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Emerging trends of Enterococcal isolates in a tertiary care hospital

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ABSTRACT
Background: Enterococci, commensals of the gastrointestinal and genitourinary tracts, have become significant nosocomial pathogens. Enterococcus faecalis and Enterococcus faecium are the most commonly isolated species, with rising antimicrobial resistance, thus posing a major concern. Objectives: To determine the antibiotic susceptibility patterns of Enterococcus species and review resistance trends over five years (2019–2024) in a tertiary care hospital. Methods: Enterococcus isolates were identified and tested using the Vitek 2 Compact system. A retrospective data review was conducted to analyze resistance trends. Results: Among 76 isolates, E. faecalis (55.26%) was predominant, followed by E. faecium (38.16%) and E. gallinarum (6.58%). VRE prevalence rose from 5.75% to 35.53%, with Van A phenotype increasing from 46.15% to 81.48%. Resistance to Linezolid, Vancomycin, Nitrofurantoin, Tetracycline and Tigecycline increased, while susceptibility to Ciprofloxacin and Gentamicin improved. Conclusion: E. faecium showed higher resistance than E. faecalis, with a notable rise in vancomycin-resistant strains. Tigecycline and linezolid remained effective. The increasing resistance highlights the need for antimicrobial stewardship and judicious antibiotic use.

Keywords: Vancomycin; Enterococci; Trends

I. INTRODUCTION:

Enterococci form the normal microbiota of GI and biliary tracts, vagina, and male urethra. However, they can cause complicated UTIs, bacteremia, endocarditis, intra-abdominal and pelvic infections, wound and soft tissue infections, neonatal sepsis, and rarely meningitis.[1]

Enterococcus faecalis and Enterococcus faecium are the most frequently isolate from human specimens[2]. Enterococcus gallinarum has been isolated from cases of bacteremia, hemodialysis-associated infections, native valve endocarditis, arthroplasty-associated infections, and meningitis.[3]

A major problem with Enterococci is its antibiotic resistance. They show intrinsic, low-level resistance to aminoglycosides and lincosamides (due to acquisition of transposon encoding an aminoglycoside-modifying enzyme), high level streptomycin resistance (due to ribosomal mutation or acquisition of aminoglycoside nucleotidyltransferase), have high MIC for penicillin and cephalosporin (due to diminished affinity of cell wall PBPs for these agents), and are resistant to sulfonamide in vitro. [4]

Acquired glycopeptide resistance in Enterococcus species. corresponds to 11 different van gene clusters based on DNA sequences and organization, for example van A, B and C.[3]

The emergence and dissemination of multidrug-resistant Enterococcus strains, including vancomycin-resistant enterococci (VRE), pose a significant challenge to infection control and patient management strategies. This review aims to provide an overview of the current trends in resistance patterns among Enterococcus species and the factors contributing to the spread of antimicrobial resistance. This study was done in a tertiary care hospital to compare the trends of resistance pattern over 5 years in Enterococci (2019- 2024).

AIM & OBJECTIVES:

1. To isolate and determine antibiotic susceptibility pattern of Enterococcus species.
2. To review the temporal changes in their antibiotic resistance over a period of 5 years (2019-2024).

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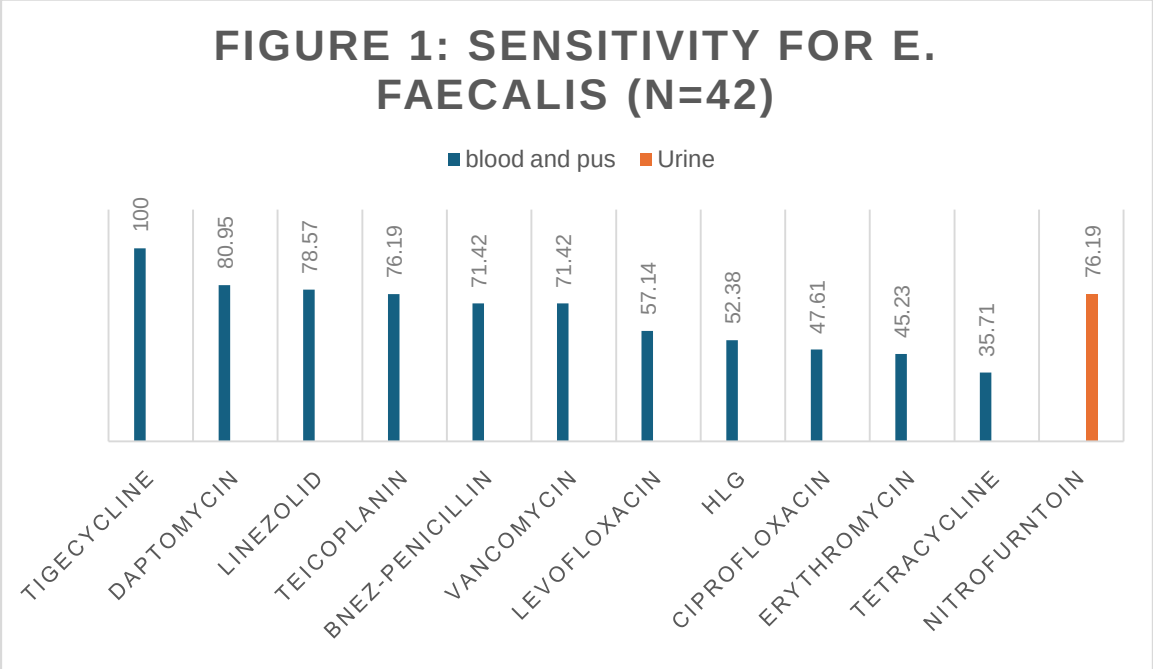
METHOD:
Identification and antimicrobial susceptibility testing of positive cultures was by Vitek 2 Compact (Biomerieux). A computerized data review was done to note changes in antibiotic resistance pattern for Enterococcus, if any.

