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PREVALENCE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF ENTEROCOCCUS SPECIES ISOLATED IN CLINICAL SAMPLES FROM A TERTIARY CARE CENTRE

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Abstract

Objectives:

Enterococci is the part of normal commensals of human intestinal tract which is an important opportunistic pathogens. Arousal of antimicrobial resistance among the enterococci is the main threat to human healthy ecosystem. The present study was carried out to determine the prevalence of antimicrobial resistance among the *enterococci* i.e. Vancomycin-Resistant Enterococci (VRE) isolated from various clinical samples received from the patients admitted at tertiary care centre at all age group. Early detection, implementing infection control practices to minimize the transmission of infection and antimicrobial stewardship to minimize the arousal of antimicrobial resistance among the enterococci.

Methods:

A one year retrospective study was conducted at a tertiary care centre. Various specimens like pus, urine, blood, body fluid etc. were collected from the patients admitted at tertiary care centre of all age. Culture and antimicrobial sensitivity testing was carried out following standard guideline.

Results:

During the study period of one year, 950 samples were found to be bacterial culture positive out of which 110 (11.6%) isolates were identified as *Enterococcus species*. Among 110 enterococcal isolates, 80 (72.7%) isolates were *Enterococcus faecalis* and 30 (27.3%) were *Enterococcus faecium.* enterococci more frequently isolated from sample collected from male patient 75 (68.2%) than female patients 35 (31.8%). It was more frequently isolated in patients belongs to age group of 35-40 years (34.5%). Isolates were predominantly resistance to tetracycline (80.9%) followed by ciprofloxacin (70%), Benzyl-penicillin (38.2%), high-level aminoglycosides (36.4%), quinupristin-dalfopristin (5.5%) and vancomycin (3.6%), while linezolide and teicoplanin showed the maximum sensitivity. Our study detected the *E.faecium* more resistant strain to different antibiotics as scompared to *E. faecalis*.

Conclusion:

Our study reports the prevalence of *Enterococci* isolates as well as of VRE isolates. To reduce the arousal of VRE prevalence worldwide, appropriate use of antibiotics according to antimicrobial susceptibility testing should be encouraged. Efforts should also be made to reduce the transmission of VRE in the hospital.

Keywords: Enterococcus, Vancomycin-resistant Enterococci, Prevalence

Introduction:

The genus *Enterococci* are Gram-positive, ovoid shaped cocci, arranged in short chain or in pairs. Though they are normal flora of the intestinal tract, oral cavity and vagina, but have emerged as nosocomial pathogens [1,2]. As their ability to cause different types of serious infections in human like endocarditis, bacteremia, intra-abdominal and urinary tract infection and their ability to acquired resistant to different antimicrobial agents like β lactams, aminoglycosides, glycopeptides (Vancomycin) it becomes very important to study it in details[3]. The mainstay treatment of multiple antibiotic-resistant Gram-positive pathogen infections as Vancomycin resistant enterococci (VRE) is Linezolid, resistance to this antibiotic is now not uncommon and in fact appears to be increasing [4]. High mortality usually found in severe infection with *Enterococcus* which is refractory to antimicrobial therapy. Early detection of antibiotic resistance profile may help in determining a worthy alternative treatment and prevent the spread of VRE [5]. The main aim of our study was to identify the common species of *enterococci* causing the various infections i.e. *E.faecalis* and *E. faecium* and their antimicrobial sensitivity pattern.

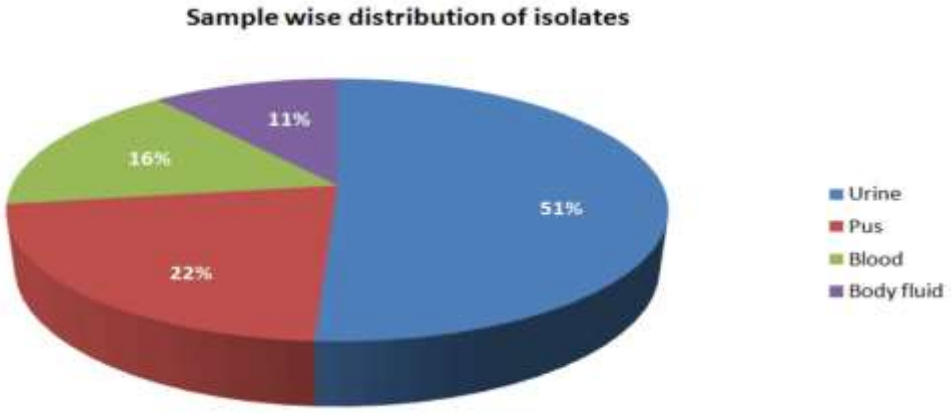
Materials & Methods:

