



A Case Report of Meningitis due to *Aeromonas hydrophila*

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Abstract

Background: *Aeromonas hydrophila* is one species of the genus *Aeromonas* that received increasing attention as an opportunistic pathogen because of its association with human diseases associated with a wide range of illnesses in humans, including gastroenteritis, wound infections, septicemia, meningitis, peritonitis, endocarditis, osteomyelitis in both immunocompromised and healthy host.

Case: This was a 1- month- old female child with a history of fever, of not sucking the breast, and exhibiting symptoms of meningitis born from a 23 years old para-I-mother whose last normal menstrual period was unknown but claimed to be amenorrheic for the last 9 months and had antenatal care follow up, given tetanus vaccine (TT) (two-dose) but not supplemented folic acid and mode of delivery was vaginal and cried immediately after birth with unknown Appearance, Pulse, Grimace, Activity and Respiration score and empirical antibiotic therapy started for ceftriaxone, ampicillin, and ventriculoperitoneal (VP) shunt done. Based on the results of the antimicrobial sensitivity, the patient was started on the antibiotic therapy was changed to meropenem.

Conclusion: *Aeromonas hydrophila* was isolated from CSF samples of a 1-month-old female child.

Keywords: *Aeromonas Hydrophila*; Meningitis

Background

Members of the genus *Aeromonas* are gram-negative, catalase, and oxidase-positive facultative anaerobic bacilli with large zones of hemolysis around colonies on blood agar that ferment carbohydrates [1]. *Aeromonas hydrophila* is one species of the genus *Aeromonas* that received increasing attention as an opportunistic pathogen because of its association with human diseases associated with a wide range of illnesses in humans, including gastroenteritis, wound infections, septicemia, meningitis, peritonitis,

endocarditis, osteomyelitis, etc. in both immunocompromised and healthy host [2].

Generally, the family *Aeromonadaceae* is characteristically divided into three biochemically differentiated groups (*Aeromonas hydrophila*, *Aeromonas caviae*, and *Aeromonas sobria*), and these contain several genomospecies, and recently, new species have been added [3]. Currently, the genus comprises 17 DNA hybridization groups (HGs) or genomospecies and 14 phenospecies [4].

The majority of the serious infections caused by this organism occur in individuals with certain predisposing factors for *Aeromonas* infection including hepatic diseases, diabetes, hematologic malignancies, hepatobiliary, and renal diseases [5]. Meningitis caused by this organism is a rare clinical entity. *Aeromonas meningitis* may involve all age groups and can be either community or nosocomially acquired [6,7]. Factors that affect the virulence of *Aeromonas* include cytotoxins, endotoxins, hemolysins, enterotoxins, proteases, siderophores, and adherence factors, all of which may play a role in the pathogenesis of human disease [8].

The management of these infections is challenging because of the ability of *Aeromonas* to produce multiple beta-lactamases. Clinical studies have demonstrated differences in antimicrobial susceptibility among species, highlighting the importance of species identification and appropriate susceptibility testing.

Case Report

This was a 1- month- old female child with a history of fever, of not sucking the breast, and exhibiting symptoms of meningitis born from a 23 years old para-I-mother whose last normal menstrual period (LNMP) was unknown but claimed to be amenorrheic for the last 9 months and had antenatal care (ANC) follow up, given TT-vaccine (two-dose) but not supplemented folic acid and mode of delivery was vaginal and cried immediately after birth with unknown Appearance, Pulse, Grimace, Activity and Respiration score. The child was referred from Metema Primary Hospital at the age of 3 days for spinal bifida after presenting with a complaint of lower back bone defect limitation of movement of the lower extremity, decreased breastfeeding, and the size of the head. CSF was sent for culture, and empirical antibiotic therapy started for vancomycin, ceftazidime, and VP shunt. Subsequently after an operation, the infant develops new onset fever, decreased breastfeeding, abnormal breath sound, decreased mentation, and cessation of breath after 15 days of admission. The lower foot is internally rotated and the distal tibiae is also inverted. The CNS was Lethargic, Moro reflex-incomplete, Grasp reflex-weak, and the sensory nerve system was unresponsive lower extremities. Tone also the lower extremity hypotonic, upper extremity normal tonic, and power no spontaneous lower extremity movement even for pain. On examination, she was afebrile (temperature of 38.9 ° C) with a pulse rate of 68/min, blood pressure of 162/50 mm of Hg, and respiratory rate of 30/min. Eye examination showed pink conjunctivae, bulged fontanelle with sutural diastasis, cracked sign positive, and sunset eye appearance. CVS examination showed all peripheral arteries are pal-

pable, no central or peripheral cyanosis, no precordial bulging, no murmur or gallop, S1 and S2 are well heard. Abdominal ultrasound showed flat abdominal moves with respiration, no palpable organ, and pre-anal tone hypotonic with well-formed female external genitalia. INT showed no rash with the presence of a protruded mass on the lower lumbar area which measure 6x5 cm and leakage of CSF fluid and pussy discharge from surroundings skin.

