ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 04 | April - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ANTIMICROBIAL SUSCEPTIBILITY PATTERNS OF ENTEROCOCCUS SPECIES ISOLATED FROM URINARY TRACT INFECTIONS IN A TERTIARY MEDICAL COLLEGE SMS HOSPITAL, JAIPUR

Microbiology

Dr Nitika Garg Assistant Professor, Dept. Of Microbiology, JNUIMSRC Jaipur, Rajasthan

Dr Rekha Bacchiwal* Senior Professor Dept. Of Microbiology, SMS Medical college, Jaipur. Rajasthan *Corresponding Author

Dr Rajni Sharma Senior Professor, Dept. Of Microbiology, SMS Medical college, Jaipur, Rajasthan

ABSTRACT

Background: Enterococci are a common cause of urinary tract infection. Enterococcus has gained clinical importance due to their intrinsic and multidrug resistance. The present study was undertaken with a view at characterizing the clinical isolates of Enterococcus spp. recovered from the cases of urinary tract infections (UTI). **Objective:** 1).To determines the species of Enterococci. 2).To determines the antibiogram of Enterococci. **Materials and Methods:** A prospective study was conducted at a tertiary care hospital in SMS medical college, Jaipur. Standard protocols were followed for isolating & speciation of Enterococcus. As per CLSI (2021) guidelines antimicrobial susceptibility testing was done. **Results:** Out of Enterococcal isolates majority were Enterococcus faecalis (92%) and Enterococcus faecium were (8%). Among gender distribution, majorities (68%) were females and (32%) were males. High prevalence of Enterococcal infections were seen in the age group 21-40 years (52%) followed by 41-60 (34%). Among the Enterococcus isolated E. faecalis was the predominant species 92(92%) followed by E. faecium 8 (8%). All the isolates were susceptible to Linezolid and fosfomycin (100% each). Maximum resistance was seen against ampicillin and ciprofloxacin. In overall Enterococcus spp 23% strains were vancomycin resistant (VRE). Among Enterococcus spp. 35 (35%) strains were multidrug resistance. **Conclusion:** The appropriate infection control measures, use of antibiotics prescribed based on susceptibility pattern obtained and avoid the empiric use of antimicrobials by clinicians can prevent the burden of drug resistance in Enterococcus.

KEYWORDS

Enterococcus, Nosocomial infection, Antibiotic susceptibility

INTRODUCTION

Enterococci, an indigenous flora of the intestinal tract, oral cavity and the genitourinary tract of the humans, are known to be relatively virulent in healthy individuals, but have become important opportunistic pathogens, especially in hospitalized patients. [1]

Enterococcus species have become problem of the world as emerging nosocomial infection and multi drug resistance bacteria. [2]

In recent years it causes serious infections like urinary tract infection (UTI), endocarditis, bacteremia, intra-abdominal infections, and sepsis etc. [3]

Now days it causes urinary tract infection (UTI), it is a serious health problem. In India, all age groups across the lifespan are affected.It is the most common cause of mortality and morbidity. The urinary tract both the upper and lower tract is involved. [4] *Enterococcus* predominantly affect urinary tract, the most frequent sites of infection are urethra and urinary bladder. For urinary tract infections women are more prone than man. A significant number of microorganism, usually $>10^5$ cells/ml of urine is called as UTI, are detected in properly collected mid-stream "clean catch" urine. [5,6]

A center for disease control (CDC) survey of nosocomial infection, *Enterococci* ranked third most common cause of hospital-acquired infections (HAI) after *Escherichia coli*, *S.aureus* and *Pseudomonas aeruginosa* and accounted for 13.9% of urinary tract infection. [7]

Among different species which belong to genus *Enterococcus*, *E. faecalis* is the most common isolate that has an association with 80–90% of human *Enterococcal* infection. *E. faecium* is also isolated from 10 to 15% of infections. [3]

In recent years there are increasing trend of resistance to commonly used antimicrobial agents such as penicillin, aminoglycoside, trimethoprim and also to glycopeptide such as vancomycin and teicoplanin created an increasingly worrisome problem in clinical practice. [4]

Due to the increasing level of antimicrobial resistance, treatment of UTI has thrown up a lot of challenges in over the years. [8]

The study was designed to determine the antimicrobial susceptibility pattern of different isolated species of *Enterococci* causing UTI.

MATERIAL AND METHODS:

In this study a total 100 isolates of *Enterococcus* from urine samples were tested. Urine of suspected urinary tract infection patients of outpatient and inpatient department of Microbiology of SMS Medical College, Jaipur, Rajasthan, from September 2021 to February 2022 included in this study.

Specimens of urine were collected in universal containers. Mid stream clean catch urine sample was preferably collected. The urine specimens having pus cells (more than 5 cells per high power field from un-centrifuged urine) on microscopy were included. Culture of urine samples was done by semiquantitative method. They were sub cultured on blood agar and Mac-Conkey plates and incubated at 37°C for 24 hrs. All suspected colonies were identified by standard microbiological methods including gram staining, catalase test and esculin hydrolysis test, growth in 6.5% NaCl.

