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A Case Report on *Aeromonas veronii* Meningitis: Isolation from CSF in a Hospitalized Immunocompromised Girl, Duhok City, Iraq

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Abstract: *Aeromonas veronii* causes Aeromonas meningitis, a rare and fatal condition among immunocompromised adult patients. *Aeromonas veronii* is a gram-negative, facultative anaerobic, non-spore-forming bacillus bacteria under the family Aeromonadaceae, and it has several characteristics with the Enterobacteriaceae family. Both freshwater and marine habitats have large populations of this bacterium. Although they have been separated more frequently during warmer months, Aeromonas species may grow in various temperatures. Warm-blooded and cold-blooded animals, such as fish, amphibians, reptiles, mammals, and humans, are susceptible to a variety of illness syndromes caused by Aeromonas species. The Department of Microbiology at Shyrian Private Hospital in Duhok City received a cerebrospinal fluid specimen from a hospitalized immunosuppressed 23-year-old girl with meningitis. *Aeromonas veronii* was isolated from culturing of cerebrospinal fluid samples on the MacConkey agar, blood agar, and chocolate agar. Then the isolate was identified by using VITEK System 2. The antibiotic susceptibility test used the classical disc diffusion method and the VITEK System 2. It showed that this bacterium was susceptible to these antibiotics: azithromycin, azatreonam, ceftriaxone, cefotaxime, ciprofloxacin, gentamycin, levofloxacin, and trimethoprim/sulfamethoxazole and resistant to ampicillin, ampicillin+ clavulanic acid, colistin, and meropenem. This case report is the first reported case of the isolation of *Aeromonas veronii* from CSF in Iraq and Duhok City. It also found that this bacterium can cause fatal infections such as meningitis rather than gastrointestinal infections in adult immunocompromised hospitalized patients. An antibiotic susceptibility test found this bacterium to be sensitive and resistant to multiple antibiotics, which means that the treatment of meningitis needs the antibiotic sensitivity test.

Keywords: *Aeromonas veronii*, CSF, Meningitis, Antibiotic, Case report.

INTRODUCTION

Aeromonas veronii (A. vermonii) is a rod-shaped anaerobic facultative gram-negative bacillus, non-spore-forming bacteria in aquatic environments that can cause necrotizing fasciitis, biliary tract infections, gastroenteritis, urinary tract infections, and endogenous endophthalmitis (Mencacci, A. *et al*., 2003; Spadaro, S. *et al*., 2014; Hickman-Brenner, F. W. *et al*., 1987). *Aeromonas veronii* belongs to the genus Aeromonads and has been isolated from humans in sputum, wounds, and feces (Yu, J. H. *et al*., 2010). Members of the *Aeromonas* are under the phylum: *Proteobacteria*, class: *Gammaproteobacteria*, order: *Aeromonadales*, and family: *Aeromonadaceae*. They share several characteristics with the Enterobacteriaceae family (Bhowmick, U. D. *et al*., 2018).

The most frequent location for Aeromonas spp. infection is the intestine (Janda, J. M. *et al*., 2010). Aeromonas also causes various extraintestinal infections that are linked to conditions including peritonitis, biliary tract infections, urinary tract infections, empyema, and skin and soft tissue infections (Chao, C. M. *et al*., 2012; Chao, C. M. *et al*., 2013; Ismael, S. *et al*., 2024). Additionally, Aeromonas species are responsible for bacteremia, sepsis, endocarditis, myonecrosis, and osteomyelitis (Kimura, M. *et al*., 2013). Furthermore, especially in individuals with weakened immune systems, Aeromonas species must be regarded as one of the bacteria responsible for healthcare-associated bacteremia (Ismael, S. *et al*., 2024; Kimura, M. *et al*., 2013; Mohamed, W. F. *et al*., 2022). Aeromonas' pathogenicity is caused by a variety of interrelated mechanisms. There are numerous established virulence factors, such as protease, toxins, iron ion acquisition systems, outer membrane proteins, and others (Hossain, S. *et al*., 2018; Sun, J. *et al*., 2016; Soodmand, J. *et al*., 2018). This case report was reported by *A. veronii* for the first time in a cerebrospinal fluid (CSF) sample from girls in Duhok City, Iraq.

CASE REPORT PRESENTATION

The present report case showed a rare case of Aeromonas meningitis, caused by *Aeromonas veronii* among a hospitalized immunocompromised 23-year-old girl. The girl presented with a high fever, a mental disorder, and signs of meningitis. There was an increase in the level of both white blood cells and protein during the examination of cerebrospinal fluid, and there was no response for treatment.

The Department of Microbiology at Shyrian Private Hospital in Duhok City received a CSF sample from a hospitalized immunosuppressed female patient. A sample was for a girl 23 years

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old with meningitis. CSF was cultured on the blood agar, chocolate agar, and MacConkey agar, and then incubated overnight at 37º C as shown in Fig. 1. After that, a slide was prepared from the colonies and stained with gram stain that revealed the growth of *A. veronii*. Then the isolate was identified by VITEK System 2.

