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CASE REPORT

Aeromonas hydrophila Septicaemia in a 6-Month-Old Infant: A Case Report

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Abstract

Background: *Aeromonas hydrophila*, a Gram-negative, motile, facultative anaerobe, is emerging as a serious pathogen. It is found in water, soil, and food, causing various infections, from mild diarrhoea to life-threatening sepsis. Young children, older people, and immunocompromised people are most susceptible. While treatable with antibiotics, *A. hydrophila's* growing resistance to penicillin and other commonly available antibiotics complicates treatment. This case report highlights a rare instance of *A. hydrophila* sepsis in a young child in rural Gambia.

Case summary: A 6-month-old African female child with high fever, cough, fast breathing, and vomiting was diagnosed with septicemia caused by Aeromonas hydrophila, a waterborne bacteria. The infant likely contracted the infection from contaminated fish or water. We started the child on the initial first-line empirical antibiotics but later switched to ceftriaxone due to antibiotic resistance, and the child recovered fully. This case highlights the importance of appropriate diagnosis, antibiotic susceptibility and surveillance of emerging antibiotic-resistant pathogens in young children.

Conclusion: This report describes the infection of emerging antibiotic-resistant *A. hydrophila* sepsis in an African female child. *A. hydrophila* is an emerging pathogen causing opportunistic infections in both immunocompetent and immunocompromised patients. This study suggests that prompt identification of bacterial pathogens, coupled with targeted antimicrobial therapy guided by local antibiogram data and blood culture for antibiotic susceptibility, is likely a crucial factor for optimal patient outcomes. Furthermore, we advocate for more comprehensive surveillance systems to effectively track and monitor these emerging antibiotic-resistant pathogens.

Abbreviations

IV: Intravenous; API: Analytical Profile Index

Introduction

Aeromonas hydrophila is a pathogen of growing concern in medicine. It is found primarily in aquatic environments, soil, and even food, and it causes gastrointestinal tract infections, wound infections, soft tissue

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infections and septicaemia [1]. It is a heterotrophic, Gram-negative, motile, non-spore-forming, oxidase-positive, rod-shaped facultative anaerobic bacterium that is ubiquitous and found in natural aquatic environments, especially in warm climates [2]. *A. hydrophila* causes infections in fish, amphibians, mammals and humans because of its ubiquitous characteristics and causing mild infections like diarrhoea to severe infections like necrotising fascitis and septicaemia [3]. The *Aeromonas* genus was identified in the late 19th century and grouped into two categories based on growth characteristics and other biochemical features. They include the mesophilic category represented by A. *hydrophila* (motile) and the psychrophilic strains (non-motile) pathogenic to aquatic animals [4]. The bacteria is known to cause infections in both healthy and immunocompromised people [1]. The signs and symptoms of infections from *Aeromonas hydrophila* include vomiting, diarrhoea, skin infections, fever, and abdominal pain [5]. The global overall prevalence of infection from A. *hydrophila* is about 4.2% based on cross-sectional articles published in the last 22 years, and more than two-thirds occur in the tropical region [6]. The risk factors for contracting the infection include age (under-five age group and elderly), immune status (immunocompromised), and environmental factors. *Aeromonas*'s production of beta-lactamase renders them significantly resistant to common antibiotics, particularly penicillin, posing a significant challenge to treatment [7]. Most reported cases of Aeromonas infections are from developed countries [8]. We report a case of *Aeromonas hydrophila* sepsis in a 6-month-old child at a rural hospital in Central River Region, the Gambia.

Case Report

A 6-month-old infant was brought to the clinic by the mother with a three-day history of continuous high fever. Mother also complained of a cough of insidious onset, non-paroxysmal and associated fast breathing. There is an associated history of non-bilious vomiting, four episodes on the day of presentation, associated with poor feeding and general body weakness. The mother also complained of a reduction in urine output in the last 24 hours before the presentation. There was no history of dyspnoea, abdominal swelling, diarrhoea, crying while micturating, convulsion or loss of consciousness. The infant has received all immunisations for age. The child is not on exclusive breastfeeding because the mother complained of inadequate lactation, and the fish meal was an everyday family meal. Since the onset of the illness, the child was given some over-the-counter medications with no improvement.

