CASE SERIES

Enterococcus avium: A Rare Opportunistic and Multi-drug Resistant Pathogen in Healthcare Setting

Peetam Singh , Anita Pandey, Gaurav Saini

Abstract

The enterococci are Gram positive and catalase negative bacteria usually inhabiting the gastrointestinal tract of animals and humans. The common species of the genus *Enterococcus* associated with clinical conditions are *Enterococcus faecium* and *Enterococcus faecalis.* The other species of the genus *Enterococcus* are rarely isolated from clinical specimens and rarely considered as pathogens. *Enterococcus avium* has rarely been reported causing opportunistic infections in immunocompromised individuals or persons having comorbidities and the pathogenic potential of *Enterococcus avium* is still debatable. We reported a series of four clinical cases due to infection with *Enterococcus avium*. Among these cases we reported one case of blood stream infection IN one case of catheter associated urinary tract infection and two cases of peritonitis. These reported cases were associated with immunocompromised states or comorbidities. *Enterococcus avium* was identified by VITEK-2 Compact automated system. All of these isolates were susceptible against high end antibiotics glycopeptides and linezolid.

Key Words

Enterococcus avium, Healthcare Associated Infections, MDR Enterococci, Opportunistic Enterococcal Infections, Rare *Enterococcus* Species

Introduction

The *Enterococcus* species are Gram positive, catalase negative and non-spore forming bacteria usually inhabiting the gastrointestinal tract of animals and humans. The common species of the genus associated with clinical conditions are *Enterococcus faecium* and *Enterococcus faecalis*.[1-3] Other species of the genus *Enterococcus* are frequently known as "non-*faecalis* non-*faecium* enterococci" or "other enterococci". The other clinically significant species of *Enterococcus* consist of *Enterococcus casseliflavus, Enterococcus gallinarum*, *Enterococcus durans*, *Enterococcus raffinosus*, *Enterococcus avium* and *Enterococcus mundtii*.[4] The enterococci are not frequently reported as a human pathogen and most of them are associated with the immunocompromised states or comorbidities. *Enterococcus avium* was formerly known as "group Q Streptococcus" and mostly found in birds. The infections caused by *Enterococcus avium* are rare due to low pathogenic potential and generally cause diseases in immunocompromised individuals.[5] The association of *Enterococcus avium* with clinical conditions among humans is rarely reported in few case reports only including brain abscess, bacteremia, endocarditis, osteomyelitis, urinary tract infection (UTI), colitis, skin

Department of Microbiology, Subharti Medical College, NH-58, Meerut. Utar Pradesh

Correspondence to: Dr. Peetam Singh, Department of Microbiology, Subharti Medical College, NH-58, Meerut-250005, Utar Pradesh, India.

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and soft tissue infections.[3,5-10] *Enterococcus avium* is mostly found in birds and rarely a cause of infection in humans.[3] We reported four clinical cases associated with the infection of *Enterococcus avium* in this case series from a tertiary care hospital from Uttar Pradesh, India.

Case-1: A 69 years old female patient presented with vomiting, abdominal distention, pain over abdomen and inability to pass stools. On examination generalized tenderness over abdomen and absent bowel sounds were observed. The case was diagnosed as perforation peritonitis with type 2 diabetes mellitus (DM). The peritoneal pus sample collected during laparotomy was subjected to bacterial culture and antimicrobial susceptibility testing (AST).

Table-1: AST Results of all of the four Enterococcus avium isolates

Antibiotics	AST Result (MIC in µg/mL)			
	Case-1	Case-2	Case-3	Case-4
Benzylpenicillin	R (≥ 32)	R (16)	R (≥ 64)	R (16)
High Level Gentamicin	R (N-SYN)	R (N-SYN)	R (N-SYN)	R (N-SYN)
Ciprofloxacin	R (4)	R (4)	R (≥ 8)	R (4)
Levofloxacin	R (≥ 8)	R (≥ 8)	R (≥ 8)	R (≥ 8)
Erythromycin	R (≥ 8)	R (≥ 8)	R (≥ 8)	I (4)
Linezolid	S (2)	S (2)	S (2)	S (2)
Teicoplanin	S (≤ 0.5)	S (≤ 0.5)	S (1)	S (≤ 0.5)
Vancomycin	S (≤ 0.5)	S (≤ 0.5)	S (≤ 0.5)	S (≤ 0.5)
Tetracycline	R (≥ 16)	R (≥ 16)	R (≥ 16)	R (≥ 16)
Nitrofurantoin*	NA	NA	I (64)	NA

S-Susceptible, I-Intermediate susceptible, R-Resistant, N-SYN-Non-Synergistic, NA-Not Applicable, *For urine isolates only

