



STUDY OF ENTEROCOCCUS SPECIES CAUSING HUMAN INFECTIONS WITH SPECIAL REFERENCE TO URINARY TRACT INFECTIONS.

Microbiology

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ABSTRACT

Objectives: To determine the distribution of enterococcus species among various clinical specimens and their association with various human infections and to study the predisposing factors for enterococcal urinary tract infection.

Material and Methods: Conventional identification scheme by Faclam and Collins was used to speciate the various enterococcal isolates from clinical specimens. Retrospective analysis of patient's history and clinical criteria were taken into account for evaluating the major risk factors associated with enterococcal urinary tract infections.

Results: 180 enterococcal isolates were obtained from various clinical samples from October 2014 to November 2016. *E. faecalis* (103) was the predominant species isolated, followed by *E. faecium* (76) and one isolate of *E. hirae* (1). Out of 180 isolates, 125 (69.44%) were from urine samples, 25 (13.89%) from pus and wound swab, 23 (12.78%) from blood and 7 (other specimens). Most common enterococcal infection was urinary tract infections found in 70.56% cases, out of which 55.91% patients were catheterised and 5.51% patients were on prolonged antibiotic therapy.

Conclusion: Enterococcus have emerged as a major pathogen in various human infections specially nosocomial urinary tract infections in catheterised patients and prolonged use of antibiotics. Since they are a part of normal human flora of gastrointestinal tract and perianal area, it is a cause of great concern. Study results appeal that need of hour is to implement infection control practices and prevent injudicious use of antibiotics.

KEYWORDS

Enterococcus, Urinary tract infections, risk factors, catheterisation.

INTRODUCTION

Enterococci were traditionally regarded as low grade pathogens but have emerged as an increasingly important cause of nosocomial infections.¹ Since 1990s, they have emerged as pathogens in serious nosocomial infections including bacteraemia, intra-abdominal infections and urinary tract infections.² Enterococci are commensal flora of human anatomical sites like gastrointestinal tract, vagina and perianal area, but they also cause human infections such as urinary tract infections, bacteraemia, endocarditis, intra-abdominal and pelvic infections, wound and soft tissue infections, neonatal sepsis and rarely meningitis. *E. faecalis* is the predominant species incriminated in human infections (80-90%), followed by *E. faecium* (10-15%).³ Infections have been reported to be caused by other uncommon species as well like *E. hirae*, *E. raffinosus*, *E. casseliflavus*, *E. gallinarum*, *E. avium*, *E. durans* and *E. dispar*.^{4,5,6,7} Urinary tract infections (UTIs) are commonly caused by enterococci, particularly among hospitalized patients. In persons who have been instrumented or received antibiotics, or patients with structural abnormalities in the urinary tract suffer from recurrent enterococcal UTIs and also the rate of urinary colonization and infection by enterococci rises in such cases.²

MATERIAL AND METHODS

The study was carried out in the department of Microbiology, at a tertiary care hospital of Central India from October 2014 to October 2016. A total number of 180 enterococcus strains were isolated from different clinical samples e.g. urine, blood, pus, wound swab, different body fluids, urinary catheter tips etc. received in this hospital set up. All the samples were collected and processed by standard protocol.⁸

The isolates were characterised as enterococci according to the conventional identification scheme by Faclam and Collins.^{3,9} Criteria used for labelling the enterococcal isolate as infective: a) Enterococcal isolate from urine samples was considered as infective if there was significant bacteriuria.¹⁰ b) From specimens like blood, wound swab, body fluids like pleural fluid, ascitic fluid etc. enterococci were considered as infective when isolated from at least two samples. Once enterococcal isolate was obtained from a sample, that patient was reviewed retrospectively in the ward and detail records of history, instrumentation if any, duration of antibiotic therapy, were obtained.

RESULTS:

In the present study, three enterococcus species were identified, *Enterococcus faecalis*, *Enterococcus faecium* and *Enterococcus hirae* (Table 1).

Table 1: Different Enterococcus species isolated in the study (n=180)

Enterococcus species	<i>E. faecalis</i>		<i>E. faecium</i>		<i>E. hirae</i>	
	No.	%	No.	%	No.	%
N= 180	103	57.22%	76	42.22%	1	0.56%

In the present study, maximum number of enterococci were isolated from urine (69.44 %) followed by pus and wound swab (13.89%) (Table 2).

Table 2: Different clinical specimens and enterococcal isolates from different clinical specimens

S. No.	Clinical specimen	No. of enterococcal isolates (%)
1.	Urine	125 (69.44%)
2.	Pus and wound swab	25 (13.89%)
3.	Blood	23 (12.78%)
4.	Others *	7 (3.89%)
	Total	180 (100%)

* Others include CSF = 3, pericardial fluid=1, Catheter tip = 2 and Drain fluid = 1

The study revealed, most common enterococcal infections were urinary tract infection (125 urine and 2 catheter tip) being 70.55%, followed by wound infections (13.89%) (Table 3).