A retrospective study was conducted in tertiary care centre, for a period of one year. All the samples (pus, urine, blood, body fluids, etc.) received from the indoor patients of all age groups admitted in tertiary care centre for culture and sensitivity report, the specimen like sputum, throat swab, stool, and vaginal swab were excluded from the study, as *Enterococcus* forms a part of the normal commensals at this region. Culture of the specimen was performed by inoculating the specimen on standard bacterial culture media plate and incubated at 37°C temperature for 18-24 hours [6]. Out of all culture positive samples, colonies were identified and their antimicrobial sensitivity testing was performed by an automated method i.e. VITEK 2 following Clinical and Laboratory Standard Institute (CLSI) guideline 2024[7]. Of the five known vancomycin resistance phenotypes, Van A and Van B are the most common and have been primarily described in *E. faecalis* and *E. faecium*. VanA-resistant strains show high-level resistance to vancomycin (minimum inhibitory concentrations [MICs], ≥64 mcg/ml) and teicoplanin (MICs, ≥16 mcg/ml), whereas Van B isolates show resistance to vancomycin (MICs, 4 to ≥1000 mcg/ml) but are susceptible to teicoplanin [8].

Results:

During the study period of one year, 950 samples were found to be bacterial culture positive out of which 110 (11.6%) isolates were identified as Enterococcus species. Among 110 enterococcal isolates, 80 isolates were *Enterococcus faecalis* (72.7%) and 30 were *Enterococcus faecium* (27.3%). Regarding sample wise isolation of *enterococci*, most of enterococci were isolated in the urine samples 56 (50.9%) followed by pus 24 (21.8%), blood 18 (16.4%) and body fluid 12 (10.9%) (Fig:1).

Figure 1: Sample wise distribution of isolates

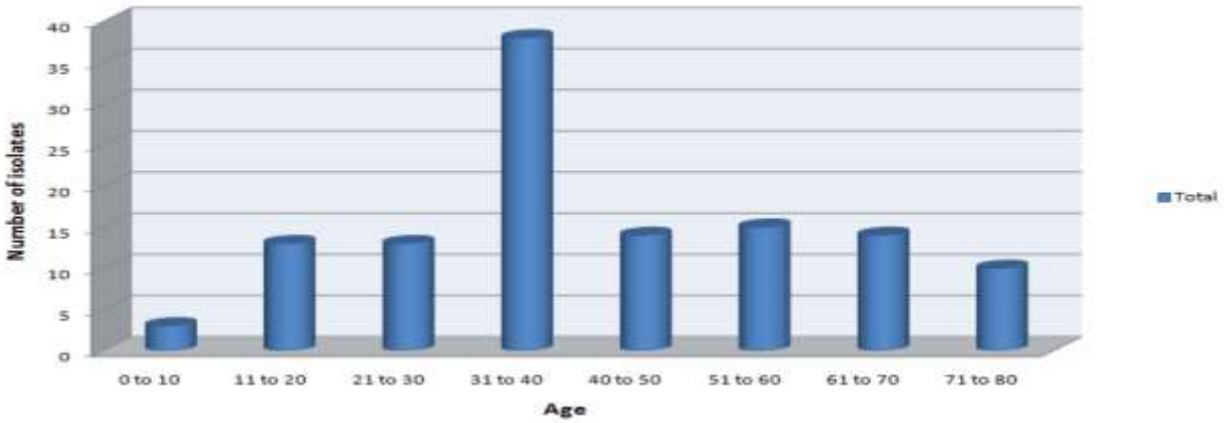


Enterococci predominantly isolated from the samples collected from male patients 75 (68.2%) than female patients 35 (31.8%). Age wise distribution showed a range from 10 months to 75 years with the maximum number of isolates 38 (34.5%) from the age group 35-40 years (Table: 01, Fig: 02).

Table 1: Age and sex wise distribution of isolates

Age	Male	Female	Total
0-10	2	1	3 (2.7%)
11-20	8	5	13 (11.8%)
21-30	9	4	13 (11.8%)
31-40	28	10	38 (34.5%)
41-50	10	4	14 (12.7%)
51-60	12	3	15 (13.6%)
61-70	10	4	14 (12.7%)
71-80	6	4	10 (9.1%)
Total	75	35	110

Figure 2: Age wise distribution of isolates.