Table-2: Summary of all of the Four Cases

Characteristics	Case 1	Case 2	Case 3	Case 4
Underlying conditions/ Comorbidities	Chronic Type-2 DM, Surgical procedure, Presence of CVC	Surgical procedure, Presence of CVC	Steroid therapy, Indwelling Foley's catheter	Bronchial asthma, Type-2 DM, Steroid therapy, Presence of CVC
Clinical Diagnosis	Perforation peritonitis	Perforation peritonitis	Nephrotic Syndrome with CAUTI	Head injury with blood stream infections with bronchial asthma with type-2 DM
Targeted antimicrobial therapy	Vancomycin	Vancomycin	Vancomycin	Vancomycin
Follow-up and outcome	Recovered and discharged after 14 days	Recovered and discharged after 15 days	Recovered and discharged after 21 days	Recovered and discharged after 20 days

DM-Diabetes mellitus, CVC-Central venous catheter, CAUTI-Catheter associated urinary tract infection

Case-2: A six years old male child was admitted with recurrent vomiting, abdominal pain and fever. On examination generalized abdominal tenderness and absent bowel sounds were observed. The case was diagnosed as perforation peritonitis. The child undergone laparotomy for intestinal perforation. The child was under postoperative care when he developed fever and abdominal pain while the drain fluid turned out to be purulent. On examination, raised temperature and generalized tenderness over abdomen were observed. The intraoperative and postoperative peritoneal fluid samples were subjected to bacterial culture and AST.

Case-3: A seven years old male child presented with generalized swelling all over the body. The case was diagnosed as nephrotic syndrome. He was being managed for nephrotic syndrome with steroids, diuretics and other medications. The Foley's catheterization was done as a routine procedure in pediatric ward. After three days of catheterization he developed lower abdominal pain and fever. The catheter was removed and mid-stream urine sample was subjected to bacterial culture and AST.

Case-4: A 62 years old male patient, a known case of type-2 DM and bronchial asthma on treatment presented with the history of fall from height followed by loss of consciousness and vomiting. He was diagnosed as a case of head injury and kept on conservative management along with ventilator support. On fifth day of admission he developed high grade fever. Along with the routine investigations, blood culture was done by BacT/ Alert 3D (bioMerieux, France) followed by AST.

In all the four cases the bacteria grown on culture media were presumptively identified as catalase negative

Gram positive cocci (GPC) on the basis of colony characteristics on culture media and Gram stain findings. The colony characteristics on cysteine lactose electrolyte deficient (CLED) agar and blood agar along with the microscopic findings of Gram stained smear are shown in figure-1-A, 1-B and 1-C respectively.

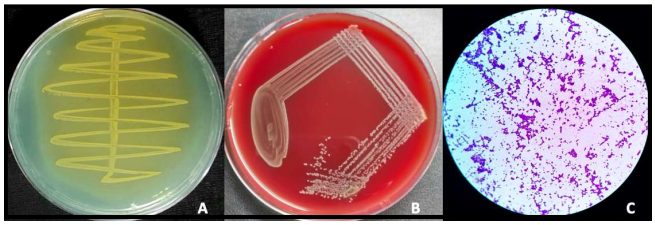

Figure-1-A: Colony characteristics of *Enterococcus avium* on cysteine lactose electrolyte deficient agar; 1-B: Colony characteristics of *Enterococcus avium* on blood agar; 1-C: Microscopic findings of Gram stained smear of *Enterococcus avium*

After preliminary identification, the species level identification and AST was performed by Vitek 2 compact automated system (bioMerieux, France) using Vitek 2 GP test card and Vitek 2 AST P628 card for identification and AST respectively. *Enterococcus avium* was identified by Vitek 2 in all of the four cases. The AST results along with MIC (minimum inhibitory concentration) of all of the four *Enterococcus avium* isolates and summary of all cases is shown in table-1 and table-2 respectively.

Discussion

The enterococci are usually considered as commensals of urogenital and gastrointestinal tracts. Apart from *Enterococcus faecium* and *Enterococcus faecalis* responsible for majority of the clinical infections, *Enterococcus avium* is rarely reported in literature highlighting its association with various clinical conditions in humans.[3,11] *Enterococcus avium* is reported causing various infections in healthcare facilities especially among immunocompromised individuals or having comorbidities. The most of the case reports reported endocarditis, peritonitis, osteomyelitis, cholecystitis, brain abscess, skin and soft tissue infections and urinary tract infections[3,5-11]. One of the important risk factors is contact with birds as *Enterococcus avium* is commonly found in birds.[3] None of the case in our case series was having the history of contact with birds. In this case series, all of the cases were having multiple comorbidities/ immunocompromised states including type-2 DM, surgical procedures, presence of CVC (central venous catheter), indwelling Foley's catheter and steroid therapy highlighting the opportunistic nature of *Enterococcus avium*.