Table 1: Clinical Characteristics of a Patient .

Characteristics	Patient	
Age	1 month	
Sex	Female	
Significant past medical history	Spinal bifida after presenting with a complaint of lower back bone defect, limitation of movement of the lower extremity, decreased breastfeeding, and the size of the head increasing	
Symptoms onset	History of fever, of not sucking the breast, and exhibiting symptoms of meningitis	
Respiratory distress	Developed 3 days after symptoms onset	
Central Nervous System (CNS)	Lethargic, Moro reflex-incomplete, grasp reflex-weak, sucking unstained, and muscle- back-symmetric	
Deep tendon reflex (DTR)	Right	1/4
	Left	1/4
Plantar reflex	Right	downward response
	Left	downward response
Sensory	Unresponsive lower extremity	
Tone	Lower extremity hypotonic, upper extremity normatonic	
Power	No spontaneous lower extremity movement even in pain	
Assessment	Term + appropriate for age+ Paraplesia 2 ° myelomeningocele + chiari crisis (chirari-II- malformation) +bilateral clubfoot + hospital acquired infection	

	Weight	4.2k.g
	Height	53 cm
	Head circumference	41 cm
	Weight / Length- between	1&0
	Length/age- between	1&2
	Head circumference/age	≥3 z score-macrocephaly
Blood pressure (mmHg), pulse rate (beats per minute), Respiratory rate (breaths per minute), and temperature (°C)	162, 68, 30 and 38.9	
Head, Ear, Eye, Nose and Throat (HEENT)	Pink conjunctivae bulged fontanelle with sutural diastasis, cracked sign-positive, and sunset eye appearance	
Lymphoglandular system (LGS)	No lymphadenopathy, Chest -subcostal and intercostal retraction, audible stridor, or inspiratory stridor on auscultation	
Cardiovascular Examination (CVS)	All peripheral arteries are palpable, with no central or peripheral cyanosis, no precordial bulging, no murmur or gallop, S1 & S2 are well-heard	
Abdomen	Flat abdominal moves with respiration, no palpable organ, pulse rate -anal tone -hypotonic	
Genital system	Well-formed female external genitalia	
Integumentary	No rash	
Musculoskeletal	There is protruded mass on the lower lumbar area which measures 6×5 cm and leakage of CSF fluid and pussy discharge from the surroundings skin	

Cerebrospinal fluid analysis

The cerebrospinal fluid (CSF) was turbid with 500 cells/ μ L (N-80%, L-20%). The Gram-stained smear of CSF showed Gram-negative rods, with a protein concentration of 115 mg/dl and a glucose concentration of 24 mg/dl.

Table 2: Cerebrospinal fluid analysis.

Cerebrospinal fluid analysis performed	Cerebrospinal fluid analysis Result	Normal Value
Appearance	Turbid	Clear and Colorless
Cell count	500 cells/ μ L	Acellular
Glucose	24 mg/dL	15-45mg/dl
Protein	115 mg/dL	50-80mg/dl
Neutrophils	80 %	2% \pm 5
Lymphocytes	20 %	62% \pm 34
Gram stain	Gram-negative bacilli were seen	No microorganism
Ziehl-Neelsen Stain	No AFB seen	No AFB seen
CSF culture	Growth after 48 h of incubation	No microorganism

Materials and Methods

A Centrifuged CSF specimen at 1500g for 15 minutes and leave 1 ml of the sediment inoculated on BAP, CAP, and MAP Place a drop on each plate; streak the plates in 4 quadrants for isolated colonies plates were incubated at 35-37°C in candle overnight. After overnight incubation identification of *A. hydrophila* by microscopic Properties: Gram stain was used to examine the isolated bacteria for studying the microscopic properties as initial identification of *A. hydrophila*. Cultural Characteristics: Morphological colony characteristics were recorded on the specific media for primary identification of *A. hydrophila*.

Biochemical Tests: Biochemical tests of the *A. hydrophila* 1-2 colony were tested for oxidase, catalase, Simmone Citrate, Kligler Iron agar, and Indole tests and these entire tests were positive [9]. API 20 E system strains identification of *A. hydrophila* using API 20E (Biomérieux, France). Identification of *A. hydrophila* by API 20 E System used to confirm the identification of *A. hydrophila* includ-

ed in this study. The results demonstrate that clinical isolate was positive in identification by API20E, as shown in ONPG=negative, ADH=Positive, LDC= negative, ODC= negative, CIT= Positive, H2S= Positive, URE= negative, TDA= negative, IND= Positive, VP= Positive, GEL= Positive, GLU= Positive, MAN= Positive, INO= negative, SOR= negative, RHA= negative, SAC= Positive, MEL= negative, AMY= Positive/negative, ARA= Positive, OX= Positive. Using the analytical profile index of this system the identification percentage is (id% = 99.2%).

