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Surveillance of Antimicrobial Resistance and Multidrug-Resistant Pathogens in a Tertiary Care Hospital, Chengalpet District, Tamil Nadu

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Abstract
Antimicrobial resistance (AMR) is a growing global health crisis, with Enterococcus species emerging as significant multidrug-resistant pathogens in community and hospital settings. However, regional surveillance data from southern India remains scarce. To assess the prevalence of antibiotic resistance and analyse resistance patterns of Enterococcus and other bacterial isolates from clinical specimens in a tertiary care hospital in Chengalpet District, Tamil Nadu. We conducted this observational study at a Tertiary Care Hospital X, attached to the Medical College XX, in Chengalpet District, Tamil Nadu, from January 2021 onward. 110 clinical samples were processed using standard microbiological methods, including urine, pus, sputum, blood, and other fluids. Isolates were identified, and antibiotic susceptibility testing was performed using the Kirby-Bauer disk diffusion method according to CLSI guidelines. Resistance trends were analysed per organism and specimen type. Multidrug resistance (MDR) was defined as resistance to =3 antibiotic classes. Statistical analysis included Chi-square and Fisher's exact tests ($p < 0.05$ significant). Enterococcus was the most frequently isolated organism (69.1%), followed by Streptococcus spp. (12.7%) and MRSA (1.8%). High resistance was observed to Ampicillin (85.1%) and Ciprofloxacin (60%) in Enterococcus, while Vancomycin (87.5%) and Linezolid (100%) retained efficacy. Resistance varied significantly across specimen types ($p < 0.05$), with urine and blood isolates showing the highest resistance rates. MDR was identified in 35.5% of Enterococcus, 35.7% of Streptococcus spp., and 50% of MRSA isolates. However, the overall difference in MDR prevalence between organisms was not statistically significant ($p = 0.915$). This study highlights a high burden of Enterococcus-associated infections with substantial multidrug resistance, particularly in urinary and bloodstream isolates. Resistance patterns varied significantly by specimen type, underscoring the importance of localised antibiograms and site-specific empirical therapy. Continued microbiological surveillance and robust antibiotic stewardship are imperative in this setting.

INTRODUCTION

Global escalation in the annals of Antimicrobial Resistance (AMR) seemingly represents one of the more daunting public health emergencies. The effectiveness and compliance of common infectious diseases may be impaired, while the additional morbidity, mortality, and costs to healthcare would inevitably follow[1,2]. Infection-causing bacterial pathogens, including hospital-acquired infections and community-acquired infections, have revealed an unprecedented resistance rise to widely effective antibiotics[3,6]. Most alarming and difficult to combat is the organisms' proclivity to acquire and spread plasmids of resistance, which puts nosocomial and community-based treatment in a dire situation. The situation is exacerbated by a recently reported increase in the prevalence of vancomycin-resistant Enterococcus and highlevels of resistance to Ampicillin and Ciprofloxacin among strains of multidrug-resistant enterococci. Sufferers also confront highly differentiated resistance blueprints between and within various regions of the HUESA-affected country, which may affect prescription policies, contamination, and resistance to preventive testing. Given the variability, it is imperative to collect localised, regional datasets to guide clinicians in selecting empiric antibiotic regimens and board-gathered antibiograms-affiliated updates. Chengalpet, a District in south India, was reflected in the notable lack of data related to resistance in the local publication[7,12]. The unknown formula hampers the chances for data-driven antibiotic stewardship, because it is both necessary, as Enterococcus is commensal by nature, while the opposite also occurs at high frequencies; thus, it is critical to understand the resistance portrait of those assays. Numerous Indian publications report flowering rates of HLA, fluoroquinolone, and vancomycin resistance among Indian isolates[12-16]. However, both types lack the analysis necessary to document the statistical significance of resistance profiles, which leads to a differentiation in the prophylactic plan of source-related isolates[17,18].

Therefore, the article was designed to evaluate the epidemiology of bacteria isolated from clinical samples and resistance patterns to those and other medicines in an HUESA-resistant tertiary clinical centre.Essential focus was placed on Enterococcus species patients' representative trends, patterns, the growth of multidrug resistance, and mitigation.

