Invasive Meningococcal Disease in North Batina, Oman in 2023. A Case Study

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Abstract

Invasive Meningococcal Disease is a severe bacterial infection with a high fatality rate particularly in young children. It is caused by Neisseria meningitidis bacteria which colonizes the nasopharynx. The transmission is by direct contact with droplets or discharge from an infected person or a carrier. Invasive meningococcal disease commonly presents as meningitis or meningococcemia. Acute meningococcemia progresses rapidly with a characteristic purpuric rash. Confirmation of the disease is through isolating the bacteria from sterile body fluids (CSF, blood). Early diagnosis and treatment are crucial. Recognizing purpuric rash as a late symptom of meningococcemia is important. Vaccination remains the best prevention. In this case study we present the details of a 12-year-old Omani child with rapidly progressive fulminant meningococcemia, leading to death.

Introduction

Invasive Meningococcal Disease (IMD) is a severe bacterial infection with a significant impact on children's health. High case-fatality rates (7-9%) and serious long-term sequelae underscore the disease's burden, particularly among infants and young children, although a secondary incidence peak occurs in adolescence [1]. Case fatality rate can reach up to 80% in untreated patients [2].

IMD is caused by Neisseria meningitidis (N. meningitidis) which is an anaerobic Gram-negative diplococcus. Meningococcal carriage, the initial stage of disease transmission, exhibits significant variation with respect to age and setting. Interestingly, N. meningitidis can colonize the naso-pharynx of up to 5-10% of asymptomatic adults. It is noted that carriage prevalence gradually increases throughout childhood, reaching a peak of 23.7% in 19-year-olds, before declining to 7.8% in 50-year-old adults [3].

Annually 1.2 million cases of infections were caused by N. meningitidis, as well as 135,000 deaths were estimated worldwide. Serogroup B is responsible for 50% of meningococcal cases in infants, while serogroup C is more common in adolescents, and serogroups B and Y are seen in older adults [4].

Between 2012 and 2021 a total of 156 IMD cases were reported by the Gulf Cooperation Council countries which including Oman. 30% to 80% of cases were reported among individuals aged ≥15 years old [5]. Transmission of the bacteria is by direct contact including droplets and discharge from nose and throat of infected persons and more often from carriers than...
cases. The incubation period varies from 2 to 10 days but commonly 3 to 4 days. The disease remains communicable as long as the bacteria are present in discharge from nose and throat. Meningococci usually disappear from the nasopharynx within 24 hours after antibiotic initiation [6].

Clinically, the presentation of IMD varies from meningitis (50–60% of cases), to septicemia, or acute meningococcemia (30–40% of cases) [7]. Acute meningococcemia is characterized by its rapid progression. The cardinal feature is the purpuric rash. Unfortunately, this rash appears late after the non-specific symptoms of fever, headache, nausea, vomiting and cold extremities. The rash begins with erythema then progress into petechiae and purpura. Further, the purpuric rash may progress to purpura fulminant, which is a cutaneous manifestation of disseminated intravascular coagulation. It presents as a purpuric rash and gangrene that often necessitates amputation and is often associated with a shock state. This state is characterized by the rapid onset of hypotension, acute adrenal hemorrhage and multi organ failure. In these cases death can occur within 24 hours [8].

The confirmation of IMD is by direct detection and isolation of *N. meningitidis* from sterile body fluids, such as cerebral spinal fluid (CSF) or blood. Samples for culture should be collected before administration of antibiotics. To overcome this limitation other methods can be utilized to detect the bacteria such as polymerase chain reaction (PCR) method either from blood or CSF [9]. Compared to culture methods, real-time PCR has a higher sensitivity, specificity, negative predictive value, and positive predictive value. In addition, subtyping can be done for subtypes that were previously untypeable.

**Objective**

In this paper, a case study of a 12 years old Omani child who presented with rapidly progressive fulminant meningococcemia with fatal outcome will be presented.

**Case presentation**

A 12 years old boy was brought by his mother to As Suwaiq Poly Clinic in North Batina Governorate on 14th of October 2023. He had few hours’ history of fever, confusion and 5 episodes of vomiting. He had one episode of passing black tarry stool. He was seen at 14:23. On physical examination, he was febrile (T 39.2 C) and tachycardic with hearth rate of 146/minute. His oxygen saturation on room air was normal. He had a swelling at the base of right thumb with purpuric rash. He also had petechial rash on the trunk. Blood investigations showed normal white blood cell count of 4.16 10*9/L, with normal neutrophil and lymphocyte counts. Hemoglobin was normal as well (11.32 g/dl). Kidney function test showed mildly raised urea and creatinine (6.5 mmol/l and creatinine 93 umol/l, respectively). Prothrombin time was prolonged (17.3 seconds) while activated partial thromboplastin time was normal (31.7 seconds). Liver enzymes were normal.

**Management and Outcome**

In the polyclin the patient received 250 ml of ringer lactate solution intravenously and ibuprofen syrup. He started to have sub conjuntival hemorrhage in both eyes while he was in the polyclinic receiving the treatment. At 16:01 the patient was referred to Sohar hospital emergency room (the regional secondary hospital) but the family decided to take the patient to Armed Force Hospital which is located in Muscat governorate and is about 1 hour drive from As Suwaiq polyclinic.

