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Prevalence of Enterococcal Urinary Tract Infections in Dialysis Patients

KEYWORDS: enterococci, urinary tract infections, dialysis

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ABSTRACT *The enterococci are commensals of the gastrointestinal tract but are being increasingly implicated in nosocomial infections. They are one of the leading causative agents of urinary tract infections. 50 chronic renal failure patients undergoing dialysis at a tertiary care institution were included in the present study. Standard microbiological techniques were employed in the isolation of the causative agent(s). Among the urine samples, 12 (24%) yielded pure cultures of enterococci. The emergence of resistant enterococci can be controlled by regular monitoring of hospitalized patients and the surveillance of the antimicrobial patterns.*

Introduction

Enterococci are widespread in nature and can be found in soil, plants, water, food and animals. [1, 2, 3] In humans, these are intestinal commensals and are not highly pathogenic. They are predominantly inhabitants of the gastrointestinal tract .[1] Enterococci cause a wide variety of diseases with urinary tract and wound infections as the most common while the bloodstream infections and endocarditis are the most severe and therapeutically challenging ones. Resistance to the most commonly used antimicrobial agents is a typical characteristic of enterococci and an important explanation for their success as nosocomial pathogens.

In recent years, they have become important nosocomial pathogens, especially since the acquisition of resistance to multiple antibiotics, including the glycopeptides. The recent rapid spread of vancomycin-resistant enterococci (VRE) is of concern, not only because of the problems related to treatment but also because of the potential for vancomycin resistance genes to spread into other organisms. The patients requiring chronic hemodialysis is a high-risk and rapidly growing population. The epidemiological characteristics of nosocomial infections among these have not been fully elucidated.

Uremia is associated with increased susceptibility to infections, mostly of bacterial origin and account for the majority of hospitalizations in patients undergoing dialysis [4]. Since enterococci are a common cause of nosocomial urinary tract infections (UTIs) and associated with instrumentation of the urinary tract, we conducted a study to determine the prevalence of enterococci causing UTI in this patient population.

To identify risk factors for developing a nosocomial infection among chronic hemodialysis patients, a matched case-control study was performed by D'Agata et al. they found UTIs are significantly more common among chronic hemodialysis patients as compared with non-chronic hemodialysis patients. Among chronic hemodialysis patients, Candida spp and enterococci were the most common pathogens in contrast to coagulase-negative staphylococci and *Staphylococcus aureus* among patients not requiring hemodialysis. Thus, they found chronic hemodialysis patients are at a substantially greater risk for developing a nosocomial infection compared to other hospitalized patients.

Material and Methods

Fifty numbers of clean-catch midstream urine specimens were collected from patients undergoing dialysis for a period of one year. Patients with chronic renal failure who had undergone hemodialysis at least 3 times in ASRAM Medical College Hospital, Eluru (Andhra Pradesh, India) were included in the study. Samples were processed in the Microbiology Laboratory.

Microscopy of uncentrifuged urine was performed and semi-quantitative culture done on blood agar and MacConkey agar plates (Hi-Media laboratories, Mumbai, India). Gram positive cocci in pairs or short chains which were catalase negative or pseudocatalase positive isolated in pure culture (Plate 1) were included in the study. Enterococci were identified on the basis of growth on bile-esculin medium, 6.5% NaCl, pH 9.6 and heat resistance test (growth after exposure to 60°C for 30 minutes) (Plate 2). Other tests such as resistance to bacitracin, acidification of ribose and positive Voges Proskauer test by Coblentz method were also used for confirmation of isolates as enterococci.

The HiStrep™ latex test kit (LK06-25NO) was used for serogrouping of the enterococci according to Lancefield's classification. Antibiotic sensitivity testing was done with amoxycillin (10µg), vancomycin (30µg), erythromycin (10µg), gentamicin (10µg), penicillin (10U), and ciprofloxacin (5µg) on Mueller Hinton agar (Hi-Media laboratories, Mumbai, India) incubated for 18-24 hrs at 37°C (Plate 3).

Results

Patients with chronic UTI infections and undergoing dialysis from all age groups were included in the study. Table 1 and Figure 1 show the sex and age distribution of cases included in the study. While the patients were from the age group 11 – 70 years, majority of them were in the range 41 to 50 years.

Among the 50 samples examined, 12 numbers (24%) yielded pure cultures of enterococci, whereas others yielded organisms like *Pseudomonas aeruginosa*, *Escherichia coli* and *Candida* spp as the common pathogens. Table 2 and figure 2 show the distribution of cases positive for enterococci. It was observed that the maximum number of cases positive were in the group of 31-40 years, all diabetic males and known cases of chronic renal failure with end-stage renal disease

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(CRF-ESRD). Enterococci were responsible for causing urinary tract infections in 24% of patients undergoing hemodialysis in our study.