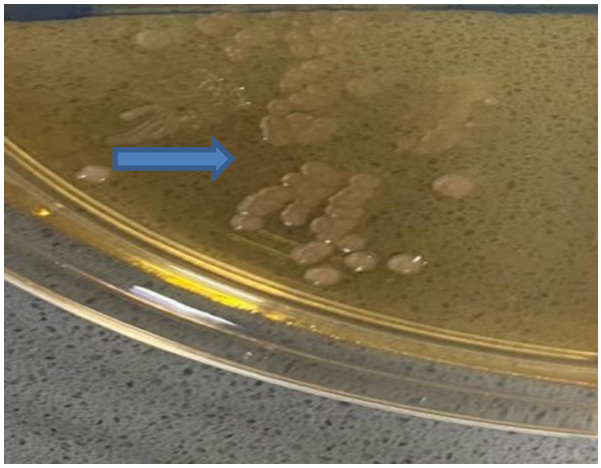

Figure 1: Colonies of *A. vermonii* on MacConkey agar

The antibiotic susceptibility test was done by both the classical disc diffusion method and by using the VITEK system and showed that the *A. veronii* was sensitive to the following antibiotics: Amikacin, Azithromycin, Aztreonam, Ceftriaxone, Cefotaxime, Ciprofloxacin, Gentamycin, Levofloxacin, and Trimethoprim/sulfamethoxazole and resistant to Amoxicillin+ Clavulanic Acid, Ampicillin, Colistin, and Meropenem as seen in Table 1.

Table 1: *Aeromonas veronii* antibiotic susceptibility interpretation*:*

No.	Antibiotics	Interpretation
	Amikacin	S
	Azithromycin	S
	Aztreonam	S
	Ceftriaxone	S
	Cefotaxime	S
	Ciprofloxacin	S
	Gentamycin	S
	Levofloxacin	S
	Trimethoprim/sulfamethoxazole	S
	Ampicillin	R
	Amoxicillin+ Clavulanic acid	R
	Colistin	R
	Meropenem	R
S: Sensitive R: Resistant		

DISCUSSION

Human opportunistic *A. veronii* infections primarily affect those with weakened immune systems. From mild gastroenteritis to more serious cases that need medical attention, it describes the different kinds of illnesses that might happen (Vera, H. P. *et al*., 2023). Aeromonas meningitis is a rare case and mainly observed in adult patients with cirrhosis, alcoholic hepatitis, head trauma, or those who have had surgery such as a splenectomy, craniotomy, hemorrhoid ligation, or medicinal leech therapy (Ellison, R. T. *et al*., 1984; Lin, C. S. *et al*., 1998; Parras, F. *et al*., 1993).

This report isolated *A. veronii* from CSF after culturing on the MacConkey agar, blood agar, and chocolate agar, which means that this bacterium is the cause of meningitis. Clinically, Aeromonas meningitis manifests as bacterial meningitis that might or might not be followed by gastroenteritis. This report follows the line of Parras, *et al.* (1993), who reported that *A. veronii* is a cause of meningitis in men 54 years old.

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The VITEK system 2 interpretation revealed that this bacterium was found susceptible to several antibiotics such as ampicillin, azithromycin, azatreonam, ceftriaxone, cefotaxime, ciprofloxacin, gentamycin, levofloxacin, and trimethoprim/sulfamethoxazole and that it was found resistant to ampicillin+ clavulanic acid, colistin, and meropenem. These results align with the results of a study done by Janda and Abbott, and within the line of a study findings by (Abdullah, B. H. *et al*., 2024). This report disagrees with Parras, *et al*., (1993), who reported that patients with Aeromonas meningitis were sensitive to the third generation of cephalosporins, and Kali *et al.*, (2016), who recorded that penicillin and first-generation cephalosporins were found to be resistant to Aeromonas meningitis.

CONCLUSION

This is the first reported case of the isolation of *Aeromonas veronii* from CSF and is concluded to be the pathogen responsible for fatal infections such as meningitis in adult hospitalized patients rather than gastrointestinal infections. An antibiotic susceptibility test found this bacterium to be sensitive and resistant to multiple antibiotics, which means that the treatment of meningitis needs the antibiotic sensitivity test**.**

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CONTRIBUTION STUDY CONCEPT AND DESIGN

Assistant Professor Dr. Bland Husamuldeen Abdullah and Assistant Professor Dr. Shameeran Salman Ismael.

ANALYSIS AND INTERPRETATION OF DATA

Assistant Professor Dr. Shameeran Salman Ismael.

ETHICS

The study proposal was approved by the ethics and scientific committee of the College of Health Sciences, University of Duhok, Duhok, Iraq with reference No.20241023.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding.

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