MATERIALS AND METHODS

We conducted this hospital-based observational study in the Tertiary Hospital X, attached to theMedical College and Research Institute XX, in Chengalpet District, Tamil Nadu, India. All clinical specimens arriving at the microbiological laboratory from in-patients and out-patients received over a defined period from January 2021 were included. The study included fresh samples submitted to the microbiology laboratory for routine culture and sensitivity testing, without regard to any specific age, sex, or clinical criterion. In total, 110 clinical specimens, comprised of various types of urine, pus, blood, sputum, and other body fluids, including pleural fluid, stool, endotracheal aspirate, etc. were analysed. The specimens were immediately processed in the microbiology laboratory following standard bio-safety and aseptic handling protocols. The isolated organisms were identified using colony morphology, Gram's staining, and standard biochemical tests. Antibiotic susceptibility testing was performed to test all the isolated organisms using the Kirby-Bauer method on Mueller-Hinton agar as per the Clinical and Laboratory Standards Institute guidelines. All bacteria were tested against Ampicillin, Cefotaxime, Ciprofloxacin, Gentamicin, Vancomycin, Linezolid, Doxycycline, Nitrofurantoin, and other antibiotics. The zone diameters were measured and interpreted as Sensitive, Intermediate, or Resistant according to break point standards of CLSI. The antimicrobial resistance profile for each bacterial isolate was recorded. Multidrug resistance was defined when the resistance is found against three or more different classes of antibiotics.

The prevalence of resistance was also divided by type of specimen taken, and especially for Enterococcus, which was the most common isolate, the growing pigs resistance history was studied. The sample type computed the resistance patterns, and a chi-square test was used to check for significant correlation. The data were organised in Microsoft Excel, and the statistical analysis was done in Python using the SciPy library for hypothesis testing and Chi-square tests-Fisher's exact test to compare the complete pairwise MDR proportions. A p-value less than 0.05 was considered statistically significant. Data visualisation using bar graphs and dot plots was done with Seaborn and Matplotlib to understand better and interpretthe resistance trend. The Institutional Ethics Committee approved the ethical clearance for the study.

RESULTS AND DISCUSSIONS

Demographic and Clinical Characteristics of Patients (N = 110): A total of 110 patients were included in this study, drawn from both in-patient and out-patient services of the Tertiary Care Hospital X under the Medical College and Research Institute XX, Chengalpet district,Tamil Nadu.. The mean age of the patients was 47.7 ± 21.8 years, reflecting a diverse age group

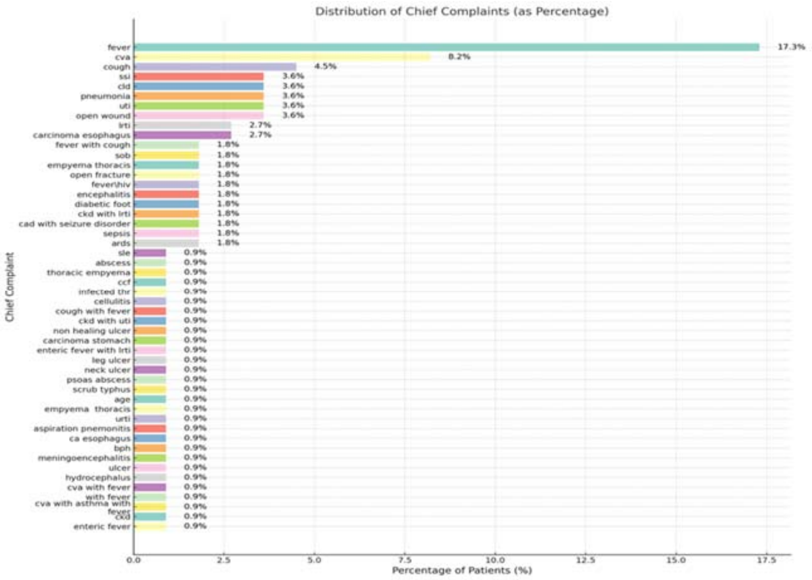

Fig. 1. Percentage Distribution of Chief Complaints Among Patients
A horizontal bar chart showing relative frequency of presenting complaints among patients (N = 110). CVA-Cerebrovascular Accident, SSI-Surgical Site Infection, CLD-Chronic Liver Disease, UTI-Urinary Tract Infection, LRTI-Lower Respiratory Tract Infection