II. RESULTS:

A total of 76 Enterococcal isolates were studied. Males showed predilection to the infection (n= 47, 61.84%) in comparison to females (n= 29, 38.16%). Age group of 40-60years were most affected (n=32,42.11%) followed by 60-80years (n=25,32.89%). Most number of isolates were from wards (n=46,60.53%) followed by ICU (n=26,34.21%) and OPD (n=4,5.26%).Majority of isolates were from blood, (n=34,44.73%) followed by exudates (n=22,28.95%) and urine (n=20,26.32%).

E. faecalis accounted for 42(55.26%) isolates, followed by 29(38.16%) E. faecium and 5(6.58%) E. gallinarum. Vancomycin Resistant Enterococcus (VRE) faecalis were 12 (28.57%) and Vancomycin Resistant Enterococcus (VRE) faecium were12 (41.38%).Among the Van gene phenotypes, 22 (82%) were Van A, 2 (7%) were Van B and 3 (11%) were Van C phenotypes.

In this study, E faecalis was most susceptible to Tigecycline (100%) followed by Daptomycin (80.95%) and Linezolid (78.57%). Among the isolates from urine. 76.19% were susceptible to Nitrofurantoin.This is shown in Figure 1 below.



Isolates of E. faecium were most susceptible to Tigecycline (96.55%) followed by Linezolid(75.86%), Teicoplanin (62.06%), and Vancomycin(58.62%). On the contrasy only 7 % of E. faecium isolated from urine were susceptible to Nitrofurantoin. This is depicted in Figure 2 below.E. gallinarum was most susceptible to Tigecycline(100%) followed by Linezolid(80%) and Teicoplanin(60%).

