

CASE REPORT

MENINGOCOCCAL DISEASE OUTBREAK IN A LIBERIAN COUNTY

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ABSTRACT

Meningococcal infection caused by *Neisseria meningitidis* causes epidemics especially in the "Meningitis Belt" of Sub-Saharan Africa with a case fatality of 5.9% and attack rate 1%. We report a localized outbreak of Meningococcal disease in a Liberian county (a West African country) where our Pakistan Army Military Hospital was working under United Nations (UN) Mission. It began suddenly as a cluster of cases who had all attended a funeral. Patients developed sudden headache, vomiting and abdominal pain with petechial rash in a few but without fever in the majority. It caused much diagnostic confusion until the illness was diagnosed by Centres for disease control (CDC) as Meningococcal septicemia due to *Neisseria meningitidis* group C.

Keywords: Meningococcal disease, *Neisseria meningitidis*, Outbreak.

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INTRODUCTION

Neisseria meningitidis (*N meningitidis*), a gram-negative diplococcus can cause meningitis with or without meningococemia called invasive meningococcal disease (IMD). Meningococci are subdivided into serogroups based upon capsular polysaccharides; eight serogroups are infectious in humans (A, B, C, X, Y, Z, W135, and L)¹ causing 1.2 million infections with 135,000 deaths world wide annually². Large African epidemics occur in the African meningitis belt (an area stretching from Senegal to Ethiopia) while sporadic cases occur outside this area as well mainly caused by *Neisseria meningitidis* group A (NmA) but since the introduction of meningococcal A conjugate vaccine the cases caused by NmA have declined while cases by other serogroups have increased for example large epidemics in Nigeria from 2013-15 caused by NmC^{3,4}. It colonizes nasopharynx of humans, the only known hosts, and is transmitted through respiratory droplets³. The aim of case series is to highlight unusual characteristics of this meningococcal outbreak.

CASE SERIES

On 23rd April 2017 an eleven years old child

was admitted to FJ. Grant Memorial Hospital in Greenville with diarrhea, vomiting and confusion. She had attended a funeral in Greenville (a district in Sinoe county) on 22 April 2017. The patient died 1hr after the admission. A cluster of total 31 cases followed the index case over the next 2 weeks mostly with complaints of weakness, headache, abdominal pain, vomiting, diarrhea and confusion. Fever was present in minority of cases. Purpura fulminans and petechial rash were seen in 4 cases while ecchymosis in 2 cases. The outbreak showed features of point-source epidemic with maximum number of cases seen within the first 3 days. All but two cases had attended the funeral who were subsequently identified as the contacts of the index case. 45% cases were below 20 years of age, 55% were females. Total funeral attendees were 110 (attack rate 26%). Total fatalities were 13 with a case fatality rate of 42%. National health authorities in collaboration with international agencies started investigation. Out of a total of 56 biological specimens collected 26 tested negative for Ebola and Lassa viruses. Coliform and toxicology screen were negative. Autopsy was also done on 2 cases. The outbreak was declared officially over on 15 May 2017 after CDC Atlanta laboratory confirmed *Neisseria meningitidis* serotype C in 13 out of 24 blood samples from the cluster, using PCR technique. Ceftriaxone plus symptomatic treat-

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ment was given to the hospitalized patients. Ciprofloxacin was given to all the close contacts and health care workers who came in contact with the patients.

DISCUSSION

Meningococcal infection is prevalent in African meningitis belt and follows a peculiar epidemiological pattern characterized by sporadic epidemics which may be localized or large. Invasive Meningococcal Disease (IMD) comprises 3 syndromes: Meningitis, and meningococemia with or without meningitis. Meningitis is characterized by headache, neck stiffness, altered sensorium and fever. In meningococemia there is petechial rash, Disseminated Intravascular Coagulation (DIC) and patients rapidly go into septic or hypovolemic shock if not treated urgently.

This case series had certain unusual features. This was the first recorded outbreak of Meningococcal septicemia in Liberia and that too with a high case fatality rate, indicating a fulminant course of meningococemia, in contrast to meningitis which has a mortality rate of 5%^{5,6}. Fever was present only in a minority of cases. Meningitis rather than meningococemia is the predominant course of IMD in African epidemics^{3,7}. *N meningitidis* is a nasopharyngeal colonizer. Its asymptomatic carriage is an immunizing event and systemic immunity (serum antibodies) develops about 14 days after acquisition of meningococci⁷. IMD occurs when it invades the bloodstream following colonization. A few factors are postulated to cause post-colonization invasion precipitating outbreaks. In household contacts the risk of IMD in family members is increased by a factor of 400-800⁸. Epidemics of meningococcal disease regularly occur in Sub-Saharan African belt during the dry season (December-May) whereas the incidence falls during rainy season (June-November)⁹. Dryness and seasonal dust-wind damage nasopharyngeal mucosa and increase cough facilitating transmission through droplet spread and causing mucosal injury with subsequent bacterial invasion². The incidence of epidemics by previously dominant Nm Sero

group A (NmA) is falling in the meningitis belt and the incidence of serogroups W, C, and X is increasing since the introduction of meningococcal A conjugate vaccine (MenAfriVac)⁴.

In dry season IMD follows three patterns: Hyperendemicity (incidence slightly above the endemic level), Localized epidemics (localized to small communities; weekly incidence rates of $\geq 10/100,000$ at the district level), Epidemic waves (more localized epidemics than usual occurring in a larger region or a country or with a higher attack ratio). Localized epidemics is a unique and interesting phenomenon for meningococcus as no such localized meningitis epidemics have been reported for other bacterial meningitis agents. It is postulated that hyperendemic situation shifts to localized epidemic state because of co-factors like respiratory viral infections (high transmission through droplets, mucosal injury and transient immunosuppression), over-crowding or population shifts⁹. This outbreak occurred at the end of dry season, was precipitated by crowding during funeral rites and was probably caused by a hyperinvasive variant of NmC as it has a potential of genomic evolution. IMD is treated with any of intravenous ceftriaxone, intravenous penicillin G or I/M oily chloramphenicol. Single doses of I/M ceftriaxone or oily chloramphenicol are suitable in Africa epidemics¹⁰. Prevention is through vaccination and adoption of standard droplet infection control measures. Chemoprophylaxis with oral ciprofloxacin or rifampicin or I/M ceftriaxone, preferably in less than 24 hours, is indicated in close contacts defined as individuals having prolonged (>8 hours) and close proximity (<3 feet) exposure to the patient. Vaccination provides active immunization. Different polysaccharide and conjugate vaccines are available against different serogroups⁶. In Africa, reactive vaccination with bivalent (A, C) or trivalent (A, C, W135) polysaccharide vaccines is done. Mass vaccination with meningococcal A conjugate vaccine was started in 2010. The protective effect of vaccination is good and immunity lasts for 3 years with polysaccharide and longer with conjugate vaccines.

This case series highlights the importance of vigilance required for early detection and aggressive management of infectious diseases especially in connection with troops deployed on foreign assignments.

RECOMMENDATIONS

In view of the changing epidemiological pattern of Meningococcal infection it is important that the troops are vaccinated against Serotype C *Neisseria meningitidis* also.

Lectures on infectious diseases specific to Africa should be included in the pre-induction training program of the doctors employed on UN Missions in Africa.

AMC outfits employed on foreign assignments to be educated about the Integrated Disease Surveillance and Response (IDSR) system now in place in African countries to deal with any outbreak in a professional way.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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