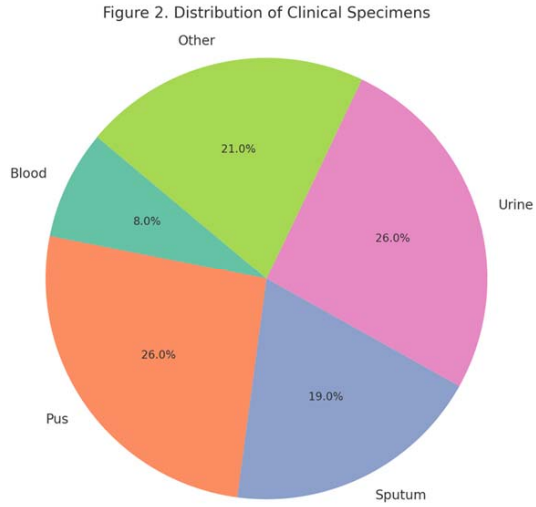

Fig. 2. Percentage Distribution of Clinical Specimens Collected
*A pie chart depicting the relative frequency of specimen types submitted for culture and sensitivity testing among patients (N = 110). **Pus:** Wound swabs, abscess discharge, **Urine:** Midstream clean catch or catheter sample, **Sputum:** Lower respiratory tract expectorate, **Blood:** Venipuncture samples for culture, Other: Endotracheal tube aspirate, pleural fluid, stool*

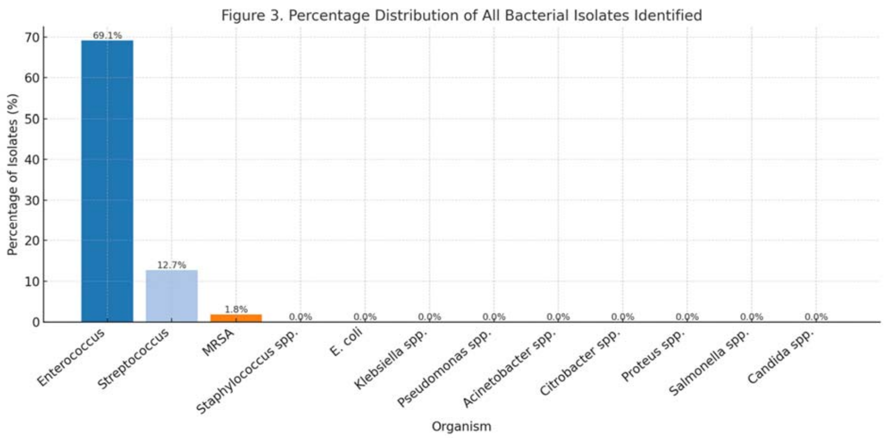

Fig.3: Percentage Distribution of All Bacterial Isolates Identified
Figure 3 showing the proportion of each bacterial species identified from clinical samples. Organisms not isolated are included for completeness.

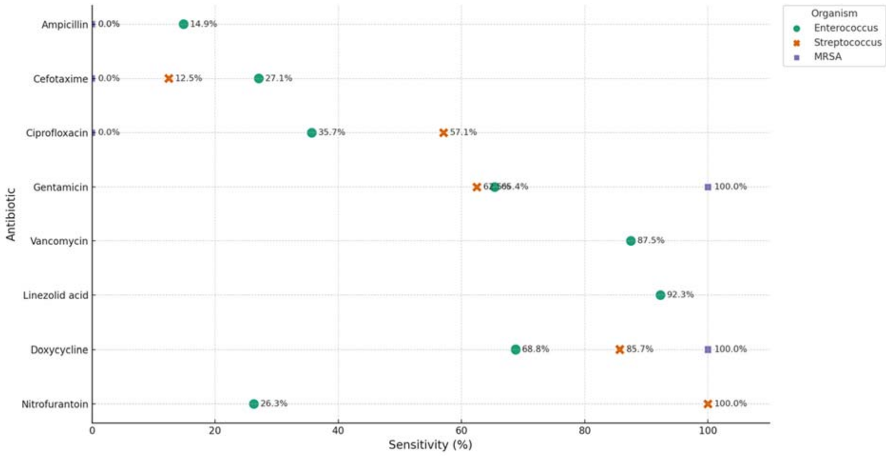

Fig. 4. Antibiotic Sensitivity for Major Bacterial Isolates

Figure 2 .illustrates the percentage sensitivity of Enterococcus, Streptococcus spp., and MRSA to selected antibiotics. Each dot is annotated with the exact sensitivity percentage. The plot highlights high resistance to ß-lactams and fluoroquinolones, especially among Enterococcus and MRSA, and emphasises retained susceptibility to Vancomycin, Linezolid, Doxycycline, and Gentamicin.