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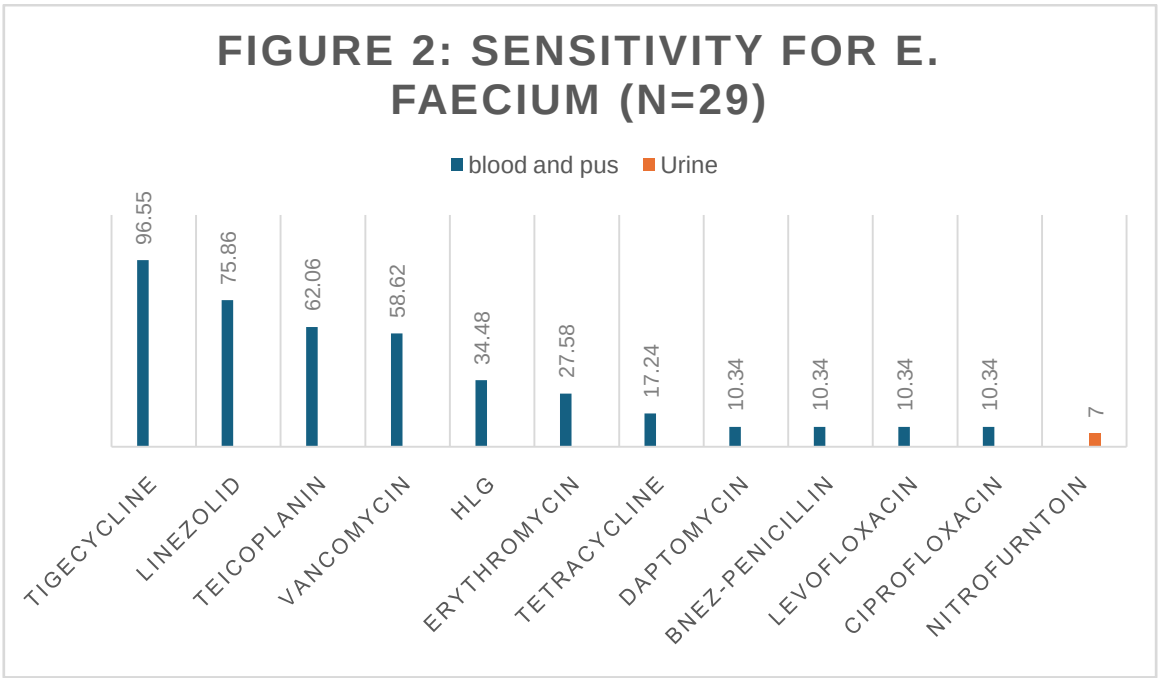
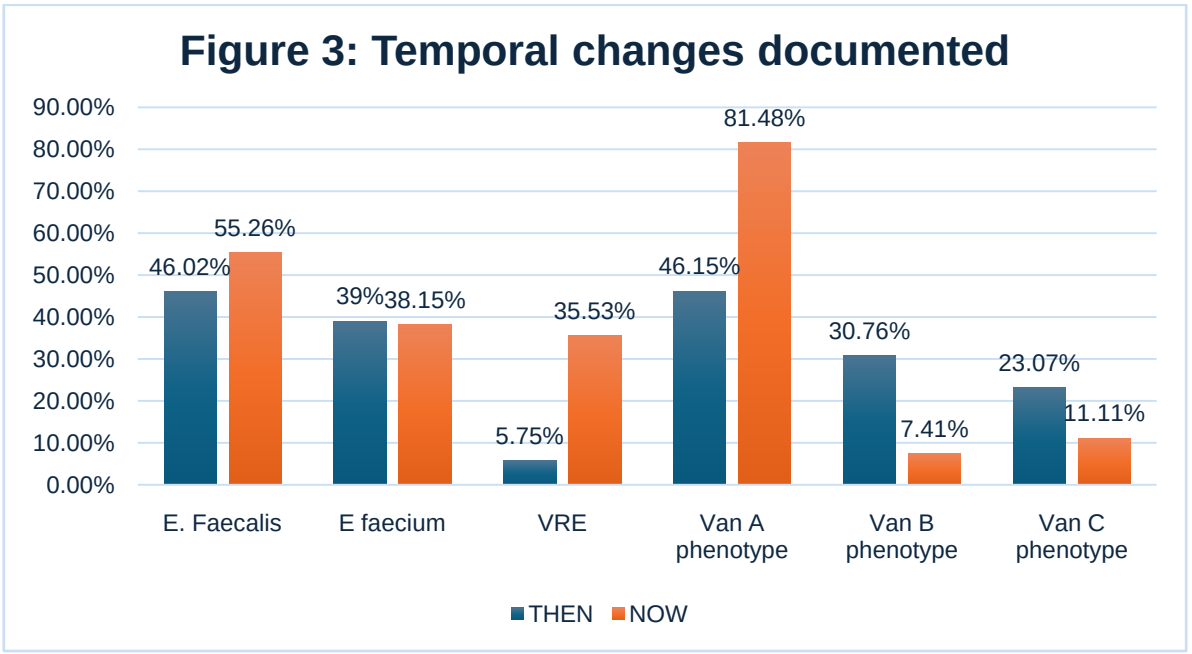


E. faecalis remained the predominant species throughout the 5 years. However, E. faecalis: E. faecium ratio has increased from 1.18:1 to 1.45:1. VRE has increased from 5.75% to 35.53% in a span of 5 years. Van A phenotype has increased from 46.15% to 81.48%, whereas Van B and Van C has decreased from 30.76% to 7.41% and 23.07% to 11.11% respectively. The changes documented are shown in Figure 3 below.



As shown in Figure 4 below, resistance to Tetracycline, Nitrofurantoin, Teicoplanin, Vancomycin, Linezolid, and Tigecycline has increased. On the contrary, there was an improvement in the susceptibility of Ciprofloxacin, High-level Gentamicin, and Levofloxacin over the last 5 years.

