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Epidemic cerebrospinal meningitis in children at Federal Medical Centre, Gusau, Zamfara state, Nigeria

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Abstract Epidemic meningococcal meningitis is a major public health problem still affecting tropical countries, particularly in Sub-Saharan Africa, which lies within African meningitis belt. Repeated large scale epidemics of CSM have been reported in northern Nigeria for the past four decades. It is one of the important causes of morbidity and mortality in these regions. Mortality from the CSM remains high despite advances in treatment modalities. *Neisseria meningitidis* serogroup A have been the major cause of large scale epidemics in tropical countries, while serogroups B, C, Y and W-135 are responsible for most of invasive disease in America and other developed countries.

Objective: To determine the pattern of epidemic CSM in children at Federal Medical Centre, Gusau.

Method: The study was a retrospective one carried out in children aged six months to 12 years admitted into Emergency Paediatrics Unit (EPU) with a diagnosis of CSM within the period January to May, 2009.

Results: Seventy- seven children with epidemic CSM were admitted and managed in EPU from January-May 2009.

Conclusion: *Neisseria meningitidis* serogroup A CSM is becoming the disease of young infants, and stresses the need for inclusion of CSM vaccine in early infancy in routine immunization policy, in areas within the meningitis belt in Sub-Saharan Africa.

Introduction

Epidemic meningococcal meningitis is a major public health problem still affecting tropical countries, particularly in sub-Saharan Africa, which lies in the African meningitis belt.¹ Repeated large scale epidemics have been reported in the 21st Century, about 200 years after the disease was first reported in Geneva, Switzerland. It is one of the important causes of morbidity and mortality in these regions. Mortality from the disease remains high, despite major achievement in the treatment modalities. It was reported that about 10% of patients who had the disease will not survive despite effective treatment.² *Neisseria meningitidis* have been separated by sero-agglutination into nine serogroups A, B, C, D, X, Y, Z, W-135, and 29 E. Groups B, C, Y, and W-135 are responsible for most of invasive disease in America and other developed countries, whereas, group A and occasionally group C account for large scale epidemics in many other countries particularly in sub-Saharan Africa.³ At Federal Medical Centre Gusau, Zamfara State, in the north-western Nigeria, an epidemic Cerebrospinal meningitis (CSM) was observed in the year 2009.

Subjects and Methods

The study was a retrospective one carried out in children aged six months to 12 years admitted into EPU with a diagnosis of CSM within the study period January to May 2009. The folders of all the children with the diagnosis of CSM were retrieved. The approval of Federal Medical Centre Gusau Ethical Committee was sought for and obtained before the commencement of the study. Criteria for the diagnosis of CSM was adapted from the WHO practical guidelines for the control of epidemic meningococcal diseases.⁴ Lumbar puncture was done on all patients after obtaining verbal consent from the parents. Cerebrospinal fluid (CSF) was sent for microscopy, culture, sensitivity, and LPA. The bio-data, clinical features, results of investigations, and outcome were extracted and analyzed. Simple statistical tables were drawn for the frequencies and percentages.

Results

Seventy-seven children with epidemic CSM were admitted from January 1st, to May 31st 2009. Over this period,

564 children were admitted in to EPU giving overall prevalence rate of 13.7% (77 of 564). Fifty (64.9%) were males and 27 (35.1%) were females with a M:F ratio of 1.9:1. The ages ranged from six months to 12 years with a mean age (± 1 SD) 67.4 ± 38.8 months.

Infections and age distribution:

Thirty-seven (48.1%) and 32 (41.6%) were within the ages of 6-10 and 1-5 years respectively, while 5 (6.5%) patients were aged less than one year. Three (3.8%) of the cases are seen in children above 10 years of age.

Clinical features:

The major clinical presentations are those of fever, neck stiffness, vomiting, convulsions, coma, and skin rash. Fever was present in all the patients (100%), while neck stiffness was seen in 74 (96.1%) cases. Vomiting and convulsions were seen in 38 (49.4%) and 35 (45.5%) patients respectively. Altered sensorium was present in 26 (33.8%), while 12 (15.6%) had skin rash.

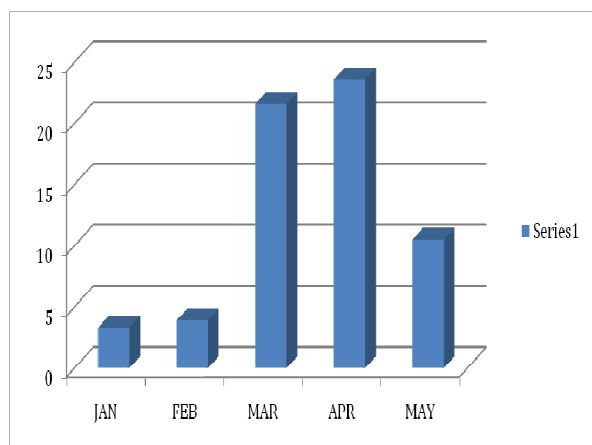
Duration of illness prior to presentation to hospital:

Forty-eight (62.3%) patients presented to hospital within 72 hours of onset of illness while 29 (37.7%) presented more than 72 hours after the onset of illness. Among the 29 patients who presented at more than 72 hours after the onset of symptoms, 11 (14.3%) of them were seen 7-14 days after onset.