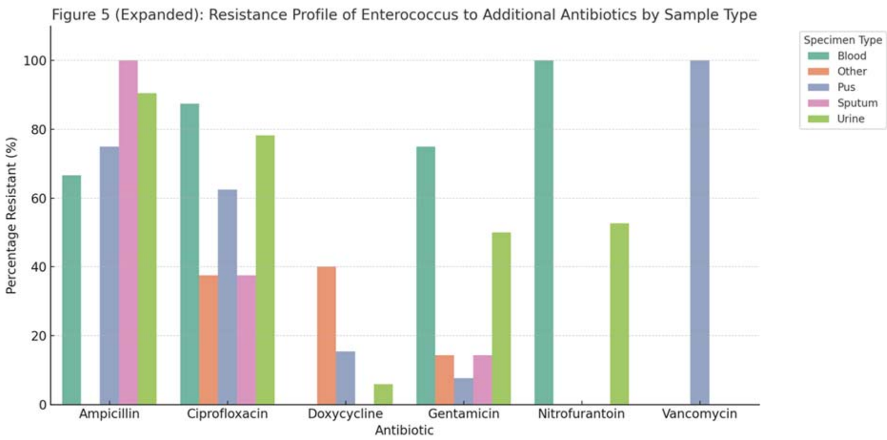

Figure 5. Resistance Profile of Enterococcus by Sample Type

A grouped bar chart comparing the percentage resistance of Enterococcus isolates across specimen types to Ampicillin, Ciprofloxacin, and Gentamicin. Higher resistance was observed in blood and urine isolates, while resistance was lowest in sputum, pus, and other specimens. Bars are color-coded by specimen type, and all values are plotted on a uniform 0–100% scale.

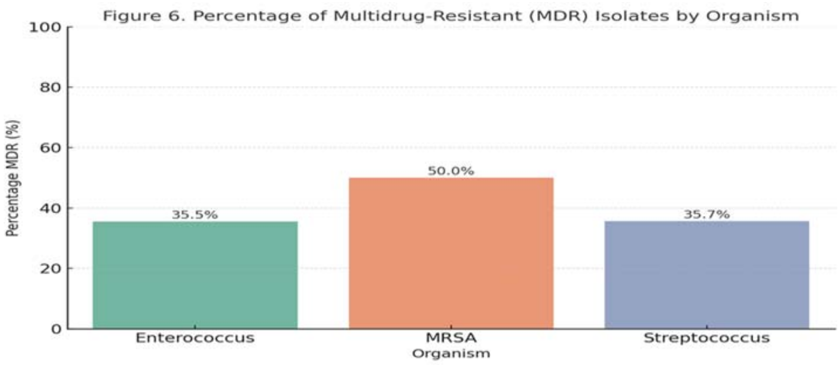

Figure 6. Percentage of Multidrug-Resistant (MDR) Isolates by Organism

A vertical bar chart illustrating the proportion of MDR isolates among the three major pathogens. Though MRSA appears highest (50%), statistical tests confirm no significant difference across organisms.

ranging from pediatric to elderly. As shown in Table 1, gender distribution was nearly equal, with females accounting for 50.9% and males for 48.2%. Most patients were adults, with 57.3% aged between 21 and 60. The most frequently recorded chief complaints at the time of sample collection included fever (17.3%), cerebrovascular accidents (8.2%), and respiratory symptoms such as cough (4.5%). Other notable

Table 1. Demographic and Clinical Characteristics of Patients (N = 110)

Variable	Category	Count (n)	Percentage (%)
Gender	Female	56	50.9
	Male	53	48.2
	Not specified	1	0.9
Age Group	<20 years	10	9.1
	21–40 years	34	30.9
	41–60 years	29	26.4
	>60 years	28	25.5
	Mean age (± SD)	47.7 ± 21.8	—
Chief Complaint	Fever	19	17.3
	CVA	9	8.2
	Cough	5	4.5
	Surgical Site Infection	4	3.6
	Chronic Liver Disease	4	3.6

Mean age presented with standard deviation. Chief complaints were extracted from admission records. Only the top five complaints are displayed.

Table 2. Bacterial Isolates Identified from Clinical Samples (N = 110)

Organism	Count (n)	Percentage (%)	Cumulative (%)
Enterococcus	76	69.1	69.1
Streptococcus spp.	14	12.7	81.8
MRSA	2	1.8	83.6
All others	0	0.0	100.0

Organism identification is based on recoding of the "Microorganism isolated" column. Percentages are calculated out of total valid clinical samples (N = 110). Organisms not isolated are listed with 0%.