Isolates were predominantly resistance to tetracycline 89 (80.9%) followed by ciprofloxacin 77 (70%), Benzyl-penicillin 42 (38.2%), high-level-aminoglycosides (36.4%), quinupristin-dalfopristin (5.5%) and vancomycin (3.6%), while linezolide and teicoplanin showed the maximum sensitivity. Out of 4 vancomycin resistant enterococci (VRE) strain 01 (1.3%) was *E.faecalis* and 03 (10%) were *E. faecium* (Table: 02). Our study detected the *E.faecium* more resistance strain to different antibiotics as compared to *E. faecalis.*

Table 2: Antimicrobial susceptibility patterns of Enterococci

Species	Benzylpenicillin		Ciprofloxacin		High level Gentamicin		Tetracycline		Vancomycin		Linezolid		Teicoplanin		Quinupristin /Dalfopristin	
	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R
E.faecalis	50	30 (3.75%)	25	55 (68.8%)	60	20 (25%)	15	65 (81.3%)	79	1 (1.3%)	80	0	80	0	80	0
E.faecium	18	12 (40%)	8	22 (73.3%)	10	20 (66.7%)	6	24 (80%)	27	3 (10%)	30	0	30	0	30	6 (20%)
Total	68	42 (38.2%)	33	77 (70%)	70	40 (36.4%)	21	89 (80.9%)	106	4 (3.6%)	110	0	110	0	104	6 (5.5%)

It was noted that the number of *E. faecium* isolates showing high-level aminoglycoside resistance was more as compared to *E. faecalis*, which was statistically significant ($P < 0.05$ by Z proportion test)

Discussion:

Enterococci is responsible for 10-20% of all hospital acquired infection[9]. In our study, the maximum number of isolates were obtained from urine 56 (50.9%) followed by pus 24 (21.8%), blood 18 (16.4%) and body fluid 12 (10.9%)[10,11].

Various species of *enterococci* have been identified out of which most common human infection are caused by *E.faecalis* responsible for 80-90% infections followed by *E. faecium* 5-10%[12]. However, the recent trends show an increase in the isolation rate of *E faecium* [13] which is alarming as its intrinsic resistance to many antimicrobial agents may lead to a treatment failure; in our study rate of isolation of *E. faecalis* (72.7%) and *E. faecium* (27.3%).

In our study isolates were predominantly resistance to tetracycline 89 (80.9%) followed by ciprofloxacin 77 (70%), Benzylpenicilin 42 (38.2%), high-level aminoglycosides (36.4%), Quinupritin-dalfopristin (5.5%) and vancomycin (3.6%) which is in agreement with other study Chakraborty et al., 2015[14]. There is a drastically increasing in resistant to commonly used antimicrobial agent by *enterococci* i.e.an increase in the penicillin resistance to 95%, an increase in the ampicillin resistance to 95% and an increase in the high-level aminoglycosides resistance (HLGR) to nearly 50%.[14]

The prevalence of vancomycin resistance in the tertiary care hospitals of India has been re-ported to vary between 1.7% and 20%; in fact, in the past decade, it has been shown to be on the rise[15,16]. Prevalence of VRE in present study is 3.6% in contrast to 13.72% in Ohri, saniya et al. 2023 [16]. In our study, there was 100% susceptibility to linezolid, teicoplanin, and 5.5% *Enterococcus faecium* were resistant to quinupristin/dalfopristin which is co relating with finding of study Maraki S. et al[17] which is in contrast to study Sengupta M et al and Sivaradjy S. et al. [18-24].

Conclusions:

In this study, we detected that there is a sudden increasing the cases of VRE in our healthcare setting, which is probably due to the overuse or indiscriminate usage of antibiotics and prolonged hospital stay. So early detection, treatment and preventive action will help to limit the serious consequences caused by vancomycin resistant enterococcal infection. Patients who are at high risk for colonization with VRE should be screened properly to start appropriate infection control measures that include isolation and cohorting of the VRE colonized patients, using patient-dedicated equipment, strict adherence to hand hygiene, and cleaning and disinfection of the room using appropriate chemical disinfectant after the discharge of the patient. It is also important to adhere strictly to antimicrobial stewardship protocol such as avoiding use of vancomycin for surgical antimicrobial prophylaxis, avoiding Vancomycin in empirical therapy if is not indicated, and de-escalation of vancomycin empirical treatment to a susceptible narrow-spectrum antibiotic when the blood culture is negative for beta-lactam-resistant Gram-positive microorganisms.

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