

Case Report

# Acute exacerbation of chronic suppurative otitis media by *Vibrio cholerae* O39 – A case report

Tessa Antony<sup>1</sup>, Yamini Anandan<sup>1</sup>, Lakshmanan Somu<sup>2</sup>, Uma Sekar<sup>1</sup>

Departments of <sup>1</sup>Microbiology, <sup>2</sup>Otorhinolaryngology, Sri Ramachandra Medical College and Research Institute, Chennai, Tamil Nadu, India.

## ABSTRACT

*Vibrio cholerae* is gram-negative bacilli belonging to the Vibrionaceae family generally found in brackish and marine water. Based on the O antigen on the cell wall of the bacteria, they are divided into three major subgroups – *V. cholerae* O1, *V. cholerae* O139, and *V. cholerae* non-O1/non-O139. The serogroups O1 and O139 harboring cholera toxin gene cause diarrhea, while the non-O1/non-O139 can cause a milder diarrhea and extraintestinal infections. We report a case of acute exacerbation of chronic suppurative otitis media by *V. cholerae* O39, which is classified in the non-O1/non-O139 group. The patient presented with slowly progressive painful ear discharge which evolved over a period of 3 months. *V. cholerae* O39 was isolated from the ear discharge by culture and confirmed by serologic and molecular testing. The patient improved symptomatically with 1 week of treatment with intravenous ciprofloxacin and tobramycin ear drops.

**Keywords:** *Vibrio cholerae*, Otitis media, Ear discharge

## INTRODUCTION

Infections of the ear can be broadly divided into those affecting the external ear (otitis externa) and those affecting the middle ear (otitis media). Otitis media can be acute or chronic. Chronic suppurative otitis media is inflammation of the middle ear and mastoid cavity with recurrent ear discharges. The organisms isolated from chronic otitis media include aerobic bacteria – *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus* spp., and *Klebsiella pneumoniae* which are common followed by rarer anaerobic bacteria – *Bacteroides* spp., *Clostridium* spp., *Peptostreptococcus* spp., and *Prevotella melaninogenica*.<sup>[1]</sup> *Vibrio cholerae* -non-O1/non-O139 can cause a wide range of extraintestinal manifestations such as wound infections, ear infections, meningitis, septicemia, peritonitis, biliary, and urinary tract infections.<sup>[2]</sup> This case is reported to increase awareness among clinicians and microbiologists regarding the possibility of *V. cholerae* being an etiological agent for otitis media and the importance of adequate antibiotic therapy based on antimicrobial susceptibility.

## CASE REPORT

An adult male patient in his mid-thirties presented to the otorhinolaryngology department with complaints of discharge from the right ear for 3 months which was

insidious in onset and progressive in nature. The discharge was mucopurulent, foul smelling, and not blood stained. It was associated with ear pain. He had found the ear discharge to be aggravated in the preceding 1 month following bath in the sea near Tiruchendur. Tiruchendur is located at the Coromandel Coast off the Bay of Bengal, in the state of Tamil Nadu (India). The patient did not have accompanying fever, giddiness, or tinnitus. His history was unremarkable except for recurrent bilateral otitis media since childhood. Tympanoplasty was performed on the left ear 7 years ago with complete resolution of symptoms in that ear. Ear swab was taken from the right ear of the patient and sent for culture. Gram stain from the specimen revealed few pus cells and plenty of short slender gram-negative bacilli. Culture was performed on sheep blood agar, chocolate, and MacConkey agar. On sheep blood agar, gray-colored colonies with a wide zone of hemodigestion were observed which became dry and wrinkled after 48 h of incubation at 37°C [Figure 1]. Pale non-lactose-fermenting colonies were observed on MacConkey agar. Darting type of motility was observed by hanging drop method. Subsequently, culture was performed on thiosulfate-citrate-bile salts-sucrose (TCBS) agar which produced moist yellow sucrose-fermenting colonies on overnight incubation [Figure 2]. With conventional biochemical testing, the isolate was identified as *V. cholerae* [Table 1]. String test was done with

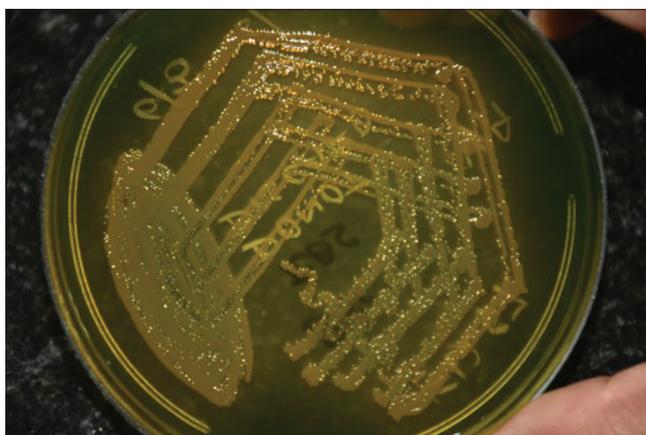
\*Corresponding author: Tessa Antony, Department of Microbiology, Sri Ramachandra Medical College and Research Institute, Chennai, Tamil Nadu, India. drtessa@sriramachandra.edu.in

