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BACTERIAL MENINGITIS AMONG CHILDREN IN FEDERAL MEDICAL CENTRE

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ABSTRACT

Cerebrospinal fluid (CSF) samples from one hundred and fifty children suspected of bacterial meningitis in the children's ward of the Federal Medical Centre, Bide, between January and December 2001 were studied. The children were aged twelve and below. Only twenty five (16.7%) of the samples were microbiologically proven. The commonest pathogens isolated were *Neisseria meningitides* (13), *Escherichia coli* (7) and *Streptococcus pneumonias* (4). The three bacteria constituted 92.3% (24 of 26) of the detected organisms from CSF either by culture, or by direct smear or both.

Antimicrobial susceptibility to Ofloxacin by *E. coli* and *Str. pneumonias* was 100% and 87% by *N. meningitides*. Susceptibility of *N. meningitides* and *Str. pnuemoniae* to penicillin was 0%. All the three main organisms showed poor susceptibility to Streptomycin. *N. meningitis* was 83.3% susceptible to Gentamicin while only one isolate each of the other organisms were tested on it and were found to be susceptible except *E. coli* that was resistant.

Key words: meningitis, children, bacterial pathogens, antimicrobial susceptibility

INTRODUCTION

Cerebrospinal meningitis is an acute medical emergency and is an important health problem in Nigeria. Large epidemics of meningitis occur periodically in Northern parts of Nigeria (1, 2, 3, 4, 5). Many researchers have reported sporadic outbreaks of meningitis in different parts of the country (1, 3, 4, 5). The aetiologic agents and the antimicrobial susceptibility patterns for Bida and its environs have not been documented.

Federal Medical Centre Bida is a young generation referral centre for Niger State, and caters for about three million people. The Centre is located in the Guinea Savannah, which is south of the meningitis belt of Africa.(6) High incidence of meningitis sometimes occurs during the hot, dry season, which is the usual period of epidemics in Northern Nigeria.(4,5,6)

MATERIALS AND METHODS

Cerebrospinal fluid samples collected from suspected meningitis children through lumbar puncture were received in the Microbiology main laboratory as soon as they were obtained in sterile Bijou bottles. The macroscopic appearances of the samples were noted. Well mixed CSF was charged into counting chamber using sterile Pasteur pipette for cell counting. Direct smears of specimens were made on clean glass slides and fixed. The smears were then stained by Gram's standard method. (7)

The remaining CSF samples were then centrifuged inside sterile tubes and the sediments were inoculated onto Chocolate, Mac Conkey and Blood agar plates.(8) The plates were then incubated anaerobically at 37^0C of 24hours, but chocolate agar plates were incubated in a candle jar system

for 24 hours. Cultures were then examined for growth. If there was no growth, cultures were re-incubated for another 24 hours before they were discarded as having no growth. The colonies were identified using standard methods. (7, 8)

RESULTS

One hundred and fifty samples of cerebrospinal fluid were received from children up to twelve years of age. Only three samples were reported turbid which were culture positive. Twenty five (25 of 150 or 16.7%) of these children had microbiology proven diagnosis of meningitis. Twenty one (21 of 25) was by culture, five by direct smear only and seven were positive for both culture and direct smear. The organisms isolated over the twelve-month period are shown in Table 1. A two-year-old girl had a mixed infection with N. *meningitides* and *E. coli.*

Only twelve case notes (12 of 25 or 48%) were retrieved out of the cases with proven bacterial meningitis. Four children survived, two died, two absconded and the outcome was not stated in two cases.

Table 1: Showing how organisms were detected

Microbiology Test	Number Positive
Direct Smear Only	5
Culture Only	21
Direct smear and Culture	7

Table II: Showing Isolates from CSF

Organisms	Frequency of Isolates	Percentage n = 26
N. meningitidis	13	50
E. coli	7	26
Str. pneumoniae	4	15
S. aureus	1	3.8
H. influenzae	1	3.8

Table III: Showing susceptibility patterns of isolates

	N. meningitidis **n = 8**	***E. coli*** **n = 7**	***Str. pneumoniae*** **n = 4**	***H. influenzae*** **n = 1**	***S. aureus*** **n = 1**
Oflocaxin	8 (100)	7 (100)	4 (100)	1 (100)	1 (100)
Chloramphenicol	7 (87.5)	5 (71.5)	4 (100)	1 (100)	0 (0)
Gentamicin	5 962.5)	6 (85.7)	N.T	0 (0)	1 (100)
Erythromycin	5 (62.5)	N.T	N.T	1 (100)	1 (100)
Streptomycin	4 950)	3 (42.8)	4 (100)	N.T	1 (100)
Penicillin	0 (0)	N.T	0 (0)	N.T	0 (0)
Cloxacillin	N.T	N.T	N.T	0 (0)	0 (0)
Unasyn	N.T	N.T	N.T	0 (0)	N. T
Tetracycline	N.T	N.T	N.T	N.T	1 (100)

n = Total number of isolated tested
( ) = Percentage of susceptible strains
N.T = Not tested

