Multidrug-Resistant Urinary Pathogens: Insights into Antibiotic Gene Transfer and Biofilm Formation

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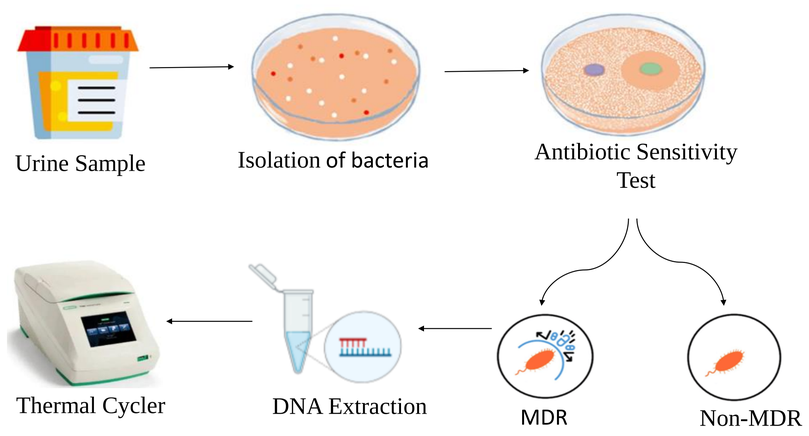
INTRODUCTION

- **MDR pathogens has seriously jeopardized the treatment of infections leading to increase morbidity and mortality.**
- **Co-trimoxazole is the combination of two antifolate compounds - sulfamethoxazole and trimethoprim, introduced in the year 1969 and widely used to treat UTI caused by bacteria.**
- **Carbapenems are β-lactams that contains fused β-lactam ring system, different from penicillins. It is unsaturated and contains a carbon atom instead of the sulfur atom.**
- **There are increasing reports of co-trimoxazole and carbapenem resistance among uropathogenic bacteria making it difficult to treat infections caused by these pathogens.**
- **Genes sul1, sul2, dfrA1, dfrA5, dfrA7, dfrA12, and dfrA17 are known to confer resistance to co-trimoxazole and blaKPC-2, blaNDM-1, blaOXA-48, and blaIMP among different bacterial isolates.**
- **The aim of this study was to investigate the prevalence and diversity of co-trimoxazole and carbapenem resistance genes among clinical isolates of bacteria causing urinary tract infections (UTI).**

METHODOLOGY



CONCLUSIONS

- **Phenotypic screening revealed that 81% bacterial isolates causing UTI were resistant to co-trimoxazole.**
- **Of the total 101 phenotypically positive for co-trimoxazole, sul1 and sul2 genes conferring resistance to sulfamethoxazole were detected in 75% and 27% isolates respectively.**
- **Furthermore, dfrA1, dfrA5, dfrA7, dfrA12, and dfrA17 gene conferring resistance to trimethoprim were successfully amplified among 29.2%, 21.2%, 58.5%, 63.6% and 8% isolates respectively.**
- **Carbapenem resistant genes, blaKPC-2, blaNDM-1, blaOXA-48 and blaIMP were successfully amplified in 8%, 35%, 64% and 27% bacterial isolates respectively.**
- **Nine isolates were resistant for both Nitrofurantoin and Fosfomycin.**
- **Successful transconjugants were obtained on co-trimoxazole and imipenem-supplemented LA plates.**
- **.PCR based amplification of antibiotic resistant genes sul1, sul2, dfrA1, dfrA7, dfrA12, blaOXA-48, and blaKPC from plasmid DNA revealed successful transfer of genetic determinants among transconjugants.**

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DECLARATION

- **Author Mohammad Saif declares no conflict of interest. All the data put forwarded is original research work carried out by the authors at Microbiology Research Laboratory, Jamia Millia Islamia.**