Table 3. Antibiotic Susceptibility Profiles of Major Bacterial Isolates (N = 92)

Antibiotic	Enterococcus (n = 76)	Streptococcus spp. (n = 14)	MRSA (n = 2)
Ampicillin	14.9% S / 85.1% R (n = 47)	0% S / 100% R (n = 7)	0% S / 100% R (n = 1)
Cefotaxime	27.1% S / 70.8% R (n = 48)	12.5% S / 87.5% R (n = 8)	0% S / 100% R (n = 1)
Ciprofloxacin	35.7% S / 60.0% R (n = 70)	57.1% S / 42.9% R (n = 14)	0% S / 100% R (n = 2)
Gentamicin	65.4% S / 26.9% R (n = 52)	62.5% S / 37.5% R (n = 8)	100% S / 0% R (n = 1)
Doxycycline	68.8% S / 8.3% R (n = 48)	85.7% S / 14.3% R (n = 7)	100% S / 0% R (n = 1)
Vancomycin	87.5% S / 12.5% R (n = 8)	Not Tested	Not Tested
Linezolid	100% S / 0% R (n = 2)	Not Tested	Not Tested
Nitrofurantoin	71.1% S / 28.9% R (n = 45)	75.0% S / 25.0% R (n = 8)	Not Tested

S = Sensitive, R = Resistant. Values are percentages of isolates tested per organism-antibiotic pair. Intermediate results (<5%) excluded for clarity. "Not Tested" indicates no valid tests available.

Table 4. Resistance Profile by Sample Type (Enterococcus Isolates)

Antibiotic	Blood	Pus	Urine	Sputum	Other
Ampicillin	66.7%	75.0%	90.5%	100.0%	0.0%
Ciprofloxacin	87.5%	62.5%	78.3%	37.5%	37.5%
Gentamicin	75.0%	7.7%	50.0%	14.3%	14.3%
p-value	0.0036	0.0036	0.0036	0.0036	0.0036
p-value	0.0148	0.0148	0.0148	0.0148	0.0148

Values represent the percentage of Enterococcus isolates resistant to each antibiotic, stratified by specimen type. P-values calculated using Chi-square test for independence. Duplicate rows reflect separate statistical tests per antibiotic.

Table 5. Multidrug Resistance Summary with Statistical Analysis

Organism	Non-MDR	MDR	Total Isolates	% MDR	Chi-square p-value
Enterococcus	49	27	76	35.5%	0.915
MRSA	1	1	2	50.0%	0.915
Streptococcus	9	5	14	35.7%	0.915

MDR defined as resistance to =3 antimicrobial classes. Chi-square p-value refers to overall test comparing all organisms. Fisher's exact p-values for all organism pairs = 1.000.

Table 6. Comparative Analysis of Enterococcus Resistance Patterns: Present Study vs. Atray *et al*. (2017)

Parameter	Present Study	Atray et al., 2017 (Southern Rajasthan)
Study Design	Hospital-based observational study (Nov 2021)	Cross-sectional observational study
Total Enterococcus Isolates	76	100
Most Common Specimen Source	Urine (50% of isolates)	Urine (50% of isolates)
Ampicillin Resistance	85.1%	Not reported
Ciprofloxacin Resistance	60.0%	70%
Vancomycin Resistance (VRE prevalence)	12.5%	11%
Doxycycline Resistance	31.2%	14%
Nitrofurantoin Resistance	28.9%	Not tested
Multidrug Resistance (MDR) Prevalence	35.5%	Not numerically defined; described as "frequent"
Statistical Significance (MDR by Organism)	$\chi^2 = 0.18$, $p = 0.915$	Not analysed

VRE – Vancomycin-resistant Enterococcus. MDR – Multidrug-resistant. Atray D. et al., Int J Curr Microbiol App Sci, 2017.

presentations were surgical site infections (3.6%) and chronic liver disease (3.6%). The distribution of all recorded chief complaints is depicted in Figure 1, using percentages for more precise comparison.

Distribution of Clinical Specimens: Clinical specimens were collected from 110 patients for microbiological analysis. The most frequently submitted samples were pus (23.6%) and urine (23.6%), followed by sputum (17.3%), and other fluids including endotracheal tube aspirates, pleural fluid, and stool (19.1%). Blood samples constituted the smallest proportion at 7.3%, reflecting selective use of blood cultures in systemic illness. The specimen distribution is illustrated in Figure 2, highlighting a diverse set of infection sources.

