nine patients had various motor deficits on discharge, and these deficits persisted in about a third. There is however, the likelihood that some deficits might have resolved after the patients stopped coming for follow-up. It is not likely that the development of complications could be due to the treatment offered, since the same standard treatment was used in all the cases. From the study, development of major complications seemed to be

related primarily to clinical factors, namely convulsions and long duration of symptoms before commencement of therapy. Duration of symptoms before presentation has also been identified by others as an important factor in the prognosis of childhood meningitis. [3 8] *S. pneumoniae* was the commonest organism isolated from the CSF in our study, accounting for 40% of all isolates. No association was however found between the development of deficits and causative organisms.

The findings from this retrospective study emphasize the need for early presentation of patients with meningitis to hospital. Disregard of this basic public health maxim continues to be associated with dire consequences. Convulsion on its own, is an indication of profound and often widespread cerebral insult. Therefore, its association with a wide range of neurological deficits was not a surprise. It is possible that other factors which were not examined in this study could have a relationship with prognosis in meningitis. That notwithstanding, this study has highlighted the fact that pyogenic meningitis is still associated with a significant level of neurological sequelae and that there is need for early institution of treatment. Convulsions should, if possible, be avoided, but if they occur, every effort must be made to control them effectively.

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