

Analysis of Demographic Profiles among Cases of Isolates of Enterococci at a Tertiary Care Teaching Hospital

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ABSTRACT

Introduction: Therapy for infections due to Vancomycin-resistant Enterococci presents real challenge for the clinician. Despite increasing reports of VRE from different countries, there is a paucity of information on this issue from our country. Hence, the present study aims to study of demographic profile among cases of isolates of Enterococci from various clinical samples of PBM and associated group of hospital SPMC, Bikaner up to the species level.

Materials and Methods: The present descriptive study was carried out in the Department of Microbiology, S.P.M.C. Bikaner over a period of one year. 194 isolates of Enterococcal were obtained from various clinical samples of patients attending P.B.M. Hospital, Bikaner.

Results: The maximum number of samples (30.41%) was isolated from patients in the 0-10 year age group. It should be noted that out of the 59 patients in this group, 21 (35.59%) were <1 year old. The mean age of incidence of enterococcal infections was 31.53 years. 21 babies included in the 0-10 year age group were <1 year old. Out of the 194 enterococcal isolates, 79 (40.72%) were from female patients, and 115 (59.28%) were from male patients.

Conclusion: Majority of the isolates were from the pediatric age group as the maximum number of samples was isolated from patients in the 0-10 year age group. The *E. faecium* strains showed a higher percentage of resistance to all the antibiotics tested, as compared to the *E. faecalis* strains.

Keywords: Antibiotics; Enterococci; Nosocomial Bacteremia.


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INTRODUCTION

Enterococci are currently ascendant nosocomial pathogens, and according to the National Nosocomial Infections Surveillance survey in the United States, Enterococci having become the second most common organism recovered from nosocomial urinary tract and wound infections and are the third most common cause of nosocomial bacteremia in the United States.¹

Despite the relative lack of pathogenicity, Enterococci have emerged as significant nosocomial pathogens in many countries. One of the major reasons why these organisms have survived in the hospital environment is their intrinsic/inherent resistance to several commonly used antibiotics such as Penicillinase-susceptible penicillin (low level), penicillinase-resistant penicillin, cephalosporin, lincosamides, nalidixic acid, low level of aminoglycosides and low level of clindamycin. Their ability to acquire resistance to antibiotics such as penicillin by β -lactamase, high level aminoglycoside resistance (HLAR), vancomycin,

chloramphenicol, and erythromycin, high level of clindamycin, tetracycline and fluoroquinolones is either by mutation or by receipt of foreign genetic material through the transfer of plasmid and transposons.^{2,3}

Therapy for infections due to Vancomycin-resistant Enterococci presents real challenge for the clinician. Most isolates of Enterococci, whether Vancomycin-resistant, remain susceptible to Nitrofurantoin, which has been successfully used to treat urinary tract infections caused by Vancomycin resistant Enterococci.⁴ Therapy for multiple drugs resistant Enterococci are extremely limited, and agents to whom they may appear susceptible are at best bacteriostatic, of unproven efficacy, or associated with toxicity.⁵

Despite increasing reports of VRE from different countries, there is a paucity of information on this issue from our country.⁶ Hence, the present study aims to study of demographic profile among cases

of isolates of Enterococci from various clinical samples of PBM and associated group of hospital SPMC, Bikaner up to the species level.

MATERIALS AND METHODS

The present descriptive study was carried out in the Department of Microbiology, S.P.M.C. Bikaner over a period of one year. 194 isolates of Enterococcal were obtained from various clinical samples of patients attending P.B.M. Hospital, Bikaner. Inclusion criteria consisted of all the enterococcal isolates from clinical samples such as blood, urine, pus, wound swab, catheter tip and other body fluid. The exclusion criteria were all commensal enterococcal isolates from anatomical sites like the gastrointestinal tract, female genital tract, and oral cavity were excluded. Permission for this study was obtained from the Institutional Ethics Committee. The collection and processing and sample were done according to recommended standard procedure.⁷ Following preliminary macroscopic and microscopic

examination of the appropriate samples, inoculation was done on blood and MacConkey agar plates and incubated overnight at 37°C.

Initial identification was based on colony morphology on the media used for isolation. On blood agar, they were seen as grey colonies, circular, translucent, convex with regular margins, 1 mm in diameter, with α-, β- or γ-hemolysis following 18-24 hours of incubation at 37°C. These were selected for further processing. On MacConkey's agar, the colonies were 0.5-1 mm in diameter, magenta, smooth, and convex following 18-24 hours of incubation at 37°C.

Smear for Gram staining were made from the colonies with typical morphology describe above. A preliminary identification was made if the smear showed Gram positive, spherical to oval cocci, arranged singly, in pairs or short chains. Catalase test with positive and negative controls was performed to differentiate these Gram positive cocci from staphylococci. Various tests were used for the identification and speciation of enterococci.