Monthly prevalence:

The monthly prevalence of epidemic CSM is shown in fig 1. The highest prevalence was seen in April (23.6%), which was closely followed by that in March (21.6%). The prevalence in January was 3.3% while in February was 3.9%. The prevalence of cases dropped to 10.5% in the month of May.

Fig 1: Monthly prevalence of CSM in children.



Laboratory results:

The Latex Particle Agglutination was positive for *Neisseria meningitidis* serogroup A in all of the 77 CSF sam-

ples. Also five more patients had non-meningococcal meningitis during the epidemics (3 pneumococcus and 2 *Haemophilus influenzae*). CSF culture was positive in only 5 (6.5%) patients with meningococcal meningitis. The five isolates were sensitive to ceftriaxone, chloramphenicol, and ciprofloxacin while resistant to penicillin.

Duration of illness prior to presentation and outcomes:

Fifty-seven (74.0%) patients recovered fully, 8 (10.4%) died, 6 (7.8%) had neurologic sequelae (visual 2, deafness 4) and 6 (7.8%) absconded. The age ranges for the fatal cases (7 months – 10 years) and those with neurologic sequelae (6 months - 10 years) did not differ. Only two of the eight fatal cases presented to hospital within 72 hours of onset of illness while six are among those presenting later. Also, four of the six patients with neurologic sequelae presented beyond 72 hours after the onset of illness. The risk of death is higher when the duration of illness prior to presentation was more than 72 hours (2/48 versus 6/29; Fisher exact $p = 0.03$). There is no statistically significant relationship between neurologic sequelae and duration of illness prior to presentation beyond 72 hours (2/48 versus 4/29; Fisher exact $p = 0.13$).

Discussion

Meningococcal meningitis is primarily the disease of young children, but in epidemic, even young infants may be affected. In this study, 40 (51.9%) of patients were aged six years and above while 32 (41.6%) were between one and five years age; out of which 11 (34.4%) are young infants. Five (6.5%) are below the age of 1 year. The same pattern of age distribution have earlier been reported in Sokoto,⁵ in contrast to what have been reported by Bwala et al⁶ in Maiduguri, north-east, Nigeria. In Maiduguri, children less than 3 years of age, some of whom were infants constitute the major group affected. Also Idris Mohammed and co-workers⁷ in Nigeria reported significant numbers of infants affected during the large-scale epidemics of 1996. The reason for relative involvement of young infants as against previously observed pattern is not known, but virulence of clonal sub-groups might be contributory as suggested by Idris Mohammed and co-workers. Considering the relative involvement of young infants during epidemics, the immunization policy may need to be reviewed in order to incorporate CSM vaccine during early infancy into the routine National Immunization Programme of different countries within meningitis belt. One major set back for the polyvalent vaccines that have been in use for the past 30 years was poor immunogenic response in infants and young children, especially in those below the age of four years.

Recently, a new meningococcal A conjugate vaccine which induces higher and more sustainable immune response even in young infants was introduced (WHO facts sheets/No 141) and may soon become widely used

across African meningitis belt. The seasonal pattern of the disease is similar to what was described by early workers.^{8,9} The prevalence of the disease rises and reached its peak in the month of April. The average temperature in Gusau and environs around the middle of April was 41°C in association with low humidity. Late presentation to the hospital is a common problem in developing countries and this may favour poor outcome with resultant high morbidity and mortality. In this study, the mortality is higher in those patients presenting to the facility lately at more than 72 hours from the onset of the illness. Also, neurologic sequelae was more in those patients whose delay in presentation is more than 72 hours. This stresses the need for public education on early recognition and prompt treatment. Owing to the unfavourable outcome and documented evidence of efficacy of intramuscular oily chloramphenicol in meningococcal disease,⁷ it is imperative to advocate the possibilities of use of pre-referral depot chloramphenicol at Primary Health Centres/or community during epidemics, which can be safely administered by trained health workers at community level. The strain of *Neisseria meningitidis* responsible for the epidemics in this study was *Neisseria meningitidis* serogroup A.

This was similar to the strain that caused major epidemics of CSM in northern Nigeria (1970, 1975, 1977, 1986 and 1996), Chad (1988), and Niger Republic (1991, 1994).⁴ Similarly, *Neisseria meningitidis* serogroup A was the cause of an epidemic reported by Moore et al,¹⁰ in Saudi Arabia in 1987. The utility value of latex agglutination test in the diagnosis of meningitis was shown in this study.

The latex test detected all the 77 cases and their specific serotype which would have been missed by CSF culture. The CSF culture detected only 5 (6.5%) cases. The low bacteriologic yield on CSF culture has implication in the sense that reasonable susceptibility testing to antibiotics can not be achieved which is a major set back for defining control measures. The ability of the LPA test to detect specific serotype causing epidemic in a particular location and time has implication for effective control of the disease in terms of mass vaccine administration. The CSF culture isolates were all sensitive to ceftriaxone, chloramphenicol and ciprofloxacin. All the patients who survived, responded well to chloramphenicol; only a few 5 (7.9%) of them have their antibiotic changed to ceftriaxone. The mortality rate of 10.4% in this study is higher than the 3.7% reported by Bwala et al⁵ in Maiduguri, in 1987.

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