Bacterial Isolates Identified from Clinical Samples: Among the 110 clinical samples analysed, Enterococcus was the most commonly isolated microorganism, identified in 69.1% of cases. This was followed by Streptococcus spp. (12.7%) and MRSA (1.8%). No isolates of E. coli, Klebsiella spp., Pseudomonas spp., Acinetobacter spp., or other gram-negative bacilli were detected in this sample set. The complete distribution of identified organisms, including those not isolated in the current cohort, is summarised in Table 2 and visually represented in Figure 3. The predominance of gram-positive cocci, particularly Enterococcus and Streptococcus, suggests a potential focus on urinary and soft-tissue infections among the studied population. The absence of gram-negative isolates may reflect a true trend, limitations in sampling, or microbiological detection variability.

Organism identification is based on recoding of the "Microorganism isolated" column. Percentages are calculated out of total valid clinical samples (N = 110). Organisms not isolated are listed with 0%.

Antibiotic Susceptibility Profiles of Major Bacterial Isolates: A total of 92 bacterial isolates from the 110 clinical specimens underwent antibiotic susceptibility testing. The predominant organisms included Enterococcus (n=76), Streptococcus spp. (n=14), and MRSA (n=2). The antibiotic sensitivity profiles of these isolates are summarised in Table 3 and illustrated visually in Figure 4. Enterococcus demonstrated a high level of resistance to ß-lactam antibiotics, with only 14.9% sensitivity to Ampicillin and 27.1% to Cefotaxime. Fluoroquinolone resistance was also substantial, with 60% of isolates resistant to Ciprofloxacin. However, good susceptibility was retained for Vancomycin (87.5%), Doxycycline (68.8%), and Linezolid (100%), suggesting these remain the most viable options for empirical treatment of severe enterococcal infections in this setting. Streptococcus spp. also exhibited marked resistance to first-line agents, with 100% resistance to Ampicillin and 87.5% to Cefotaxime, limiting the role of penicillins and cephalosporins in treatment. However, it remained relatively susceptible to Doxycycline (85.7%), Ciprofloxacin (57.1%), and Gentamicin (62.5%), providing alternative therapeutic options. Although limited to two isolates, MRSA followed the expected multidrug-resistant pattern, showing complete resistance to Ampicillin, Cefotaxime, and Ciprofloxacin. Encouragingly, it retained 100% sensitivity to Doxycycline and Gentamicin, consistent with known MRSA susceptibility profiles in resource-limited settings.

These findings emphasise the urgent need to tailor empirical therapy to local resistance patterns and reserve broad-spectrum agents such as Linezolid and Vancomycin for confirmed resistant infections.

Resistance Profile of Enterococcus by Clinical Sample Type: To evaluate whether the site of infection influences the antibiotic resistance pattern of Enterococcus isolates, resistance rates were stratified by specimen type: blood, pus, urine, sputum, and other samples (including pleural fluid, stool, and endotracheal aspirates). This analysis focused on three commonly tested antibiotics: Ampicillin, Ciprofloxacin, and Gentamicin. As summarised in Table 4, Enterococcus isolates from urine samples exhibited the highest resistance to both Ampicillin (90.5%) and Ciprofloxacin (78.3%). The highest Gentamicin resistance was observed in blood specimens (75.0%), whereas sputum and "other" samples consistently showed lower resistance rates across all three antibiotics.

Statistical analysis using Chi-square tests confirmed that the differences in resistance rates across specimen types were statistically significant for all antibiotics tested. The p-values were 0.0036 for Ampicillin and 0.0148 each for Ciprofloxacin and Gentamicin, suggesting non-random distribution of resistance across infection sites.

The analysis reveals a specimen-dependent variation in Enterococcus resistance patterns, with urine and blood isolates showing the highest resistance rates to multiple antibiotics. Notably, Ampicillin and Ciprofloxacin demonstrated consistently poor efficacy, particularly in urinary and bloodstream infections, where resistance exceeded 75% in most cases.