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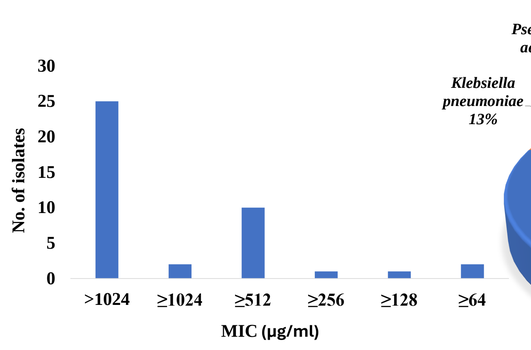
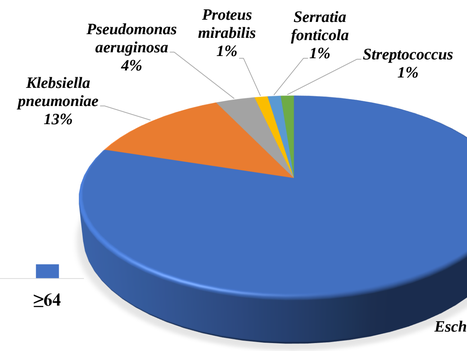
RESULTS

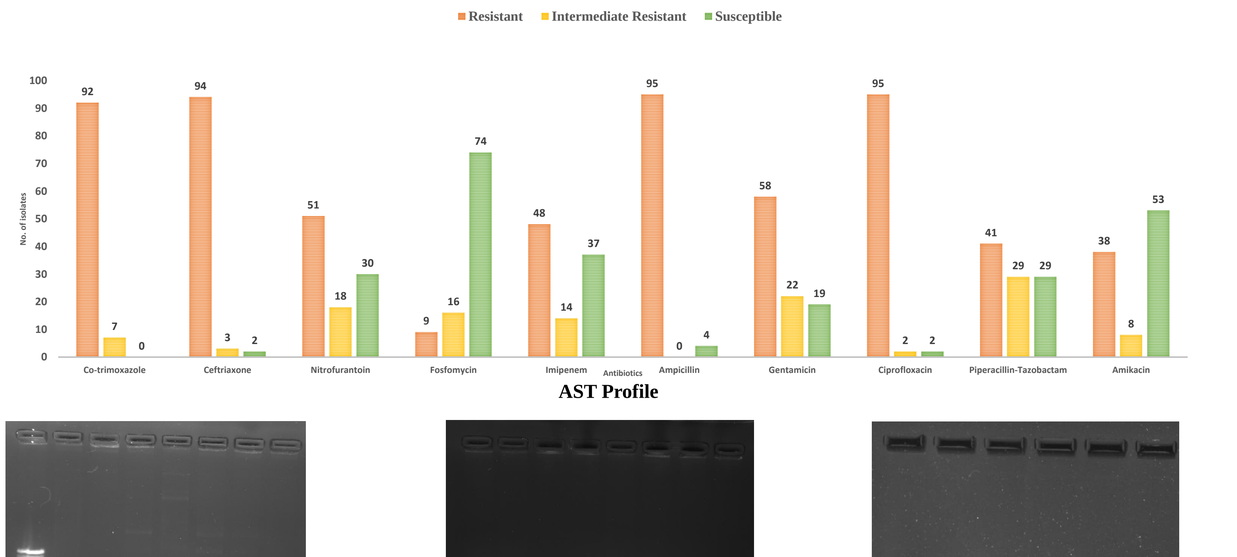
CLED Agar plate showing purified bacterial colonies by streaking method



