Case Report

Late Diagnosis of Escherichia coli Meningitis in a 6-year-old Febrile Male Child: A Case Report

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Article history: Received 28 December 2022, Reviewed 1 February 2022, Accepted for publication 17 February 2023, Published 07 March 2023

Abstract

Background: Meningitis in children is often life-threatening and a major cause of morbidity and mortality. The diagnosis is often given away by convulsions, and sometimes other neurological signs in a febrile child. Earlier requests for cerebrospinal fluid analysis can help lessen the morbidity and avert long hospital stays and death among children in the resource-poor setting.

Methods: The study was carried out using the case note of a patient managed in the children ward of a tertiary health centre in Umuahia, South-East, Nigeria

Results: A six-year-old male child whose initial history of short-lived convulsion was withheld by the mother, a health worker. Cerebrospinal fluid (CSF) analysis which was eventually done on the 5th day of admission revealed an *Escherichia Coli (E. Coli)* infection which is not common in the child's age group. It was then treated successfully with antibiotics based on the antimicrobial susceptibility, and the child has been free of any neurologic deficits for the last 3 years.

Conclusion: Need for a higher index of suspicion even in febrile school-aged children who appear not to have obvious neurological signs and symptoms has been brought to the fore. Hence, for children with less obvious or unreported initial convulsions or neurologic symptoms, a thorough history and physical examination, followed by CSF analysis is needed. Since *Escherichia coli* is an uncommon aetiologic agent for meningitis in this child's age group, further studies will be needed to elucidate the aetio-pathogenic factors.

Keywords: *Escherichia coli,* meningitis, 6-year-old, late diagnosis

Introduction

Meningitis in children is a life-threatening condition that requires prompt and adequate care to improve chances of survival and limit other neurological sequelae. But in resource-poor settings, several challenges ranging from late presentation to financial challenges adversely influence the optimal care and length of hospital stay. Meningitis is the inflammation of the meninges (cranial and spinal leptomeninges) with symptoms that include convulsions, headache, fever, loss of consciousness, and photophobia.[1] Adequate history is therefore important in unraveling the sequence of events in meningitis. The symptoms and the signs vary in different age groups. However, cerebrospinal fluid analysis is the gold standard for diagnosis.[2]

The common route of entry is the nasopharyngeal route following upper respiratory tract infections, otitis media, mastoiditis, head trauma, haemoglobinopathy, and immunodeficiencies.[3] Whereas the condition is often quite obvious, sometimes, it may be masked by prior antibiotic treatment, comorbidities and, or subclinical symptomatology. The common bacterial causes vary among different age groups. In newborns up to the age of 3 months, *Escherichia coli* (*E. coli)* and *Group B Streptococcus* (GBS) cause 33% and 31% of bacterial infections respectively.[4] Whereas Okike et al[5] in the United Kingdom and Ireland found E. coli in two–thirds of the bacterial isolates in children less than 90 days. In infants and children, *Streptococcus pneumonia, Heamophilus influenza type b*, and *Neisseria meningitides* predominate. However, in children older than 5 years, *Streptococcus pneumonia* and *Neisseria meningitides* predominate. Not many studies have reported *E coli* meningitis in children above 5 years of age. A study in Nepal however documented gram-negative organisms in 72% of cases in children below 15 years, with haemophilus influenza as the most common pathogen.[6] There is a dearth of literature on E coli meningitis in children beyond the first three months of life.

Print ISSN: 0189-9287

Case Presentation

A 6-year-old male, a son of a Nurse was admitted in May 2019 to the children's ward of Federal Medical Centre, Umuahia, Abia State, Nigeria. He had a 3-day history of high-grade fever which became mild after outpatient treatment for malaria with artemisinin-based - combination therapy for 3 days. He was admitted on the 4th day of illness following a worsening fever with a temperature of 38.6°C. He had a history of cough and catarrh 5 days earlier but which was resolving, being known to be an atopic child. However, a closer review revealed mildly inflamed tonsils and few crepitation in the lungs for which respiratory tract infection was entertained and IV cefuroxime commenced. Following a complete blood count and blood film results that were largely unremarkable except for the isolation of malaria parasites, the child was treated accordingly again for resistant malaria. Blood and urine culture results retrieved after about 3 days of admission were not remarkable as no organism was isolated in both.