Table IV: Shows the age distribution of children with microbiology proven meningitis

Ages of Children	Freq.	Cumulative Frequency	Perc.
0 – 28 days	1	1	4
1 – 5 months	2	3	12
6 months – 2 years	14	17	68
3 – 5 years	3	20	80
16 – 12 years	5	25	100

The recovery rate of organisms among children suspected to have meningitis was16.7% (25 out of 15). As it the case with most medical emergencies, the disease had been over diagnosed. The rate is slightly higher than 12% obtained by Lehman *et al* in their study of bacterial meningitis in children, but lower than 25% obtained by Salih *et al* in their study of endemic meningitis among Sudanese children. (9,10). Both of these groups of researchers made diagnoses by culture, direct smear and or antigen detecting assays, as compared to this study where only direct smear and culture were employed. The use of antigen detecting assays has the added advantage of detecting non-viable organisms especially in samples not promptly sent to the laboratory after lumbar puncture. It will also detect organisms in patients who have been receiving anti-microbial chemotherapy up to 24 hours before lumbar puncture is performed. This reagent is however expensive and was not available for routine work in the centre of the present study.

The present study revealed that the three commonest organisms causing meningitis among children in Bida are *Neiseria meningitides* (13), *Escherichia coli* (7) and *Streptococcus pneumonias* (4). This together accounted for 24 out of 26 (or 92.3%) of the isolates. The study also shows that there was higher incidence of suspected cases of meningitis during the hot dry season before the start of the rains (November to April) (4, 5). This is the usual period of epidemic meningitis in Northern

DISCUSSION

Nigeria. Greenwood *et al* reported meningococcal epidemic in Zaire in 1977.(4) The report by Rebase *et al* in Maiduguri on epidemic meningococcal meningitis showed that the peak incidence of infection occurred in March, which was the peak of the dry season. Both reports from Zaire and Maiduguri support the fact that meningococcal epidemics in Northern Nigeria usually occur during the hot dry season. The low humidity promotes breaches in the nasal mucosa for the entry of *Neisseria* into the bloodstream. The present study does not represent the occurrence of an epidemic but it shows high incidence in the month of November. Immunization against meningococcal meningitis was commenced in December (year 2001) in Bida Local Government Area. Maximum antibody response to the infection takes about four weeks to develop and so immunization should be given not later than one month to the onset of outbreaks(5). In fact, vaccination should commence when the nasal carriage rate of *Neisseiria* is 6% in the populations. (11, 12)

The recovery rate (16.7%) of bacteria found in this study shows that there were various clinical manifestations that can easily be confused with meningitis especially in children below the age of five who may give very little specific complaint. The mortality rate is highest in this age group especially below the age of one year (10, 13, 14). Fever is a common presenting problem in all the children irrespective of their definite diagnoses in this study. Early diagnosis and institution of appropriate treatment is difficult in young children below the age of five (2, 3). This depends on the alertness of their parents to seek medical care and high index of suspicion by the attending caregivers (15, 16) Headache is reported only in children above five years (16, 17). Other diagnoses made by

the clinicians that could be confused with meningitis as were found in the case files were: severe anemia (8), septicemia (5), severe malaria (4), bronchopneumonia (3), chronic osteomyelitis (2), and otitis media (2). Meningitis can complicate any of these diseases if poorly managed.

The standard regimen with chloramphenicol advocated by Tefurani and Vince for children with bacterial meningitis remains valid for this community as shown by the study (14). Further improvements in outcome are likely to be achieved not by changes in antibiotic policy, but by improving early diagnosis and basic supportive care and by preventing convulsion (13, 14).

Aminoglycosides should be added to empiric treatment when Gram negative infection is suspected (18). Meningitis causes an increase in permeability of the blood brain barrier and thus increases in the cerebrospinal fluid protein. The duration of the main complaint of vomiting, irritability, cyanosis, petechiae hemorrhages and disturbed consciousness were independent predictors or bacterial meningitis. The only independent predictors from subsequent laboratory tests were the serum C-reactive protein (CRP) concentration. Estimation of CRP in CSF samples may be made to give a preliminary or additional diagnosis of meningitis regardless of its aetiology (20). Without missing a single case, this model identifies 35% of patients without bacterial meningitis i.e. patients with meningeal signs in whom a lumbar puncture can be withheld (16).

From the foregoing, it cannot be overemphasized that future prospective study to estimate C-reactive protein for Bida's community will be invaluable in provisional diagnosis of bacterial meningitis.

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