The patient was seen in Armed Force Hospital at around 22:00 hours same day. At presentation he was sick looking with severe dehydration but conscious and alert. His blood pressure was low (86/51 mmhg), tachycardic (140/minute) and tachypnic (47/min). His oxygen saturation on room air was normal. He had purpuric rash all over the body including the face and mucus membranes. Lymph nodes were palpable in the submandibular and inguinal areas. Neck stiffness was absent and other systemic exam was unremarkable.

Initial blood work up showed neutropenia and thrombocytopenia (platelets 32 k/ul). Creatinine was high. Coagulopathy was present and suggested disseminated intravascular coagulopathy. Arterial blood gas showed metabolic acidosis and high lactate. The chest x ray showed alveolar hemorrhage. A blood film was taken and showed that the neutrophils contained vacuoles which were explained by sepsis.

The patient was started on resuscitation intravenous fluids with vitamin K. Stat doses of intravenous ceftriaxone (2 gram) and vancomycine (1 gram) were given. Along with that he received a dose of proton pump inhibitor.

Despite resuscitation the patient continued to have tachypnea and tachycardia and then he started to de saturate thus he was electively intubated and shifted from the emergency room to intensive care unit. Unfortunately, he continued to deteriorate and he passed away at around 4:00 am on 15th of October 2023.

Blood culture later showed *Neisseria Meningitidis*, Serotype Y.

**Epidemiological Investigations**

A notification from Muscat Governorate was received on 15th of October 2023 about a suspected case of meningococcal meningitis admitted in Armed Force Hospital who belongs to North Batina Governoratet. Rapid Response Team responded immediately to the
The reported 15 years old child was unfortunate as he visited the emergency room twice before he finally presented in a very critical condition. It was late to save him and he passed away. His initial symptoms were fever, vomiting and fatigue. In the next day he developed the petechial rash and became sicker. Unfortunately, these symptoms were not enough for the emergency doctor to suspect meningitis and he was sent home. On last presentation, he was confused, agitated and febrile. Purpuric rash was present all over the body and his limbs were swollen. Similar to our case neck stiffness was absent. The CSF culture showed no growth, however, the blood culture showed gram-negative diplococcic. In less than 2 hours after admission, the child developed renal failure and went into deep coma then he passed away.

Different *N. meningitidis* serotypes were isolated from patients with IMD. A systematic review and a meta-analysis of 102 studies showed that in IMD the highest proportion of cases was due to serotype B with 48.5% (95% CI: 45–52) while serotype X constituted the lowest proportion of cases with 0.7% (95% CI: 0.3–1.7) [12]. In this case study serotype Y was isolated. This serotype was rarely isolated in cases from Oman and the most common serotypes were A and W135 [13]. Similarly, in Saudi Arabia although serotypes A, B, C and W135 were isolated, the most common serotypes were A and W135 [13]. In Qatar, serotypes B and W135 were the most common serotypes isolated from patients with meningococcal disease [14]. Serotype Y is most common in the United States of America [15]. However, it was isolated from cases in Turkey, Morocco, Egypt, Kuwait and Qatar [13]. In addition, it was noticed that an increasing prevalence of serotype Y is noted across different countries in Europe [16]. Countries such as Sweden and Finland reported serotype Y in 51% and 40%, respectively, of cases meningococcal disease. In this case, travel history was denied in the patient himself, his small family and his extended family in the last few months. This raises the question of the source of the infection. Antimicrobial chemoprophylaxis of close contacts of a patient with meningococcal disease is important to prevent secondary cases. Several antibiotics are recommended for chemoprophylaxis, including ciprofloxacin, rifampin, and ceftriaxone; azithromycin can be used in areas with sustained ciprofloxacin resistance [17]. In this case study the bacteria was resistant to ciprofloxacin thus ceftriaxone intramuscular injections were given. Prevention of meningococcal disease can be achieved through vaccination. Three types of meningococcal vaccines are currently available in countries such as the United States [18]. Each vaccine is protective to different serotypes. For example, meningococcal conjugate or MenACWY is protective against serotypes...
A, C, W and Y. Meanwhile MenB is active against serotype B. Finally Pentavalent Meningococcal is protective against serotypes A, B, C, W and Y. It is recommended preteens who are 11 to 12 years old should get a MenACWY vaccine. A booster dose at 16 years of age should be given. MenB vaccine is recommended for children age 10 years of age and older if they are at risk of the infection. In Oman, a quadrivalent meningococcal polysaccharide (A, C, Y, W-135) vaccine is mandatory given to pilgrims planning to go for Hajj and Umra [6]. Immunoprotection is valid for 3 years. Persons travelling to countries were meningococcal outbreak is ongoing are required to take the vaccine as well. In addition, high-risk persons working in occupation such as the military and army should receive the vaccine on routine basis. Thus, in Oman the meningococcal vaccine is not routinely offered to the community.

**Conclusion**

Meningococcal disease can progress rapidly and be fatal, even in young, healthy individuals. Early diagnosis and prompt antibiotic treatment are crucial for survival. Recognizing Disseminated Intravascular Coagulopathy signs like purpura crucial for timely and prompt management. Serotype Y, though uncommon in Oman, presents a potential public health concern. Vaccination remains the best preventive measure against meningococcal disease. This case highlights the importance of healthcare professionals being aware of varied presentation of meningococcal disease and the urgency of aggressive management.

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**References**