In contrast, Gentamicin, Doxycycline, and Nitrofurantoin retained relatively better activity in isolates from pus, sputum, and other samples, though efficacy still varied across specimen types. While Vancomycin and Linezolid were not included in the statistical analysis due to limited testing across sample types, available data suggest preserved sensitivity, supporting their role as reserve agents. The statistically significant differences observed for Ampicillin ($p = 0.0036$) and Ciprofloxacin/Gentamicin ($p = 0.0148$) across specimen types emphasise the importance of site-specific antibiotic selection. These findings underscore the need for clinicians to individualise empirical therapy based on both local susceptibility trends and the likely source of infection.

Multidrug Resistance Among Bacterial Isolates: The prevalence of multidrug resistance (MDR), defined as resistance to at least three different antibiotic classes, was evaluated for the three major organisms isolated: Enterococcus, Streptococcus spp., and MRSA. As summarised in Table 5, the proportion of MDR isolates was 35.5% for Enterococcus, 35.7% for Streptococcus spp., and 50.0% for MRSA.

A global Chi-square test of independence revealed no statistically significant difference in MDR prevalence across these organisms ($\chi^2 = 0.18$, $p = 0.915$). This suggests that while MDR rates appear variable, such differences may be due to chance, especially considering the limited number of MRSA isolates ($n = 2$).

To further explore organism-specific differences, pairwise Fisher's exact tests were conducted:

- Enterococcus vs. Streptococcus spp.: $p = 1.000$
- Enterococcus vs. MRSA: $p = 1.000$
- MRSA vs. Streptococcus spp.: $p = 1.000$

All comparisons confirmed the absence of statistically meaningful variation in MDR distribution between organism pairs.

Approximately one-third of Enterococcus and Streptococcus isolates met the MDR criteria, with slightly higher rates observed in MRSA. However, statistical analysis confirmed that these differences were not significant, likely due to small sample sizes and homogeneity in resistance patterns. These results emphasise that MDR is a consistent and clinically relevant threat across multiple pathogen types in this setting, and routine surveillance across all organisms remains essential.

This study sought to determine the prevalence and patterns of antibiotic resistance from bacterial isolates in clinical specimens in a tertiary care hospital in Chengalpet District, Tamil Nadu.. The results will provide critical information regarding the spectrum of pathogens, antibiotic susceptibility patterns, site-specific resistance variation, and the burden of multidrug resistance. These data will be helpful in the antibiotic selection when starting on empirical therapy and can be beneficial in infection prevention guidelines. Demographic analysis of 110 patients revealed a nearly equal gender distribution and a wide age range, with a mean of 47.7 ± 21.8. The most common presenting symptoms were fever, cerebrovascular accidents, and respiratory complaints, all reflecting the type of infection reported in tertiary care facilities. The highest clinical samples were pus and urine, whereas blood and sputum were among the lowest. This can be associated with soft tissue and urinary tract infections. There were high gram-positive isolates, with an overwhelming majority among which were Enterococcus spp-comprised the most with 69.1 % and Streptococcus spp. at 12.7%. The recovery of gram-negative bacilli like *E. coli* and *Klebsiella spp.* was low and, in fact, less than that of the gram-positive cocci[19,20]. This might be an isolate bias where fastidious organisms do not yield in culture or prior antibiotic pressure. The antibiotic susceptibility patterns showed high levels of resistance to ß-lactams and fluoroquinolones from Enterococcus and Streptococcus isolates. Notably, Enterococcus demonstrated 14.9 % and 35.7 % to Ampicillin and Ciprofloxacin sensitivity, respectively, which was alarming. These are key agents used for cover therapy, but can no longer be reliable, and this is a worrisome scenario. However, Enterococcus was not resistant to Vancomycin at 87.5%, Linezolid at 100%, and Doxycycline at 68.8% and these antibiotics remained the drugs of choice[21-22].

In contrast, Streptococcus spp. had similar resistance patterns to Ampicillin *100.0% and Cefotaxime *87.5% but fared better than Enterococcus spp. in susceptibility to Doxycycline *85.7% and Gentamicin *62.5%. These trends repeat those in the other studies mentioned above and align with national and international reports on increased resistance of gram-positive pathogens to first-line agents and a sustained effect of reserved or second-line drugs[23],. In terms of MRSA isolates, though the number was low, the most expected MDR profile was observed, with 100.0% resistant to Ampicillin, Cefotaxime, and Ciprofloxacin but fully sensitive to Doxycycline and Gentamicin *100.0%. One population-specific data added in this study is E. faecalis resistance per sample type, present in Table 4 and illustrated in Figure 5. As can be seen, urine and blood are the most closely related regarding the resistance picture: the agent overall had the most significant resistance to Ampicillin *90.5% and Ciprofloxacin *78.3%. Pus showed resistance to Gentamicin *7.7%, while the factor was highly relevant for blood *75%. The rest of the form types, sputum and others, show broadly similar trends. Therefore, given the variations between the resistances per sample type, the clinician should always consider the site of infection. The findings are statistically significant for all of the abovementioned tenors and are indicated as such in the Table. The expanded resistance analysis for numerous additional drugs, including Doxycycline, Nitrofurantoin, and Vancomycin, showed relatively low resistance using pus, other, and sputum specimens. This reinforces the importance of these agents for non-urinary and non-vascular infections where resistance to ß-lactams is high[24].

