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A STUDY ON PREVALENCE AND ANTIMICROBIAL RESISTANCE PATTERN OF *ENTEROCOCCI* ISOLATED FROM PATIENTS WITH BACTEREMIA IN A TERTIARY CARE HOSPITAL IN AHMEDABAD

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ABSTRACT: Background: The emergence and spread of Vancomycin, Linezolid and combined linezolid/vancomycin resistance in *Enterococcus species* (LVRE) is a major therapeutic challenge. Vancomycin-resistant *Enterococci* are an important cause of healthcare-associated infections. Linezolid and Teicoplanin are currently approved for the treatment of VRE; however, resistance to these antimicrobials appears to be increasing. **Aims/Objectives:** The study was done to find the prevalence and to study the antimicrobial resistance pattern of *Enterococci* isolated from patients with bacteremia in a tertiary care hospital in Ahmedabad. **Methodology:** This retrospective study was conducted for a period of one year; Blood samples were received and incubated in Bact/Alert 3D automated blood culture machine. Positive indicated blood samples were cultured, and identification and antimicrobial susceptibility testing was done using both manual and automated methods. **Results:** In this study, 4147(35%) blood samples were found positive. Out of 4147 positive blood samples 278(6.7%) samples were shown growth with *Enterococci* species. Out of 278 *Enterococci*, 8(2.87%) *Enterococci* were found to have both linezolid and vancomycin resistance. **Conclusions:** Prevalence of LVRE is low (7.19%). Yet there are 2.87% LVRE and 35.7% TRLVRE are observed in the study which is a matter of concern as these antimicrobials are considered as last resort drugs for VRE infections.

INTRODUCTION: *Enterococci* are Gram-positive cocci that are normal inhabitants of the human intestine, biliary tract. Bacteraemia due to *Enterococci* is a significant complication and is associated with varying rate of mortality. In recent times *Enterococci* are becoming important agents of infections especially hospital acquired infections because of resistance to multiple antimicrobials, as there are only few options left to manage those infections.

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This resistance has led to increased mortality and morbidity due to limited treatment options. In India, prevalence of VRE is approximately 9.7% [1].

As per WHO list of priority pathogens; VRE is under category of high priority pathogens [2]. widespread use of vancomycin for *Enterococcus* infection in hospitals is majorly responsible for emergence of resistance [3].

Objectives:

The following study was done:

1. To find the prevalence of *Enterococci* isolated from patients with bacteremia in a tertiary care hospital in Ahmedabad

2. To study the antimicrobial resistance pattern of *Enterococci* isolated from patients with bacteremia in a tertiary care hospital in Ahmedabad

MATERIALS AND METHODS: This retrospective study was carried out in the department of Microbiology at tertiary care teaching hospital in Ahmedabad, India for a period of one year from January 2022 to January 2023. Blood samples were collected from patients with bacteremia. These blood samples were subjected to automated blood culture using Bact/Alert 3D (Biomerieux, Inc). Bottles that flagged as positive were cultured on Mac-Conkey agar and chocolate agar. Species identification was done by manual reaction and confirmation of ID was done with VITEK 2.0 method (Biomerieux, Inc).

Antimicrobial susceptibility testing was done using Clinical Laboratories Standards Institute (CLSI) guidelines. For that, two methods were used, that includes manual Kirby-Bauer disk diffusion method and minimum inhibitory concentration (MIC) based automated testing method by VITEK 2.0 Compact system. Isolates found to be resistant to vancomycin and linezolid by disk diffusion method were also tested by VITEK 2.0 Compact system for confirmation. Any *Enterococcus* isolate with vancomycin MIC ≥16 µg/ml, linezolid MIC ≥8 µg/ml and teicoplanin MIC ≥1 µg/ml was considered as resistant isolates.

