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ANOTHER THREAT- "HIGH INCIDENCE OF TETRACYCLINE RESISTANCE AMONG ENTEROCOCCUS SPECIES"

Medical Microbiology

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ABSTRACT

Introduction: Since the early 1950s Tetracyclines are used for the treatment of Enterococcal infections among humans & animals, though resistance towards Tetracyclines is widespread. In addition, the incidence of infections caused by multi-drug-resistant Enterococci is increasing worldwide, which is a serious problem for clinical therapy [6]. The present study was conducted between January to July 2022 aimed to determine the incidence of Tetracycline resistant Enterococci. **Method:** Total 510 samples were collected from patients coming to a tertiary care hospital near South Kolkata. Samples were tested using automated culture and sensitivity technique, Vitek2 Compact System. **Result:** Out of total samples, 215 samples were culture positive for different isolates. Further identification of the isolates showed the occurrence of total 100 Enterococcal species encompassing 39% Enterococcus faecalis (83) & 8% Enterococcus faecium (17). A high prevalence of high-level resistance to both Tetracycline (93%) & Erythromycin (90%) was documented. Only 7% Enterococcal species found sensitive to the broad-spectrum antibiotic Tetracycline. **Conclusion:** The outcome indicates that the presence of Tetracycline resistant genes in the present study population. Suggestions can be made towards the use of other effective antibiotics for the treatment of Enterococcal infections.

KEYWORDS

Tetracycline, Enterococcus, UTI, Wound infection, VITEK 2 .

INTRODUCTION

Enterococci, natural inhabitants of the Gastrointestinal tracts also known to occur in soil & faecally contaminated water & food products. Enterococci are facultatively anaerobic cocci contains over than 60 species, among which Enterococcus faecalis & Enterococcus faecium are the most common species that causes many serious human infections like UTI, bacteraemia, endocarditis, wound infections, intra-abdominal infections, meningitis and even sepsis in very rare cases in both immunocompetent & immunocompromised persons. Enterococci can tolerate a wide range of environmental conditions as well as antibiotics of different classes.

Tetracycline, a bacteriostatic broad-spectrum antibiotic, active against a wide range of Gram-positive and Gram-negative bacteria, spirochetes, obligate intracellular bacteria, as well as protozoan parasites, possess many properties considered ideal for antibiotic drugs, including proven clinical safety, acceptable tolerability, and the availability of intravenous (IV) and oral formulations for most members of the class [1]. For a long time, this antibiotic was in potential use for Enterococcal treatment. Tetracyclines preferentially bind to bacterial ribosomes and interact with a highly conserved 16S ribosomal RNA (rRNA) target in the 30S ribosomal subunit, arresting translation by sterically interfering with the docking of aminoacyl-transfer RNA (tRNA) during elongation [2,3,4].

Apart from being one of the primary causes of nosocomial infection, Enterococci are also known as a reservoir of antimicrobial resistan genes which can be caused by the acquisition of mobile genetic elements carrying tetracycline-specific resistant genes, mutations within the ribosomal binding site, and/or chromosomal mutations leading to increased expression of intrinsic resistance mechanisms [1]. Tetracycline resistance is known to governed by tet genes involved in either active efflux of the drug, ribosomal protection or enzymatic drug modification. In Enterococcus, Tetracycline resistance is usually associated with the presence of tet(M) & tet(O) genes, which confers ribosomal protection, & the tet(L) genes encodes Tetracycline export pumps [5]. Presence of these genes in Enterococcus is perilous to human health.

MATERIALS & METHODS

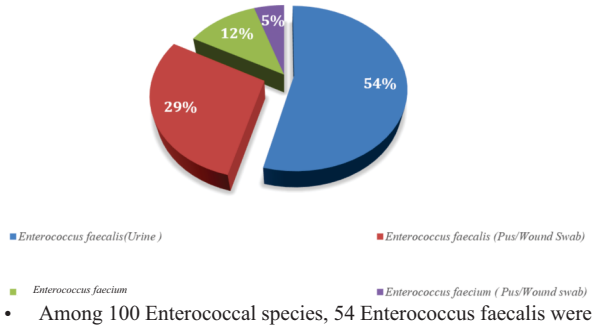
This study was conducted during the month of January to July 2022. A total 510 urine, pus & wound swab sample were collected from patients coming to a tertiary care hospitals near south Kolkata. Samples were put on different selective media and positive growth obtained after 24hrs of incubation. Identification and sensitivity of the organisms done by using Vitek 2 Compact System using different ID and AST cards. For identification of Enterococcus species , GP ID and for sensitivity P628 card is used.