On reviewing the AST results, all the isolates were multi-drug resistant (MDR) showing susceptibility against high-end second line antimicrobials such as linezolid and glycopeptides only. The MDR nature of *Enterococcus avium* results in empirical antimicrobial treatment failure, ultimately leading to higher cost of treatment, prolonged hospital stay, higher morbidity and mortality. A varying degree of resistance patterns were reported in other studies. Our findings on AST pattern are similar to the findings of a recent case report by Jangla in 2023 who reported the susceptibility against linezolid and glycopeptides.[11] The susceptibility of *Enterococcus avium* against linezolid and glycopeptides was also reported among all isolates in brief review by Toc *et al* in 2022.[12] These recent studies highlight the predominance of linezolid and glycopeptide resistant strains of *Enterococcus avium.* The cases previously reported by Shin *et al* in 2017 and Park *et al* in 2013 have reported the susceptibility of *Enterococcus avium* against all of the antimicrobials including first line antimicrobials.[7,8] The resistance against vancomycin was reported in a case report by Ko *et al*.[13] The AST patterns vary from hospital to hospital due to the differences in the bacterial strains circulating among healthcare facilities. Current trends of antimicrobial resistance among various species of *Enterococcus* reveal that *Enterococcus avium* is resistant against most of the antimicrobials and sensitive only against linezolid and glycopeptides (vancomycin and teicoplanin) which are considered as reserve and last resort of drugs. This is an alarming situation necessitating the need of preventive measures to prevent the emergence of drug resistance and spread of resistant strains. We did not perform molecular testing for confirmation of species level identification and detection of resistance genes due to limited resources.

Conclusion

Enterococcus avium is an important multi-drug resistant and rare opportunistic pathogen causing infections especially among immunocompromised individuals having various comorbidities admitted to healthcare facilities. The species level identification and AST of all *Enterococcus* isolates isolated from clinical specimens is important for timely institution of targeted therapy to reduce the morbidity and mortality due to MDR nature of *Enterococcus avium*. The strict implementation of hospital infection control practices and antimicrobial stewardship to prevent emergence and spread of resistant

strains should be considered.

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References

1. Hammerum AM. Enterococci of animal origin and their significance for public health. Clin Microbiol Infect 2012; 18:619-25.
2. Krawczyk B, Wityk P, Gatecka M, Michalik M. The many faces of Enterococcus spp.-commensal, probiotic and opportunistic pathogen. Microorganisms 2021; 9:1900.
3. Abo-Zed A, Hegazy S, Phan T. Detection of Enterococcus avium in a case of urinary tract infection and haematuria. Access Microbiology 2022; 4:000349.
4. Toc DA, Pandrea SL, Botan A, Mihaila RM, Costache CA, Colosi IA et al. Enterococcus raffinosus, Enterococcus durans and Enterococcus avium Isolated from a Tertiary Care Hospital in Romania-Retrospective Study and Brief Review. Biology 2022; 11:598.
5. Osoba AO, Kutub H, Waliuddin A, Sharab M. Enterococcus avium an unusual cause of cerebral abscess. Neurosciences 2005; 10(4):297-300.
6. Jangla SM. Enterococcus avium bed-sore infection: A rara avis. Indian J Case Reports 2023; 9(3):80-2.
7. Shin SB, Jang YN, Park EH, Cheung DY, Park SH. A case of Enterococcus avium colitis with endoscopic finding. Gastroenterol Hepatol 2017; 8(1):378-9.
8. Park S, Park K, Cho YH, Choi S. Brain Abscess Caused by Enterococcus avium: A Case Report and Review of the Literature. Infect Chemother 2013; 45(3):335-8.
9. Ramos S, Silva V, Dapkevicius M, Igrejas G, Poeta P. Enterococci, from harmless bacteria to a pathogen. Microorganisms 2020 ;8:1118.
10. Albogami M, Alsaedy A, Matrood RA, Alotaibi Y, Ahmadi BA. A case of a female patient presenting with idiopathic granulomatous mastitis with superimposed Enterococcus Avium infection. Cureus 2022; 14(10):e29997.
11. Jangla SM. Enterococcus avium bed-sore infection: A rara avis. Indian J Case Reports 2023; 9(3):80-2.
12. Toc DA, Pandrea SL, Botan A, Mihaila RM, Costache CA, Colosi IA, Junie LM. Enterococcus raffinosus, Enterococcus durans and Enterococcus avium Isolated from a Tertiary Care Hospital in Romania—Retrospective Study and Brief Review. Biology 2022; 11:598.
13. Ko YJ, Shim HS, Moon HW, Hur M, Yun YM. Vancomycin-resistant Enterococcus avium isolated from the wound of a patient with diabetes mellitus. Lab Med Online 2013; 3(2):115-8.