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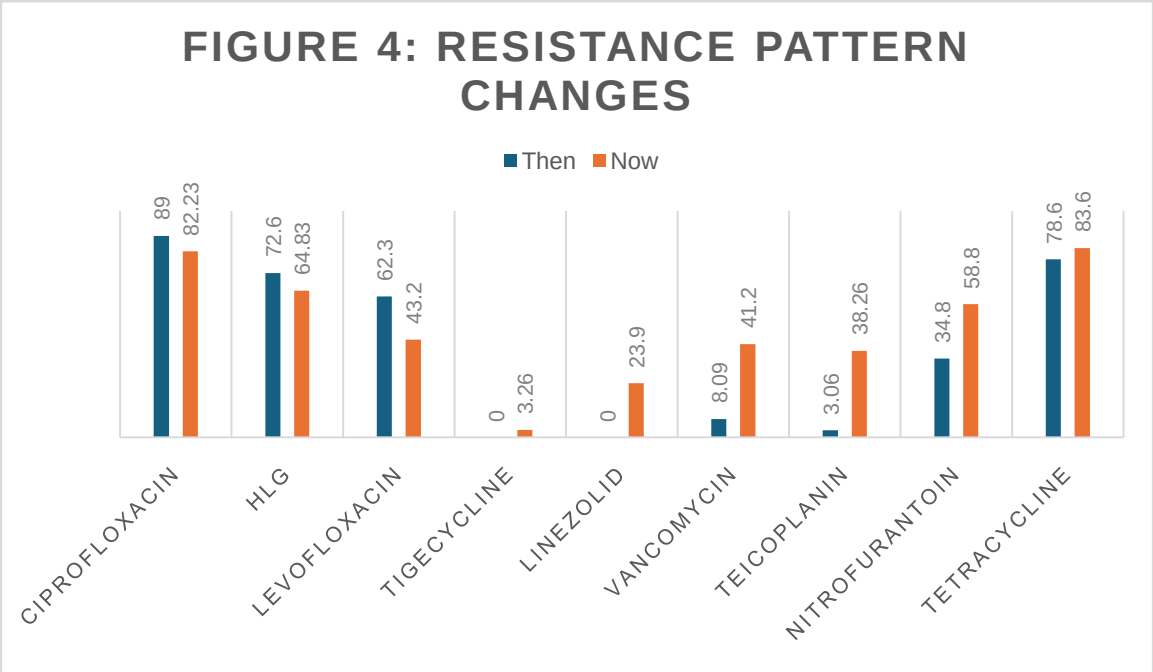

III. DISCUSSION:

In the present study, the most common Enterococcal species isolated was Enterococcus faecalis which was similar to the studies Tripathi et. al. and Yadav et. al. [2,3].

Highest proportion of antimicrobial susceptibility of Enterococcus faecalis as well as Enterococcus faecium was found to be for Tigecycline followed by Linezolid for isolates from blood and pus. This was similar to the findings of Karna et. al. [5]. Most of urinary strains of E. faecalis were susceptible to Nitrofurantoin. This finding did not correlate with the findings of Meena. S. et. al.[6], whose study showed no significant difference between two species for susceptibility towards nitrofurantoin. This could be explained by prior antibiotic usage in the patients rendering the uropathogenic enterococci resistant to the drug.

Majority of VREs were Enterococcus faecium. This was similar to most of the studies[3,5]. The rationale behind this was explained to be Enterococcus faecium exhibiting a higher propensity for acquiring and disseminating vancomycin resistance genes compared to Enterococcus faecalis, owing to its genetic flexibility and adaptability.

Over the past 5 years, there has been an increase in resistance to Nitrofurantoin, Linezolid, Vancomycin Teicoplanin which was similar tothe study done by Karna et. al.[5]. The reason behind this could be explained by continuous overuse of these drugs in the hospitalor prior exposure to antibiotics before visiting the hospital.Resistance to Ciprofloxacin, High-level Gentamicin has reduced in the past 5 years in the present study. This correlated well with the findings of Horner C et. al. [7]The most likely reason for reversal of antimicrobial resistance to Ciprofloxacin and High-level Gentamicin could be due to their long-term restriction that neutralizes the selective advantage of resistance and restores widespread sensitivity over time, thus resulting in selective inversion of resistance.

IV. CONCLUSION:

The present study concludes that the drug resistance of E. faecium was more in comparison to E. faecalis. Van A is the most common phenotype seen. Linezolid and tigecycline have a better antimicrobial effect against Enterococcal isolates from blood and pus.Enterococcus faecalis isolated from urine were susceptible to Nitrofurantoin. Yet, there was an increase in the resistance pattern of Enterococcus to these drugs. Resistance to Ciprofloxacin and High-level Gentamicin has reduced in the past 5 years.

Thus, a robust empirical and definitive treatment of enterococcal infection should be encouraged which can be achieved byantimicrobial stewardship programme and educating the patients and clinicians regarding detrimental effects of antibiotic resistance due to unnecessary overuse.By

fostering interdisciplinary collaboration and adopting a One Health approach, stakeholders can work together to mitigate the impact of enterococcal resistance on human health and promote the judicious use of antimicrobial agents.

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Conflict of interest:
The authors confirm that this work is independent and free from any external pressures that might have affected the results or conclusions drawn in the study.

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LEGEND OF FIGURES:
1. Figure 1: Sensitivity for E. faecalis (n=42)
2. Figure 2: Sensitivity for E. faecium(n=29)
3. Figure 3: Temporal changes documented
4. Figure 4: Resistance pattern changes