Received: 19 May 2022 Accepted: 28 June 2022 Published: 15 July 2022 DOI 10.25259/SRJHS\_12\_2022

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, transform, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms. ©2022 Published by Scientific Scholar on behalf of Sri Ramachandra Journal of Health Sciences



**Figure 1:** Wrinkled colonies of *Vibrio cholerae* O39 on blood agar with a wide zone of hemodigestion after 48 h of incubation at 37°C.



**Figure 2:** Yellow colonies of *Vibrio cholerae* O 39 on TCBS agar after 24 h of incubation at 37°C.

0.5% sodium deoxycholate which was found to be positive. Slide agglutination test was performed for serogrouping with antisera, since the strain was auto agglutinating, the results could not be obtained.

The colonies on MacConkey agar were subjected in a commercial automated identification system – MicroScan WalkAway 96 Plus (Beckman Coulter, United States of America). The organism was identified as *V. cholerae* with 99.9% probability. It was found to be susceptible to ampicillin, cephalosporins, aminoglycosides, fluoroquinolones, chloramphenicol, tetracycline, and trimethoprim-sulfamethoxazole by Kirby–Bauer disk diffusion method on cation adjusted Mueller-Hinton agar. Clinical and Laboratory Standards Institute guidelines (M45, 2018) were used as reference for interpretation of zone size. Further confirmation and serogrouping were done in the National Institute of Cholera and Enteric Diseases (India). OmpW (outer membrane protein W)-based PCR confirmed the isolate to be *V. cholerae* and another PCR confirmed that the strain did not harbor the *ctxA* (cholera toxin) gene. Further

**Table 1:** Identification *Vibrio cholerae* O39.

Laboratory tests		Identification
Oxidase	Positive	Belongs to Vibrionaceae family
Catalase		
Indole	Positive	
Triple sugar iron	Acid slant/acid butt and no gas production	
Mannitol motility medium	Fermented and motile	
Hanging drop	Darting motility	
String test (0.5% sodium deoxycholate) positive		<i>V.cholerae</i>
Microscan walkaway 96 plus		<i>V.cholerae</i>
OmpW (outer membrane protein W) based PCR		<i>V.cholerae</i>
Serological analysis		<i>V.cholerae</i> O39

battery of serological testing revealed the strain to belong to *V. cholerae* O39. The patient was treated for 1 week with intravenous ciprofloxacin 200 g twice a day and tobramycin ear drops. He improved symptomatically with reduction in ear discharge and pain. A repeat ear swab culture done 2 weeks later did not grow any bacteria.

## DISCUSSION

*V. cholerae* is known to produce cholera toxin and toxin-coregulated pilus which are important in causing diarrhea. The other virulence factors which favor colonization and evasion of host defense mechanisms include hemagglutinin, outer membrane proteins, proteases, and type III secretion system.<sup>[3]</sup> Vibrios produce multiple colony morphologies on non-selective media like blood agar. Some rare *V. cholerae* isolates produce extremely wrinkled colonies on non-carbohydrate-containing media, which are due to the production of a unique extracellular polysaccharide that confers the property of biofilm formation.<sup>[4]</sup> This wrinkled morphology was exhibited by the strain isolated from the patient which would have helped in colonization following exposure.

Diarrhea caused by *V. cholerae* is treated with antibiotics only if the patient is severely ill, has comorbidities, in pregnant women, and those who are severely dehydrated. The antibiotic of choice is doxycycline followed by tetracycline, trimethoprim-sulfamethoxazole, and ciprofloxacin. The extraintestinal infections caused by *V. cholerae* are treated with antibiotics and are usually found to be susceptible to beta-lactams, fluoroquinolones, tetracycline, trimethoprim-sulfamethoxazole, aminoglycosides, and chloramphenicol according to the previous literature.<sup>[4]</sup> *V. cholerae* infection of the ear presents as otitis externa or otitis media. A review of the published case reports showed that otitis media by *V. cholerae* usually follow damage to the ear drum either due to trauma or following recurrent middle ear infection. *V. cholerae* non-O1/O139 isolates from patients with ear

infection were found to be uniformly susceptible to ampicillin, cephalosporin, cotrimoxazole, and fluoroquinolones.<sup>[5]</sup> The patients were treated with ciprofloxacin ear drops and intravenous third-generation cephalosporins in severe infections and recovered uneventfully following antibiotic therapy.<sup>[1,6]</sup>