Table 3 and Figure 3 show the antibiograms for the different enterococcal isolates. Table-4 shows statistical analysis of positive cases with regard to enterococci. There is significant difference ($p<0.01$) in case of females in the age group of 31-40 and 51-60 years.

Discussion

The enterococci are commensals that act as opportunistic pathogens, particularly in patients hospitalized for prolonged periods, use of invasive devices and/ or have received broad spectrum antimicrobial therapy. They have been recognized as one of the most common causes of hospital-acquired infections since the late 1970s. Enterococci have become the second most common agent recovered from nosocomial urinary tract infections (UTI) and the third leading cause of nosocomial bacteremia in some countries[5, 6, 7]

UTIs are the most common of enterococcal infections: enterococci are implicated in about 16% of nosocomial UTIs [6]. We isolated enterococci in 24% patients undergoing dialysis, all of whom have been catheterized at some point in the hospital. Enterococcal bacteriuria usually occurs in patients with structural abnormalities and/or in those who have undergone urologic manipulations [7].

The presence of a substantial impairment of immunity in patients with uremia has been well documented. Chronic renal failure (CRF) and the subsequent need for maintenance hemodialysis can alter neutrophil function, reduce the ability for phagocytosis, depress natural killer cell activity, and can alter T and B cell function [4].Most of the infections are bacterial and account for majority of hospitalizations in this patient population.

Urinary tract infections with enterococci are the second most common source of bacteremia in hospitalized patients, after infection of central venous catheters by the microorganisms [8]. Older age, multiple underlying comorbidities, instrumentation in healthcare settings and recent or current antimicrobial therapy are factors enhancing enterococcal infections. Most of our positive cases (18%) were in the age group of 31-60 years.

The emergence of vancomycin resistance in enterococci in the 20th century is a major cause of concern [9].Widespread use of vancomycin in dialysis patients and the convenience of infrequent dosing of vancomycin in hemodialysis patients have led to the emergence of vancomycin resistant enterococci (VRE). An increasing incidence of colonization with VRE can be a potential source of serious infection [4]. We did not find vancomycin resistance in our isolates, the probable reason being that vancomycin is used with due consideration in our dialysis units. Ampicillin is the drug of choice for ampicillin-sensitive enterococcal UTIs, including VRE [10].

Conclusions

The enterococci are a major cause of nosocomial infections and are rapidly increasing in importance due to their emerging antimicrobial resistance. The study highlights that continued judicious use of vancomycin in treating renal patients and enterococcal sensitivity surveillance is required. It serves as a baseline from which monitoring the evolution and impact of enterococcal urinary tract infections in dialysis patients can be done in a tertiary care setting.

Table 1: Age and sex distribution in dialysis cases (n = 50)

Age group (yrs)	Male	Female
0-10	0	0
11-20	0	2
21-30	0	2
31-40	6	3
41-50	17	6
51-60	10	1
61-70	2	1
Total	35 (70%)	15 (30%)

Fig 1: Age and sex distribution of cases included in the study

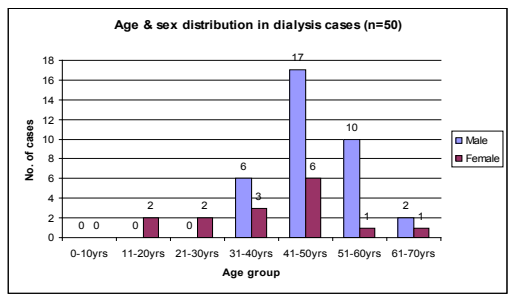

Table 2: Age and sex distribution in positive cases for enterococci

Age group (yrs)	Positive cases-Male	Positive cases-Female
0-10	0	0
Nov-20	0	2 (4%)
21-30	0	1 (2%)
31-40	3 (6%)	0
41-50	1 (2%)	1 (2%)
51-60	2 (4%)	0
61-70	1 (2%)	1 (2%)
Total	7 (14%)	5 (10%)

Figure 2: Age and sex distribution of positive cases

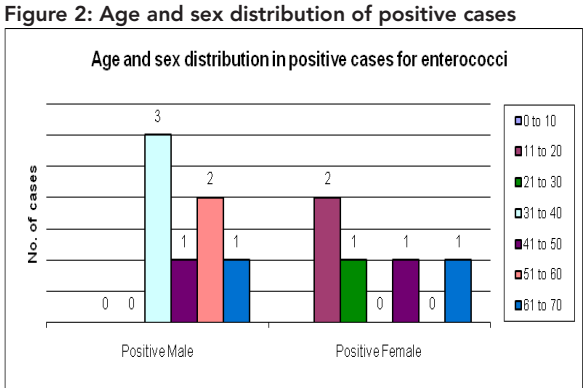

Table 3: Antibiogram for enterococcal isolates

Antibiotic	Sensitive cases	Resistant cases
Ampicillin	12 (100%)	0
Vancomycin	12 (100%)	0
Erythromycin	7 (58.3%)	5 (41.7%)
Gentamicin	11 (91.7%)	1 (8.3%)
Penicillin	8 (66.7%)	4 (33.3%)
Ciprofloxacin	9 (75%)	3 (25%)