Identification Of Species

Enterococcal strains were identified to the species level by using conventional physiological tests devised by Facklam and Collins7 which are based on carbohydrate fermentation using 1% solution of following sugars: mannitol, arabinose, raffinose, and; pyruvate. [9]

Antimicrobial Susceptibility Testing:

As per CLSI 2021 guidelines [11], antimicrobial susceptibility testing were performed with Piperacillin- Tazobactem, Ciprofloxacin, Fosfomycin, Nitrofurantoin, High level Gentamicin, Vancomycin and Linezolid using standard disk diffusion method (Kirby- Bauer sensitivity test). All tests were performed on Muller Hinton agar and results read after 24 hrs of incubation at 37°C. [10]

Vancomycin is the main antimicrobial agent to treatment of *Enterococcus*.

Vancomycin is a powerful antimicrobial agent used to treat Gram positive bacterial infections. Now a day's resistance to this antibiotic is very common. The most common vancomycin resistance phenotype among VRE is high-level resistance that occurs through acquisition of vanA & vanB genes, usually in *E. faecium* and *E. faecalis.*

Genes encoding the VanA and VanB phenotypes are carried on transposons that may be inserted into the chromosome or into plasmids.

RESULTS

A total of 100 *Enterococcus* strains were isolated from urine samples during the study period. Isolation of *Enterococcus* spp. were more in

female patients 68 (68%) than males 32 (32%). High isolation rate of *Enterococcal* infection was seen in the age group 21-40 years (52%) followed by 41-60 (34%), 0-20 (10%) and >61(4%) age groups (Figure 1). In this present study among the *Enterococcus* isolated *E. faecalis* was the predominant species 92 (92%) followed by *E. faecium* 8 (8%) (Figure 2). In the present study all *Enterococcus* strains were showed 100% susceptibility against linezolid and fosfomycin both. Among *E. faecalis* (92) maximum susceptibility was showed to linezolid and fosfomycin both (100% each) followed by nitrofurantoin (91.3%), vancomycin (77.17%) (Figure 3). Among urinary isolates least susceptibility was observed with ampicillin (53%) and ciprofloxacin (52%).

Among *E. faecium* (8) maximum susceptibility was showed to linezolid, and nitrofurantoin (100% each) followed by vancomycin and high level gentamicin (87.5% each).

In the present study among *Enterococcus* spp. 35 (35%) strains were multidrug resistance.

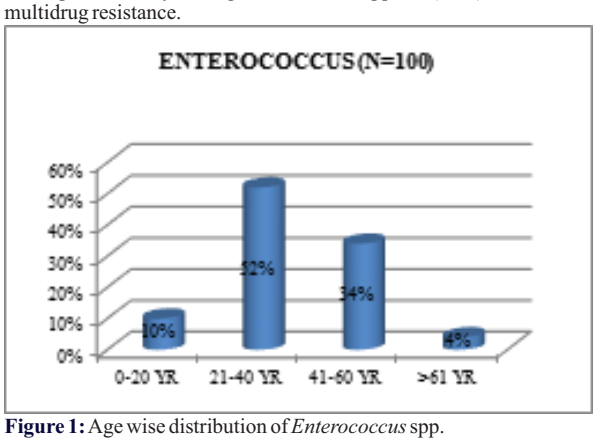

Figure 1: Age wise distribution of *Enterococcus* spp.

Among 100 *Enterococcus* isolates 35% were multi drug resistance (MDR). Out of which 34 were *Enterococcus faecium* and only 1 isolate was *Enterococcus faecalis*.

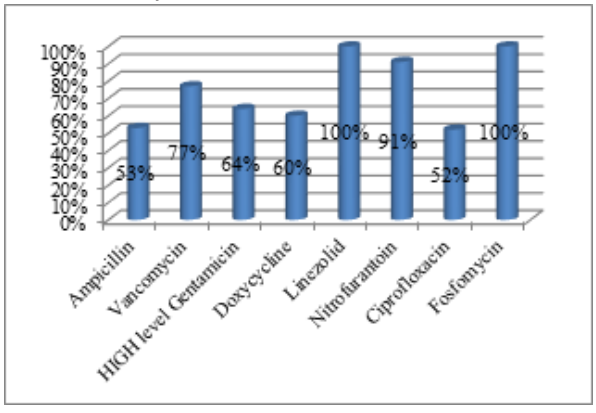

Figure 2: Antimicrobial susceptibility pattern of *E.faecalis*

DISCUSSION

Enterococci are the commensals of the human intestinal flora. In hospitalized patients, main site of colonization are soft tissue wounds, ulcers, and the gastrointestinal tract. *Enterococci* were traditionally regarded as low-grade pathogen, but now have emerged as an increasingly important cause of nosocomial infections.[12]

In the current study, *Enterococcal* UTI was more frequent than has been reported in other studies. In this study, females were more affected (68%) to *Enterococcal* infection as compared to male 32%. This is comparable with the study carried out by Shrivastav *et al.* [13] in which the number of females infected with *Enterococcal* infection was more (72%) than number of males (28%).