RESULTS: Out of 4147 positive blood samples 278 (6.71%) samples were shown growth with *Enterococci* species. As shown in **Table 1**, from isolated *Enterococci* (n=278), most common were *Enterococcus faecium* (n= 223, 80.21%), followed by *Entercoccus faecalis* (n=32, 11.51%) and other *Enterococcus species* **Table 1.**

TABLE 1: SPECIES OF *ENTEROCOCCI* ISOLATED

Species of *Enterococcus* isolated	Isolation rate in %	No. of isolates (n=278)
Enterococcus faecium	80.21 %	223
Entercoccus faecalis	11.51 %	32
Other *Enterococcus spp.*	8.27 %	23

Out of 278 *Enterococci*, 20 (7.19%) *Enterococci* were found to be resistant to Vancomycin. Amongst these 20 VRE, 8 (2.87%) *Enterococci* were found to have linezolid resistance (LRVRE). From these 8 LVRE, 1.79% (n=5) were *Enterococcus faecium* and 1.079% (n=3) were *Entercoccus faecalis* **Fig. 1.**

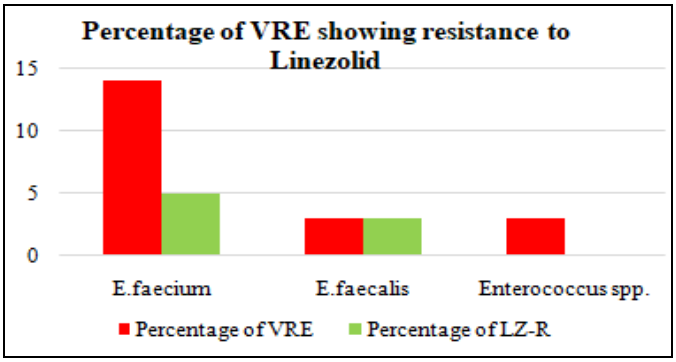

FIG. 1: LINEZOLID RESISTANCE IN VREs

Out of these 8 Isolates with Both Linezolid and Vancomycin Resistance (LRVRE): Table 2.

- All are (100%) resistant to Tetracycline.
- Amongst them 87.5% are Tigecycline resistant
- High level gentamycin resistance was seen in all (100%) of *Enterococci* isolates
- Out of those LVRE, 37.5% are found to be resistant to Teicoplanin (TRLVRE – Teicoplanin resistant LVRE)

TABLE 2: RESISTANCE TO OTHER ANTIMICROBIALS

Antimicrobials	Percentage of resistance
High level Gentamicin	100%
Tetracycline	100%
Tigecycline	87.5%
Teicoplanin	37.5%

DISCUSSION: In the following study, Majority of the isolates were *Enterococcus faecium* (80%), similar to the study of Khandelwal *et al*, where 55.7% of isolates were *E. Faecium*, in contrast to the study of Gawahir Ali *et al*, *E. Faecalis* was the major isolate (73.38%) then *E. Faecium* [3, 4].

Resistance to Vancomycin was seen in 7.19% (n=20) of the *Enterococci*, comparing to the study Gawahir Ali *et al*, VRE was seen in 10.6% of the

Enterococci, while in the study of Monica Sivaradjy *et al*, VRE isolated were 14.7% [4, 5]. In this study High level Gentamicin resistance was observed in all the *Enterococcus* isolates, while in the study of Monica Sivaradjy *et al*, High level Gentamicin resistance was seen in only 28.6% of the isolates [5].

Combined resistance to Linezolid and Vancomycin (LRVRE) was observed in 2.87% of the isolates in the following study, comparing to the study of Monica Sivaradjy *et al*, where Linezolid was resistant in 20.7% of VRE, while in the study of Alexandra Heininger *et al* and Fleminia Oleara *et al*, LRVRE isolates were 1.4% and 6.3% respectively [5, 6, 7]. Out of these 8 LVRE in the following study, 37.5% (n=3) were also resistant to Teicoplanin (TRLVRE), compared to the study of Monica Sivaradjy *et al* and Hussein OM *et al*, where TRLVRE (Teicoplanin resistant LVRE) isolated were 92% and 25% respectively (n=7/28) [5, 8].

CONCLUSION: Prevalence of LVRE and TRLVRE is low. Yet there are 2.87% LVRE and 37.5% TRLVRE isolated from the hospital is a matter of concern as till now they are considered to be last resort for treatment in patients infected with VRE. Antibiotic selective pressure exerted by extensive use of third generation Cephalosporins have been reported to predispose to VRE colonization and infection. Strict adherence to infection control practices and complete treatment using anitmicrobials must be ensured to reduce the emergence of multi drug resistant *Enterococci* as they are one of the major causes of health care associated infection.

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