On the third day of admission (about one week into illness), in the absence of any neurological findings, the mother volunteered a piece of information (withheld earlier for unknown reason) that her son had a short-lived generalized tonic–clonic convulsion (lasting about two minutes and resolving spontaneously) earlier before the presentation. She also revealed that the child had a similar episode a year earlier but Cerebrospinal fluid (CSF) analysis was not done due to logistic reasons. This history prompted a request for a lumbar puncture for CSF analysis. This was aseptically done and samples were sent for laboratory analysis. The result retrieved on the 6th day of admission revealed an isolate of *E. coli* that was susceptible to Ampicillin-cloxacillin, chloramphenicol, gentamycin, streptomycin, amoxicillin, and cefuroxime. But it was resistant to Imipenem, cefoxitin, cotrimoxazole, ciprofloxacin, ofloxacin, and ceftriaxone.

The susceptibility pattern was in favour of the IV cefuroxime as empirically used over the first 6 days on admission. However, further appropriate treatment with antibiotics was given with respect to the antibiogram using IV chloramphenicol (25mg/kg/day in 4 divided doses) and IV ampicillin-cloxacillin (100mg/kg/day in 4 divided doses) for a duration of 8 days. Subsequently, the child received a week's treatment with oral ampicillin-cloxacillin. At the follow-up visit after two weeks of discharge, the child had remained well, fever free, and had no neurological deficits. More than 3 years later, the child was still seizure free and had no neurologic sequelae.

Discussion

The diagnosis of meningitis is often based on history, physical examination, and demonstration of the causative organism in the CSF. In the absence of clinical features suggestive of meningitis in an ill child presenting in a resource-poor environment, investigations like lumbar puncture for CSF analysis may not readily come to mind. However, a history of convulsion as seen in this study should not be ignored even in the absence of other neurological signs. The difficulty in accepting lumbar puncture may also be why a literate mother may withhold a history of convulsion in a febrile child from the doctor.[7] Sometimes, even health workers do not want a lumbar puncture on their own children.[8] However, the onus lies on the doctor to allay the fears of the parents. The difficulty in diagnosis in this child understandably was contributed to by the co-morbidities of respiratory tract infection and malaria. Hence, a thorough review of management protocol in a child not responding to antimalarial drugs and antibiotics is very needful.

In the index case, the child was 6 years old and was not expected to have gram-negative meningitis as is obtainable around the newborn period.[5] *E.coli* meningitis reports are scarce in a 6-year-old but are mainly reported in older children and adults who are immunocompromised or who had head trauma or neurosurgical procedures.[9] With a global report of 1.2 million annual cases of acute bacterial meningitis, little is documented about *E coli* aetiology beyond the neonatal period in Nigeria,[1] rather, the major documented causes of community-acquired bacterial meningitis beyond the neonatal period include Streptococcus pneumoniae, Haemophilus influenzae type b, and Neisseria meningitidis.[10] Basmaic *et al*[9] in a national survey in France involving 325 children reported that only 8.9% of the children with *E coli* meningitis were up to 90 days of age. In Nigeria, a study that described the pattern of antimicrobial sensitivity following cerebrospinal fluid culture in children of post neonatal age group (1 – 144 months of age) managed for acute bacterial meningitis, reported *E. coli* meningitis only in 1 out of 66 culture-proven meningitis cases, and this was isolated in a 6-week-old baby.[11] This study agrees with the reported rarity of the organism beyond the first 3 months of age.[5] Hence, the knowledge of the mode of transmission of *E. coli* meningitis in a 6-year-old is needful in preventing such occurrences.

E. coli is a gram-negative bacterium, and a major inhabitant of the large intestine which is associated with urinary tract infections and is a common pathogen in

Print ISSN: 0189-9287

diarrhoeal illnesses.[12] Haematogenous spread to the brain is possible mainly in newborns,[13] but in adults, it usually follows CNS trauma, neuro surgeries, immunosuppression, cancer, and diabetes mellitus.[3] Though the route of infection in the index case could not be determined, *E coli* meningitis can be secondary to otitis media, gastrointestinal infection with subsequent haematogenous spread to the CNS[3] In adults, *E. coli* has been described as a rare cause of community-acquired pneumonia with higher mortality rate than other bacteria meningitides.[3]

Recommendation: More robust and regular antibiogram of CSF samples is necessary to review the prevalent organisms in children in each locality in view of possible changes in the aetiologic patterns of childhood meningitis.

Limitation of the Study: The data for this study were collected retrospectively.

Conclusion

Meningitis may be masked by co-morbidities or by a sub-clinical course. A high index of suspicion is necessary to elucidate such cases, especially with a more detailed history taking and septic workup in a child with unremitting fever despite appropriate treatment with antibiotics and antimalarial drugs. This is needed to avoid the dangerous immediate and lifelong complications of meningitis in a child.

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Print ISSN: 0189-9287