Examination revealed an acutely ill child, febrile with a temperature of 39.7°C, moderately dehydrated, not pale, anicteric, a-cyanosed and no pedal oedema.

The respiratory rate was 70 cycles per minute; oxygen saturation was 99%; chest movement was symmetrical, and there was no dullness to chest percussion vesicula breath sounds on auscultation.

The heart rate was 160 beats per minute (tachycardia), and heart sounds were normal.

The child was lethargic but conscious, with no signs of meningeal irritation, had good muscle tones globally and had normal gross motor reflexes. All other physical examination findings were normal.

We made an initial diagnosis of septicemia with a differential of acute lower respiratory tract infection. We requested a routine rapid diagnostic test for malaria, Haemoglobin Concentrations (Hb), chest x-ray and blood culture. We commenced the child on the first-line antibiotic regimen per national guidelines: IV ampicillin 30 mg/kg 6 hourly and IV gentamicin 5mg/kg daily. After correcting the dehydration with normal saline, we placed the child on dextrose intravenous fluid.

Malaria RDT was negative, Hb concentration was 9.8 g/dl, and chest x-ray was normal. The blood culture yielded a Gram-negative, non-spore-forming facultative anaerobic motile rod. We processed the bacterium for identification using the Analytical Profile Index (API) 20 E. The identification number 7527744 on the API is consistent with *Aeromonas hydrophila*. Antibiotic susceptibility testing of the pathogen using the disc diffusion method showed sensitivity to ceftriaxone, cefoxitin, ceftazidime, ciprofloxacin and gentamicin. The organism was resistant to sulphamethoxazole -trimethoprim, ampicillin, tetracycline, chloramphenicol, erythromycin and amoxicillin.

Progress Report

After 48 hours of hospitalisation, fever spikes continued with an average temperature of 38.5°C. Dehydration has been corrected, and vomiting has stopped. But the child was still coughing and with

fast breathing. The blood culture result was available on the third day, and we stopped the ampicillin and changed to ceftriaxone due to the antibiotic sensitivity. After 48 hours of commencing the ceftriaxone, the fever stopped, the breathing was normalised, and the cough stopped. We discharged the child on the seventh day of hospital admission. We saw the child one at the follow-up clinic a week after discharge with no complaints.

Discussion

Aeromonas hydrophila is a rod-shaped, indole-positive, facultative Gram-negative anaerobe found primarily in aquatic habitats, including drinking water, wastewater, and sewage [9]. It is considered an emerging pathogen responsible not only for skin infections and gastroenteritis but also for systemic conditions such as sepsis, meningitis, bacterial peritonitis, profuse diarrhoea outbreak, hemolytic uremic syndrome, and necrotising fasciitis [10]. *A. hydrophila* causes septicemia, gastroenteritis, and extraintestinal diseases like skin, eye, wound and respiratory tract infections in humans [10]. *A. hydrophila* has varied virulence depending on factors like the immune status, extreme age, bacterial load and the toxin produced (hemolysin enterotoxin, lysine decarboxylase, cytotoxin, acetylmethylcarbinol, and Dnase) [11].

Sepsis is a significant public health challenge globally, with an estimated 1.3-3.9 million young infants experiencing sepsis, and it accounts for up to 15% of all young infant deaths annually. The sub-Saharan African region alone accounts for more than half of this globally [12]. It is essential to reduce the global burden of under-five deaths due to infectious diseases, which remain one of the highest-ranked causes of infant mortality, especially in the sub-Sahara region. Hence, it is critical to understand the global trend burden of common bacterial pathogens (both susceptible and resistant to antimicrobials) to identify the greatest threats to public health. The five leading bacteria causing infant mortality globally (*Staphylococcus aureus, Escherichia coli, Streptococcus pneumoniae, Klebsiella pneumoniae, and Pseudomonas aeruginosa*) accounted for 54·9% (52·9-56·9) of deaths among the investigated bacteria [13]. However, *Aeromonas hydrophila* is now recognised as a potential non-vaccine preventable bacteria infection globally that can cause life-threatening septicaemia and other diseases in man and animals (emerging food and waterborne pathogens) [14].