The other significance of this study is the characterisation of multidrug resistance. A total of 35.5% Enterococcus and 35.7% Streptococcus spp. isolates were classified as MDR, just like 50% MRSA isolates. There was no statistically significant difference in the prevalence of MDR in MRSA compared to the others, statistically analysed using Chi-square and Fisher's exact tests with p = 0.915. This lack of significance could be due to the small sample size of MRSA and the similarity of the burden of resistance overall.

Nevertheless, this shows that MDR is a perennial problem with isolates of different species and is not inherent to a single pathogen. These findings have several implications. Primarily, empirical therapy should depend on an antibiogram, not just for prevalent organisms, but also on the distribution of resistance and site of infection. Additionally, the rapid resistance of high-use antibiotics like Ampicillin and Ciprofloxacin suggests it is time to implement antimicrobial stewardship. Moreover, the continued efficacy of Linezolid, Vancomycin, and Doxycycline mandates that these agents be reserved for appraising suspected or proven cases of resistance. Finally, regular microbiological surveys can update hospital antibiograms, critical for generating local prescribing guidelines. Subsequent investigations could improve this data set through multicentric collaborations, clone tracking by resistance gene, and outcome measurements[25,26].

The resistance profile observed in this study is broadly consistent with previously published findings from other Indian tertiary care centres. As summarised in Table 6, the most common source of Enterococcus isolates in the current study and that of Atray et al. (2017) was urine, accounting for 50% of cases in each setting. This aligns with the high burden of urinary tract infections in hospitalised populations[27]. Notably, ciprofloxacin resistance was high in both studies-60% in the present study and 70% in the Rajasthan cohort-highlighting the widespread resistance to fluoroquinolones. However, doxycycline resistance was markedly higher in the current cohort (31.2%) compared to 14% in the Atray *et al*. study, suggesting a possible temporal or regional variation in prescribing patterns or resistance evolution. Although present in both studies (12.5% vs. 11%), Vancomycin resistance remained relatively low, supporting the continued efficacy of this agent for severe Enterococcus infections[28,29],. One of the strengths of the present study is the inclusion of Nitrofurantoin resistance data (28.9%), which was not tested in the comparator study but remains a cornerstone in UTI management. Furthermore, this study quantifies multidrug resistance (35.5%) with statistical testing across organisms, whereas Atray *et al*. reported MDR qualitatively without comparative analysis[30,31].

These findings underscore the geographic consistency of resistance patterns in Enterococcus and illustrate regional nuances in antibiotic susceptibility. Continued surveillance across diverse regions and standardisation in MDR definitions are essential to understand temporal trends better and guide region-specific empirical therapy.

CONCLUSIONS

This study comprehensively analysesbacterial isolates' prevalence and antimicrobial resistance patterns, particularly Enterococcus, from clinical specimens collected at a tertiary care hospital in Chengalpet District, Tamil Nadu. The findings highlight a predominant burden of gram-positive infections, with Enterococcus emerging as the most frequently isolated pathogen. Alarmingly high resistance rates were observed for commonly used antibiotics such as Ampicillin and Ciprofloxacin, especially in urinary and bloodstream infections. Despite this, agents like Vancomycin, Linezolid, and Doxycycline retained appreciable activity, offering therapeutic options for multidrug-resistant infections. The statistically significant variation in resistance across specimen types further underscores the need for site-specific antibiotic stewardship strategies. Multidrug resistance was prevalent in over one-third of the isolates, yet no statistically significant difference in MDR distribution was found between organisms. Comparative analysis with previous Indian studies revealed similar patterns of resistance, while also identifying regional differences in doxycycline susceptibility and nitrofurantoin efficacy.

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