In this study, the highest prevalence of *Enterococcal* infection was seen in the age group 21-40 was 52%. Similar findings of higher infection rate in the age group 21-40 years were reported by Bose *et al.* [14]. This study is comparable with the study of Tayebi *et al.* [15] and Jombo *et al.* [16] in which *Enterococcus* sp. was 8.7% and 12.4%, respectively. In present study, *Enterococcus* isolates from the various clinical samples were sensitive to linezolid (100%), and vancomycin (77%). This study is comparable with the study carried out by Abdulla and Abdulla *et al*, [17] in which sensitivity of vancomycin and teicoplanin was 99.1% each.

Overall prevalence of vancomycin resistant *Enterococci* based on the standard micro broth dilution (MBD) method was 23%.

CONCLUSION

Thus, the present study highlights the prevalence of *E. faecalis* in our hospital. It causes UTI infection, which is highly prevalent among females than males. But recently due to its capability of causing variety of infections, especially in hospitalized patients and difference in antimicrobial susceptibility of each species to varying antimicrobial agents has led to understand the importance of identification of *Enterococcus* to species level.

In present study *Enterococcus* showed the high susceptibility to the vancomycin, so, it is the drug of choice, limiting the use of linezolid only in the case of vancomycin-resistant *Enterococcus*.

Thus, we suggest intensified actions to promote the rational use of antibiotics in health care settings, more surveillance studies in order to monitor changes in *Enterococcal* resistance patterns and the adoption of measures to prevent the spreading of resistance isolates.

Alarming rise in prevalence multidrug resistance strains warrants immediate, adequate, and efficient surveillance program to prevent and control its spread.

REFERENCES

1. Murray BE. The life and Time of the *Enterococci*. Clinical Microbiology review.1990; 3:46-65
2. Silverman J, Thal LA, Perri MB, Bostic G, Zervos MJ. Epidemiologic evaluation of antimicrobial resistance in community-acquired Enterococci. J Clin Microbiol. 1998;36(3):830–2.
3. Moellering RC Jr. Emergence of enterococci as a significant pathogen. *Clin Infect Dis*. 1992; 14: 1173 -1178
4. Foxman B, Barlow R, D'Arcy H, Gillespie B, Sobel JD. Urinary tract infection: Self-reported incidence and associated costs. Ann Epidemiol 2000;10:509-15.
5. Barret SP, Savage MA, Rebec MP, Guyot A, Andrews N, Shrimpton SB. Antibiotic sensitivity of bacteria associated with community acquired urinary tract infection in Britain. J Antimicrob Chemother 1999;44:359-65.
6. Williams DN. Urinary tract infection: Emerging insights into appropriate management. Postgrad Med 1996;99:189-92, 198-9.
7. Centres for Disease Control. (1989-1993) Nosocomial *enterococci* resistant to vanomycin: United States, National Nosocomial Infection Surveilance. MMWR. 1993; 42: 597 - 599.
8. Belet N, Islek I, Belet U, Sunter AT, Küçüködük S. Comparison of trimethoprim-sulfamethoxazole, cephadroxil and cefprozil as prophylaxis for recurrent urinary tract infections in children. J Chemother 2004;16:77-81.
9. Facklam RR and Collins MD. Identification of *Enterococcus* Species Isolated from Human Infections by a conventional test scheme. *J of Clin Microbiol*. 1989;27:731-734
10. Bauer AW, Kirby WM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disk method. *Am J Clin Pathol*. 1966; 45(4):493-6
11. CLSI. Performance Standard for Antimicrobial Susceptibility Testing Twenty-second Informational Supplement. CLSI Document M100-S22. PA: Clinical and Laboratory Standard Institute; 2012. p. 92-4.
12. S, Malhotra M, Das BK, Kapil A. *Enterococal* infection and antimicrobial resistance. Indian J Med Res. 2008; 128: 111-21.
13. Shrivastav P, Mehta R, Nirwan SP, Sharma M, Dahiya SS. Prevelance and antimicrobial susceptibility of *Enterococcus* species isolated from clinical samples in a tertiary care hospital of North India. Natl J Med Res 2013;3:389-91.
14. Bose S, Ghosh KA, Baraptre R. Prevalence of drug resistance among *Enterococcus* Spp isolated from a tertiary care hospital. Int J Med Health Sci 2012;1:38-43.
15. Tayebi Z, Seyedjavadi SS, Goudarzi M, Rahimi KM, Boromandi S, Bostanabad SZ, *et al*. Frequency and antibiotic resistance pattern in gram positive uropathogens isolated from hospitalized patients with urinary tract infection in Tehran, Iran. J Genes Microbes Immunity 2014;2014:1-9.
16. Jombo GT, Emanghe UE, Amefule EN, Damen JG. Urinary tract infections at a Nigerian University Hospital: Causes, pattern and antimicrobial susceptibility profile. J Microb Antimicrob 2011;3:153-9.
17. Abdulla EF, Abdulla ME. Antibiotic option for *Enterococcus faecalis* infections. Pak J Med Sci 2006;22:286-90.