RESULTS

Out of total 510 samples, 215 samples showed positive growth on different agar plates. With further speciation, 100 samples were identified as Enterococcus (46.5%). Numbers & percentages of different isolates are given below .

Table:1

PERCENTAGE OF DIFFERENT *ENTEROCOCCI* SPECIES N=100



- Among 100 Enterococcal species, 54 Enterococcus faecalis were isolated from urine samples, 29 E. faecalis from Pus & Wound swab, 12 Enterococcus faecium from Urine and 5 E. faecium from Pus & Wound swab.
- A total of 83 Enterococcus faecalis & 17 Enterococcus faecium were isolated from 215 samples. Most of these isolates (93%) were found to be resistant to Tetracycline. 90% Enterococci were also resistant to Erythromycin. Vancomycin & Teico kiplanin showed best sensitivity (97%) towards the isolated strains.

Table 2– Susceptibility Pattern Of Enterococcus Faecalis & Enterococcus Faecium .

ANTIBIOTICS	SENSITIVE (%)	RESISTANT (%)
Benzylpenicillin	49	51
Gentamycin high level (Synergy)	54	46
Ciprofloxacin	21	79
Levofloxacin	28	72
Linezolid	89	11
Daptomycin	81	19
Erythromycin	10	90
Teicoplanin	97	3
Vancomycin	97	3
Tetracycline	7	93
Nitrofurantoin	56	44

NOTE- Here Erythromycin was used only for the pus sample isolates & Nitrofurantoin was used only for urine samples.

DISCUSSION

Enterococci, an important natural microflora of human GI tract, one of the main causes of severe nosocomial as well as community acquired infections. Enterococci are resistant to a wide range of antimicrobials through intrinsic & acquired mechanisms. The presence of multidrug resistant genes in Enterococcus, especially those on mobile elements, are regarded as a hazard for animal & human health. To determine the presence of these resistant strains in our study area, the present study was conducted between January to July 2022.

We received total 510 samples including urine, pus and wound swab. 215 samples showed positive growth and out of which 100(46.5%) samples were identified as Enterococcus sp. Further speciation according to samples showed, 54 Enterococcus faecalis & 12 Enterococcus faecium in urine samples & study of pus or wound swab showed 29 Enterococcus faecalis & 5 Enterococcus faecium. Further investigations determining the antimicrobial susceptibility pattern of these isolates demonstrated a significantly higher prevalence of resistance to Tetracycline (93%) followed by Erythromycin (90%), Ciprofloxacin (79%) & Levofloxacin (72%). In addition, a good susceptibility pattern was noted to the activity of Vancomycin, Teicoplanin, Linezolid & Daptomycin. These drugs are currently widely used drugs for the effective treatment of enterococcal infections [7,8,9].

These findings are in agreement with many other previous studies conducted in different regions of Asia & South America [12, 13]. During 1995 in Cincinnati, Ohio 69% Enterococcus faecalis & 29% Enterococcus faecium was isolated among 157 samples [14]. Another study by Miranda et al. in 2001 also showed the dominance of Enterococcus faecalis (76%) followed by Enterococcus faecium (5.2%) among 289 Enterococcal isolates from a tertiary care paediatric hospital during an 18 months study in Mexico . In China, Enterococcus faecium and Enterococcus faecalis were also found to be predominant among the Enterococci isolated from clinical specimens [15]]. This has been previously studied in few other studies where Enterococcus faecalis dominated with a high percentage of resistance towards Tetracyclines & Erythromycin which are in accordance with our study [10]. Studies conducted between 1998 to 2012 in different regions of Western & East Asia disclosed over 50% Enterococci isolates remains resistant to Erythromycin & Tetracycline [11,1].

CONCLUSION

Therapeutic agents, Erythromycin and Tetracycline are in great use for the treatment of enterococcal infections for more than 70 years. In recent days, Enterococci has started showing resistance against Tetracycline to a greater extent. 93% of the Enterococcal isolated strains showed resistance to Tetracycline in the present study, which is a major threat. Extensive use of any drug could lead to the formation of 'Superbugs' which are complex to treat. Testing for antibiotic susceptibility before prescribing medicines to the patients is very much crucial step to prevent emergence of resistant strains in this multidrug resistant era. Therefore, it is evident from our study that Tetracycline has almost lost its efficacy towards Enterococcal species and therefore it should be cautiously used for clinical therapy.

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