Table 3: Various enterococcal infections:

S. No.	Enterococcal infections	Specimen type (no.)	No. of cases (%)
1.	Urinary tract infection	Urine (125)	127 (70.55)
		Catheter tip (2)	
2.	Wound infection	Pus (15)	25 (13.89)
		Wound swab (10)	
3.	Bacteraemia	Blood (23)	23 (12.78)
4.	Meningitis	CSF (3)	3 (1.66)
5.	Peritonitis	Drain fluid (1)	1 (0.56)
6.	Pericardial effusion	Pericardial fluid (1)	1 (0.56)
	Total	180 (100)	

In this study out of the 127 cases of enterococcal UTIs, 80 (63%) cases were associated with prominent risk factors (Table 4). The most common risk factor observed for development of enterococcal urinary tract infection was urinary catheterization 71 (55.91%) followed by prolonged antibiotic therapy in 7 (5.51%).

Table 4: Risk factors associated with enterococcal urinary tract infection:

Enterococcal urinary tract infection (n=127)	Risk factors	No. of cases (%)
	Catheterisation	71 (55.91)
	Prolonged antibiotic therapy (Cephalosporin)	7 (5.51)
	Structural abnormality	2 (1.57)
	Apparently, no risk factors	47 (37.01)

DISCUSSION:

Out of the 180 enterococcal isolates, *E. faecalis* (57.22 %) was predominant followed by *E. faecium* (42.22 %). One isolate of *E. hirae* (0.56 %) was also isolated in the study. Other workers, Rahangdale et al in 2008, Salem-bekhit et al in 2012, Deshpande et al 2013, Fernandes et al 2013, Aher et al in 2014, Chakraborty et al in 2015, Tripathy et al in 2016 and Lall et al 2016 also reported *E. faecalis* to be the most common species isolated followed by *E. faecium*.^{11,12,13,14,15,16,17,18} *E. faecalis* produces virulence factors, haemolysin and gelatinase enzymes in greater amount as compared to *E. faecium*; which could possibly be one of the reasons why *E. faecalis* is responsible for more number of infections than *E. faecium*; which was shown by Fernandes et al in 2013.¹² Also, the fact that *E. faecalis* predominates in the endogenous flora of the body which could probably be a reason behind its isolation in higher proportion as compared to *E. faecium*.¹⁵

Urinary tract infection is the most common infection caused by enterococci.³ In a CDC survey of nosocomial infection, enterococci accounted for 13.9% of urinary tract infection, second only to *E. coli* as a sole agent of nosocomial urinary tract infection.¹⁹ In the present study, maximum number of enterococcal strains were isolated from urine (69.44%). Various other workers, also found that major source of pathogenic enterococcal isolation was urine.^{7,12,20,21,17,18} Srivastava et al isolated 70% enterococcal isolates from urine in 2013.²⁰ In our study, second most common source for enterococcal isolation was pus and wound swab (13.89%), similar to the finding of Adhikari et al, Chakraborty et al and Mukherji et al, who isolated 16.67%, 13.89%, 19.06% and 16% enterococcal isolates from wound infections respectively.^{18,22,23} Blood stream infections (12.78%) were found to be the third most common infection following UTIs and wound infections. In the present study, *E. hirae* consisted of 0.56 % of the isolates. Salem-bekhit et al and Lall et al reported 0.8 % and 0.5 % of isolates to be *E. hirae* causing human infections, in their respective studies.^{14,17} It is important to identify the species of enterococcal isolates from clinical samples because *E. faecium* are more resistant to antibiotics.²⁴

We found common enterococcal infections were urinary tract infection (70.55%), wound infections (13.89%) & bacteraemia (12.78%) in that order, which co-related well with study conducted by Chakraborty et al and Mukherji et al who reported similar findings.^{18,23} In the present study, there were 3 (1.66%) cases of meningitis, which was comparable with study conducted by Srivastava et al who reported 2% cases of enterococcal meningitis.²⁰ There was 1 (0.56%) case of peritonitis and 1 (0.56%) case of pericardial effusion in the present study.

In our study we made a note of the predominant risk factors associated with Urinary tract infections caused by enterococcus. The most common risk factor was urinary catheterization (55.91%) followed by prolonged antibiotic therapy, especially cephalosporin (5.51%) and structural abnormality (1.57%) (Table 4). Catheterization as a risk factor for urinary tract infection was also reported by Gordon et al 43%, Desai et al 48.2% and Taneja et al 82-95%.^{5,6,25} Previous studies showed that patients who are colonised with enterococci in their rectum they subsequently develop colonization in their perineum and then develop urinary tract infection following Foley's catheter.²⁶ Cephalosporin use was identified as an independent risk factor for colonization of enterococci, hence causing enterococcal infections.^{27,28} Prolonged antibiotic therapy specially cephalosporin lead to enterococcal superinfections as this drug has low in vitro susceptibility to enterococci.²⁹ The intensive use of broad spectrum antibiotics is responsible for the conversion of enterococci, the otherwise gut commensal bacteria, to opportunistic nosocomial pathogens and important causes of community-acquired enterococcal infection.¹⁹

CONCLUSION:

Enterococci are commensal at many sites of the body but have emerged as a significant pathogen in causation of various infections,

particularly urinary tract infection. Majority of cases were associated with catheterisation and prolong use of cephalosporin. Hence there is a need to identify and speciate enterococci and practice judicious use of antimicrobials and appropriate infection control practices to prevent enterococcal infections. Further such studies should be conducted for better understanding of role of enterococcus in nosocomial infections and associated risk factors, so that they can be prevented; hence taking a step ahead to justify that prevention is better than cure.

Conflicts of interest: There are no conflicts of interest.

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