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Fig. 3: Antibiogram for enterococcal isolates

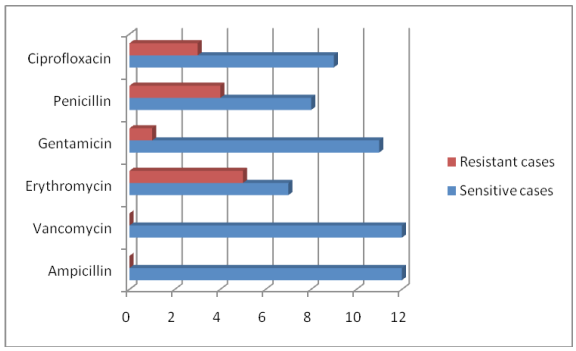

Table-4: Statistical analysis of positive cases for enterococci

Z value	p	Attributes
0.96	0.4	31-40-Male
1.32	0.2	41-50M
0.54	0.6	51-60M
1	0.35	61-70M
1.31	0.2	11-20F
0.46	0.7	21-30F
2.78	0.01	31-40F
0.77	0.5	41-50F
2.78	0.01	51-60F
1.33	0.2	61-70F
0.61	0.5	Male-Female

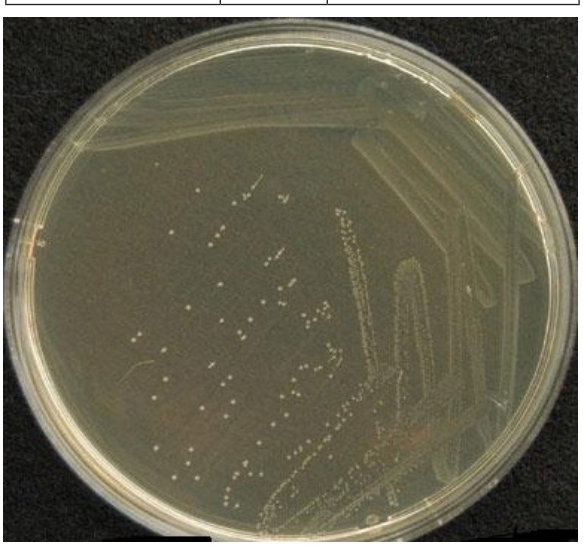

Plate 1: Enterococci on nutrient agar

Plate 2: Enterococci before and after heat resistance test

Plate 3: Antimicrobial sensitivity testing for enterococci

REFERENCE

1. Aarestrup, F. M., Butaye, P., and Witte, W.,2002. Nonhuman reservoirs of enterococci. In: Gilmore, M. S., Clewell, D.B, et al. (eds). The enterococci: pathogenesis, molecular biology and antibiotic resistance. Washington DC: ASM Press, 55 – 99 | 2. Blaimont, B., Charlier, J., and Wauters, G., 1995. Comparative distribution of Enterococcus species in faeces and clinical samples. Microbiol. Ecol. Health Dis., 8, 87 – 92 | 3. Devriese, L. A, Collins, M. D, and Wirth, R, 1992. The genus Enterococcus. In: Balows, A., and Truper, H.G. (eds), The prokaryotes. A handbook on the biology of bacteria: ecophysiology, isolation, identification, applications. New York: Springer Verlay, 1465 – 1481 | 4. Minnaganti V.R, Cunha B.A, 2001. Infections associated with uremia and dialysis. MD consult: Infectious Diseases Clinics of North America, 15(2) | 5. Murray B.E., SinghK. V., Heath J. D., Sharma B. R., and Weinstock G. M., 1990. Comparison of genomic DNAs of different enterococcal isolates using restriction endonucleases with infrequent recognition sites. J Clin Microbiol, 28, 2059-2063 | 6. Schaberg DR, Culver DH, Gaynes RP. Major trends in the microbial etiology of nosocomial infections. 1991 Am J Med;91(Suppl 3B):72S-5S | | 7. Moellering RC, Jr. Emergence of enterococcus as a significant pathogen. 1992. Clin Infect Dis; 14: 1173-8. | | 8. Madani T. A. A., Kabani A., Orr P., Nicolle L., 1999 Enterococcal bacteremia in a tertiary care centre in Winnipeg. Can J Infect Dis; 10 (1): 57-63 | | 9. Cetinkaya Y., Falk P., Mayhall C. G. 2000. Vancomycin –resistant enterococci. Clin Microbiol Rev; 13: 686-707 | | 10. Caballaro-Granado F. J., Becerril B., Cuberos L., Bernabeu M., Cisneros J. M., Pachon J., 2001. Attributable mortality rate and duration of hospital stay associated with enterococcal bacteremia. Clin. Infect. Dis.; 32 (4): 587- 94 |