Table 1: Age-wise distribution of the isolates

Age group (years)	Number	Percentage
0 - 10 years	59	30.41
11 - 20 years	13	6.70
21 - 30 years	36	18.56
31 - 40 years	15	7.73
41 - 50 years	23	11.86
51 - 60 years	18	9.28
>60 years	30	15.46
Total	194	100

Table 2: Gender-wise distribution of the isolates

Gender	Number of isolates	Percentage
Male	115	59.28
Female	79	40.72
Total	194	100

Table 3: Comparison of antibiotic resistance between *E. faecalis* and *E. faecium*

Antibiotics	<i>E. faecalis</i> (n=172)		<i>E. faecium</i> (n=22)	
	Resistance (number)	Resistance (%)	Resistance (number)	Resistance (%)
Penicillin	152	88.37	20	90.91
Ampicillin	97	56.40	15	68.18
Erythromycin	120	69.77	16	72.72
Amikacin	84	48.84	11	50
Ciprofloxacin	115	66.86	18	81.81
Gentamycin (HL)	42	24.42	2	9.09
Vancomycin	22	12.79	4	18.18
Linezolid	8	4.65	2	9.09

RESULTS

The maximum number of samples (30.41%) was isolated from patients in the 0-10 year age group. It should be noted that out of the 59 patients in this group, 21 (35.59%) were <1 year old (table 1). The mean age of incidence of enterococcal infections was 31.53 years. Note: 21 babies included in the 0-10 year age group were <1 year old. Out of the 194 enterococcal isolates, 79 (40.72%) were from female patients, and 115 (59.28%) were from male patients. The male- female ratio was 1.45:1 (table 2). 85.5% of the enterococcal isolates were resistant to penicillin. A higher percentage of resistance was seen among *E. faecium* (90.91%) as compared to *E. faecalis* (88.37%). A higher percentage of resistance to penicillin was seen among *E. faecium* (90.91%) as compared to *E. faecalis* (88.37%). A higher percentage of resistance to all antibiotics tested was noted among *E. faecium* strains, as compared to *E. faecalis* (table 3).

DISCUSSION

The current study intent to evaluate data on the occurrence of enterococcal infections in a tertiary care hospital according to age and gender of patients and to assess the antibiotic resistance pattern to widely prescribed antibiotics. In this study, the maximum number of samples (30.41%) was isolated from patients in 0-10 year age group. It should be noted that out of the 59 patients in this age group, 21(35.59%) were less than one year old. The mean age of incidence of enterococcal infections was 31.53 years. This in contrast to a study by Carmeli et al.⁸ where the average age was 62 years, and one by Gordon et al.⁹ where 96% of the patients were greater than 18 years of age. The prevalence of enterococcal infections was found to be lower in female patients (40.72%). Other studies have shown the prevalence to be 46%,⁸ and 49.5%⁹ in females.

Vancomycin resistance in the present study was observed to be 12.79% among *E. faecalis* isolates, and 18.18% among *E. faecium* isolates. Vancomycin resistance among enterococci has been observed to generally be on the rise over the years, from 0.3% in a study by Gordon et al. in 1992,⁹ through 1.5% observed by Vandamme et al in 1996,¹⁰ and 20% observed by Devi et al in 2002,¹¹ to 38.5% in a study by Karmarkar et al in 2004.¹² All the vancomycin –resistance *E. faecium* strains isolated by Ghoshal et al had Van A phenotype.¹³ Mathur et al¹⁴ reported vancomycin resistance in 1% (5) isolates, of which 4 had Van A phenotype, and 1 had Van B phenotype.¹⁴ About 70% of the vancomycin-resistant isolates in the United States currently exhibit the vanA resistance phenotype, and about 25% exhibit the vanB resistance phenotype.¹⁵

In this study, 85.5% of the enterococcal isolates were resistant to penicillin. A higher percentage of resistance was seen among *E. faecium* (90.91%) as compared to *E. faecalis* (88.37%). This is comparable to studies by Devi et al (90%),¹¹ Rahangdale et al (89.4%),¹⁶ Chaudhary et al (84.7%),¹⁷ and others. A higher percentage of penicillin resistance was seen among *E. faecium* isolates as compared to *E. faecalis* in studies by Karmarkar et al,¹² and Mendiratta et al.¹⁸

Species identification of enterococci may be useful both as an epidemiological tool in the investigation of outbreaks of nosocomial infections, and because antimicrobial susceptibilities may vary by species, for clinical decisions about therapy. Identification of enterococcal isolates to the species level in the

clinical microbiology laboratory is useful because it can help predict patterns of antimicrobial susceptibility, particularly to penicillins. In serious clinical diseases (e.g. bloodstream infections or meningitis), identification to the species level and determination of high-level aminoglycoside resistance to gentamycin and streptomycin should be strongly encouraged because of the differences in antimicrobial susceptibilities between *E. faecalis* and *E. faecium*.⁹

The CLSI guidelines state that for *Enterococcus* spp., cephalosporins, aminoglycosides (except for high-level resistance screening), clindamycin and trimethoprim-sulfamethoxazole may appear active in vitro, but are not effective clinically, and warns against reporting isolates as susceptible.¹⁹

A patient cannot have VRE infection if VRE is not first spread to the patient. Originally classified as enteric gram positive cocci, enterococci have been identified as an important cause of a wide variety of infections, particularly urinary tract and wound infections, endocarditis, and since the 1970s, a common cause of hospital acquired infections. Of particular interest has been vancomycin resistant enterococci, which over the years have been increasingly isolated from numerous countries, including India.²⁰

CONCLUSION

Majority of the isolates were from the pediatric age group as the maximum number of samples was isolated from patients in the 0-10 year age group.

Among the enterococcal isolates, maximum resistance was noted to penicillin, erythromycin, ciprofloxacin, and ampicillin. They were most sensitive to linezolid and vancomycin. The *E. faecium* strains showed a higher percentage of resistance to all the antibiotics tested, as compared to the *E. faecalis* strains.

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