Our patient, a 6-month-old infant who presented with features of septicaemia, had already commenced supplementary feeds before the age of six months. The primary source of animal protein was fish, and the child was also eating other family meals. Although the bacteria is ubiquitous, this may be a significant risk factor for contracting the infection. Moreover, the source of infection varies (man, animal, fish, reptiles, and vegetables), and the mode of transmission could be direct (drinking contaminated water or eating contaminated food) or indirect (faecal-oral route) [15].

Additionally, the rapid emergence of resistant bacteria occurring worldwide and endangering the efficacy of antibiotics has become a serious and concerning global threat in treating infectious diseases. *Aeromonas hydrophila* has a significant resistance profile to the commonly available antibiotics, probably due to misuse and overuse, which makes it more challenging to treat infections from *A. hydrophila* [16]. *Aeromonas hydrophila* possesses multiple mechanisms of antibiotic resistance. Plasmids, transposons, and integrons facilitate the spread of antibiotic resistance among bacteria through three pathways: transformation, transduction, and conjugation. The plasmids produce different B-lactamases (broad spectrum β-lactamases, metallo-β-lactamases, cephalosporinases, and penicillinases) that can confer resistance to penicillins, cephalosporins and monobactams [16,17]. Our patient was initially started on IV ampicillin and IV gentamicin per national guidelines, but there was no clinical improvement during the first three days of hospital admission. This was due to the antibiotic-resistant nature of the microorganism. It was resistant to penicillin, sulphamethoxazole-trimethoprim, tetracycline, chloramphenicol, and erythromycin. And when we commenced the child on ceftriaxone, the child got better and was discharged home. It is essential to follow antibiotic guidelines in treating infectious diseases to limit the misuse of antibiotics and multidrug resistance; however, it is crucial to have the ability to perform blood cultures and antibiotic susceptibility for improved quality care and limit the incessant use of antibiotics.

This case report highlights the critical challenges for healthcare delivery in resource-limited settings where emerging pathogens are significantly under-recognised due to low resources in human resources,

technical know-how, poorly equipped laboratories and ineffective surveillance systems. It also describes the rise in antibiotic resistance with available limited treatment options and antibiotic choices. It implies a more sustained, strengthened surveillance system to track emerging, multidrug-resistant pathogens. There is a need to improve access to diagnostic tools and facilities to boost effective treatment and limit the abuse of antibiotics. Also, there is a need to invest in well-equipped laboratories to support prompt and early diagnosis, which can significantly reduce morbidity and mortality.

Antibiotic susceptibility results assisted in excellently managing this patient. However, doing this in many clinical settings in resource-limited rural areas is challenging, which may significantly affect the quality of healthcare delivery and infant mortality.

Our case report outlined the significance of more surveillance for potentially life-threatening emerging pathogens with multidrug resistance ability. Also, this report shows that *A. hydrophila*, although rarely reported in the sub-Saharan region, should be investigated as a cause of bacteraemia or sepsis in the under-five age group, especially as an emerging infection with considerably high resistance to commonly available antibiotics. Also, early detection and management based on local antibiogram data is essential for excellent patient outcomes. The lack of microbiology services in many settings in sub-Saharan Africa will mean that infections with *A. hydrophila* are under-detected and may be poorly treated.

Limitations

We had some limitations in terms of adequate investigations. We could not do a complete blood count and electrolytes because our laboratory is under-equipped.

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Contributions

WOA managed the patient and drafted the case report. MO, OB, MM, and RS provided the results of the microbiology laboratory work. BMW and YAO assisted in editing the case report. KML assisted in the patient's management. IO and GM provided clinical work support, supervision, and writing of the case report manuscript.

Ethics Declaration

The clinical care provided was in a clinical trial approved by the Gambian Government Ministry of Health and Medical Research Council Gambia Joint Ethics Committee.

Consent for Publication

We obtained informed consent from the patient's father to publish this case report. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of Supporting Data

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

Competing Interest

The authors declare that they have no competing interests in this section.

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