Most of the reports of otitis media by *V. cholerae* non-O1/non-O139 in temperate regions were reported in summer months following exposure to swimming pool, lake, or seawater. The patient had exposure to seawater in December so such variation is not observed in the tropics where it is warm throughout the year. *V. cholerae* can be identified in the microbiology laboratory by conventional culture and biochemicals. The commercial automated identification systems such as API 20E, Crystal E/NF, MicroScan Neg ID 2, Rapid Neg ID 3, and Vitek can correctly identify only 63%–81% of these organisms to the species level.<sup>[7]</sup> Therefore, it is important to use conventional biochemical methods for identification to support the automated identification systems. Molecular techniques like polymerase chain reaction (PCR) targeting outer membrane protein W (Omp W) are very useful in rapid identification of *V. cholerae* isolates.<sup>[8]</sup> Majority of cases of otitis media or otitis externa caused by *V. cholerae* non-O1/O139 has been reported from European countries and the United States of America.<sup>[1,6]</sup> This is the first report of otitis media caused by *V. cholerae* O39 from India.

## CONCLUSION

*V. cholerae* can be a cause of chronic recurrent otitis media and can remain undiagnosed unless the ear discharge is sampled, sent for culture and appropriate treatment initiated.

- *V. cholerae* can be a cause of otitis media persons who have a breach in the ear drum due to past ear infections and exposed to contaminated seawater.
- *V. cholerae* infections can occur throughout the year in tropics as opposed to the warmer months in temperate region.

## Acknowledgment

We would like to thank Dr. Asish Kumar Mukhopadhyay (Scientist F) and his team at National Institute of Cholera

and Enteric Diseases, Kolkata, for performing the serological and molecular work to identify the isolate as *V. cholerae* O39.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Van Bonn SM, Schraven SP, Schuldt T, Heimesaat MM, Mlynski R, Warnke PC. Chronic otitis media following infection by non-O1/non-O139 *Vibrio cholerae*: A case report and review of the literature. *Eur J Microbiol Immunol (Bp)* 2020;10:186-91.
2. Chowdhury G, Joshi S, Bhattacharya S, Sekar U, Birajdar B, Bhattacharyya A, et al. Extraintestinal infections caused by non-toxicogenic *Vibrio cholerae* non-O1/non-O139. *Front Microbiol* 2016;7:144.
3. Rajpara N, Vinothkumar K, Mohanty P, Singh AK, Singh R, Sinha R, et al. Synergistic effect of various virulence factors leading to high toxicity of environmental *V. cholerae* non-O1/non-O139 isolates lacking ctx gene: Comparative study with clinical strains. *PLoS One* 2013;8:e76200.
4. Abbot SL, Janda JM, Farmer JJ 3<sup>rd</sup>. *Vibrio* and related organisms. In: Carroll KC, Jorgensen JH, Landry ML, Funke G, Warnock DW, editors. *Manual of Clinical Microbiology*. 10<sup>th</sup> ed. Washington, DC: ASM Press; 2011. p. 666-76.
5. Huhulescu S, Indra A, Feierl G, Stoeger A, Ruppitsch W, Sarkar B, et al. Occurrence of *Vibrio cholerae* serogroups other than O1 and O139 in Austria. *Wien Klin Wochenschr* 2007;119:235-41.
6. Kechker P, Senderovich Y, Dror SK, Shitrit SL, Arakawa E, Halpern M. Otitis media caused by *V. cholerae* O100: A case report and review of the literature. *Front Microbiol* 2017;8:1619.
7. O'Hara CM, Sowers EG, Bopp CA, Duda SB, Strockbine NA. Accuracy of six commercially available systems for identification of members of the family vibrionaceae. *J Clin Microbiol* 2003;41:5654-9.
8. Nandi B, Nandy RK, Mukhopadhyay S, Nair GB, Shimada T, Ghose AC. Rapid method for species-specific identification of *Vibrio cholerae* using primers targeted to the gene of outer membrane protein OmpW. *J Clin Microbiol* 2000;38:4145-51.

**How to cite this article:** Antony T, Anandan Y, Somu L, Sekar U. Acute exacerbation of chronic suppurative otitis media by *Vibrio cholerae* O39 – A case report. *Sri Ramachandra J Health Sci* 2022;2:40-2.