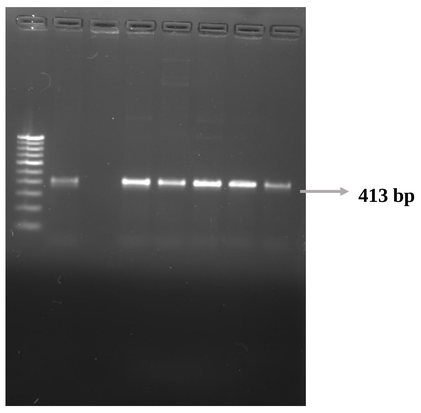
MIC determination



Pie chart showing identified uropathogens

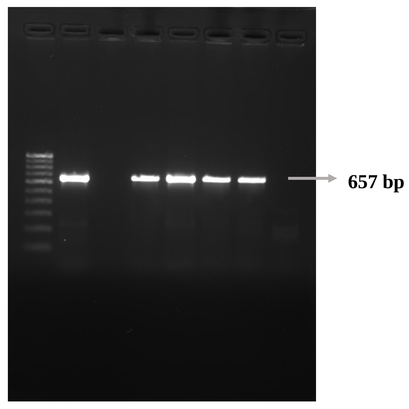


AST Profile



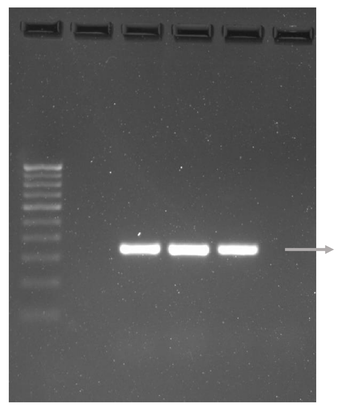
413 bp

PCR amplification of sul1 gene



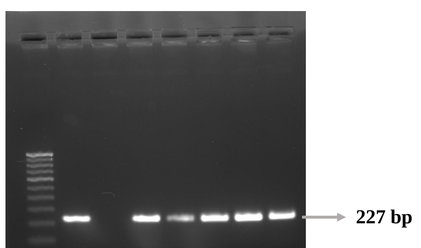
657 bp

PCR amplification of sul2 gene



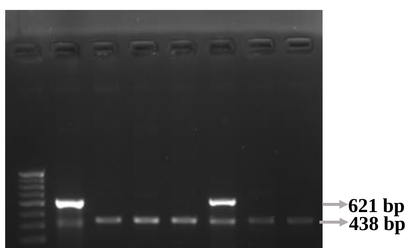
341 bp

PCR amplification of dfrA5 gene



227 bp

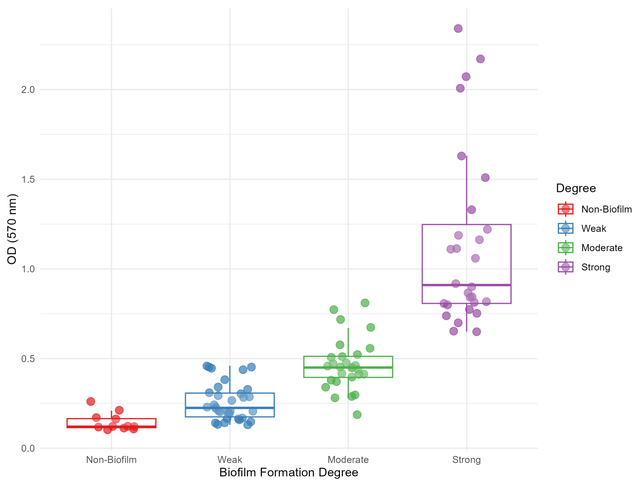
PCR amplification of dfrA7 gene



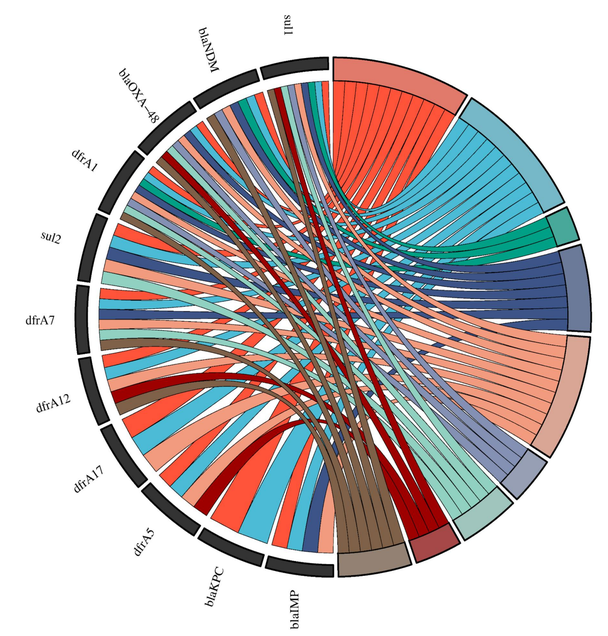
621 bp
438 bp

798 bp
232 bp

PCR amplification of carbapenem resistance gene



Box and Whisker plot showing degree of Biofilm and Non-biofilm formation



Chord plot illustrating the correlation between co-trimoxazole and carbapenem resistance genes among bacterial isolates