Antimicrobial Susceptibility Test

After bacterial species identification, suspension was done in a sterile test tube by sterile physiological saline; its turbidity was compared to 0.5% McFarland standards. We dipped a cotton swab into the suspension, picked and pressed it against the wall of the tube to remove excess of the suspension, and inoculated on Mueller-Hinton agar (MHA) (Oxoid, UK), then the antibiotic discs were added and left for 15 minutes until discs adhere firmly onto the media, and finally incubated for 18 hours at 37°C. The Kirby-Bauer disk diffusion methods were used to determine the antimicrobial susceptibility test (AST). The following antibiotics were tested in the present study: (ampicillin (AMP) (10 µg), gentamicin (GEN) (10 µg), Cefotaxime (CTX) (30 µg), Chloramphenicol (30 µg), amikacin (AMK) (30 µg), Ciprofloxacin (CIP) (5 µg) and Meropenem (MER) (10 µg), all are from (Oxoid, UK)) to determine AST profile of isolates. The AST results were reported as susceptible, intermediate, or resistant as per the clinical laboratory standards institute guideline [10].

Quality Control

The culture media, strips, and reagents are systematically quality controlled for sterility by overnight incubation of 5% of the newly prepared media and checking for its performance was checked by inoculating a known strain of *E. coli* American Type culture collection (ATCC 25922), *Proteus mirabilis* (ATCC 35659), and *Klebsiella pneumoniae* (ATCC 35657) (ATCC 19606). The CLSI guideline was used to select antibiotic discs and interpretation of AST results [10].

The antimicrobial sensitivity pattern showed that the organism was sensitive to only meropenam and resistant to ampicillin, gentamycin, cefotaxime, chloramphenicol, amikacin, and ciprofloxacin. Based on the results of the antimicrobial sensitivity, the patient was started on antibiotic therapy and was changed to meropenem.

Table 3: Antimicrobial Susceptibility Testing.

Antimicrobial	Measured zone size	Interpretation S I R
Ampicillin	6	R
Gentamicin	6	R
Cefotaxime	6	R
Chloramphenicol	6	R
Amikacin	6	R
Ciprofloxacin	6	R
Meropenem	24	S

Key: S = susceptible, I= Intermediate, R = resistance.

Discussion

Aeromonas species are oxidase-positive motile Gram-negative bacilli which are widely distributed in nature and are found in soil and most natural water systems as well as in domestic sinks, swimming pools, and chlorinated hospital water in warm weather. Human infections such as acute gastroenteritis, sepsis, endocarditis, myonecrosis, and osteomyelitis by *Aeromonas* species have been reported in adults as well as in children [10].

Meningitis can affect all age groups, it can be community- or hospital-acquired, and most patients have conditions predisposing to infection. In the first review of meningitis cases conducted by K S, *et al.* [11] most corresponded to community-acquired cases with bacteremia; newborn infants or children with a history of hematological disease were the most affected groups

However, its association with meningitis in children is rare. Few cases have been described in pediatrics. Kali, *et al.* [12] described 7 cases. One case was *A. hydrophila* meningitis and sepsis which developed as a complication of a craniotomy in a healthy male with a subdural hematoma [13]. The second case was that of a 23-month-old boy with sickle cell anemia who developed fever, diarrhea, and seizures and died within a few hours of onset. *A. hydrophila* was grown from postmortem blood and cerebrospinal fluid cultures [14]. The third was in a neonate born after a pregnancy complicated by fever and premature rupture of membranes.

The child was initially started on ampicillin and ceftriaxone. However, CSF cultures showed growth of *A. hydrophila*, which was resistant to ampicillin and ceftriaxone, so the antibiotics were discontinued and the antibiotic therapy was changed to meropenem.

Conclusion

It is evident from the present case and published reports that aeromonas species is an unusual pathogen in humans, and it can cause life-threatening infections such as meningitis and sepsis in children. Although it may not always have a discernible source of infection, its isolation from the hospital environment is of great health concern. The isolated organism was susceptible to only meropenam and resistant to ampicillin, gentamycin, cefotaxime, chloramphenicol, amikacin, and ciprofloxacin. Based on the results of the antimicrobial sensitivity, the patient was started on the antibiotic therapy was changed to meropenem.

Abbreviation

ANC: Antenatal Care
 API 20E: Analytical Profile Index of Enterobacteriaceae
 APGAR: Appearance, Pulse, Grimace, Activity and Respiration
 CSF: Cerebrospinal Fluid
 CNS: Central Nervous System
 CVS: Cardiovascular system
 DTR: Deep tendon reflex
 HEENT: Head, Ear, Eye, Nose and Throat
 INT: Integumentary
 LNMP: Last Normal Menstrual Period
 LGS: Lymph glandular system
 TT: Tetanus Vaccine
 VP: VentriculoPeritoneal

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Conflicts of Interest

There are no conflicts of interest.

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