

# Antibiotic Susceptibility Profile and Molecular characterization of Extended Spectrum Beta-Lactamases(ESBL) in Uropathogenic *Escherichia coli* (*E.coli*) in a tertiary care hospital in Pakistan.

Rehana Gilani<sup>1</sup>, Rubina Kamran, Ashok Tanwani, Muhammad Shafiq, Fawad Ahmed.  
Department of Microbiology, Pakistan Institute of Medical Sciences, Islamabad, Pakistan.

## INTRODUCTION

Urinary tract infection (UTI) is one of the most common diseases which is encountered in the medical practice these days with an estimated 150 million cases. The most common cause of UTI in both community and health care settings is *Escherichia coli*. ESBLs are recognized to hydrolyze all penicillins', cephalosporins, oxyimino-cephalosporins and monobactams, but they do not have hydrolytic action on cephamycins and carbapenems. ESBLs are inhibited by beta-lactamase inhibitors such as clavulanic acid. Antibiotic resistance is common in ESBL producing uropathogenic *E.coli* and are a major source of concern in the current medical practice.

## MATERIALS AND METHODS

This research is a prospective, non-randomized, descriptive study with a proforma being used as a tool for data collection. 140 urine non duplicate samples of patients with UTI yielding growth of *E.coli* were selected and their susceptibility profile was determined. Their molecular characterization was done using the conventional PCR targeting CTX-M, TEM and SHV genes.

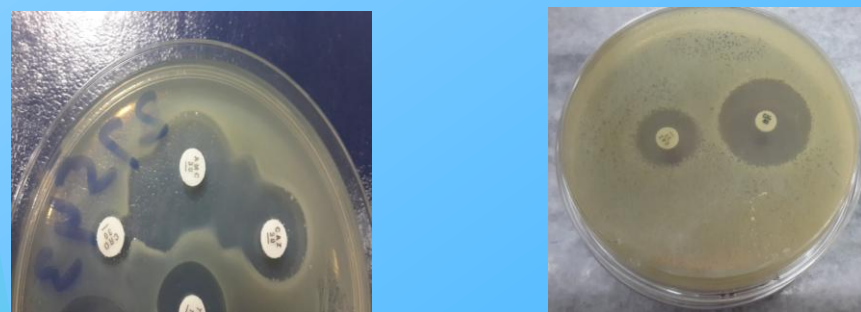


Figure 1: ESBL-Phenotypic Screening and Confirmatory Test

ESBL Screening and confirmatory tests were done as per CLSI guidelines 2012.

## RESULTS AND DISCUSSION

Out of 140 samples, 97 (69%) were screened to be ESBL positive using ESBL Initial Screening Test (ESBL-IST). The ESBL phenomenon was confirmed by ESBL Phenotypic Confirmatory Test (ESBL-PCT) which demonstrated 80 (57%) samples were positive.

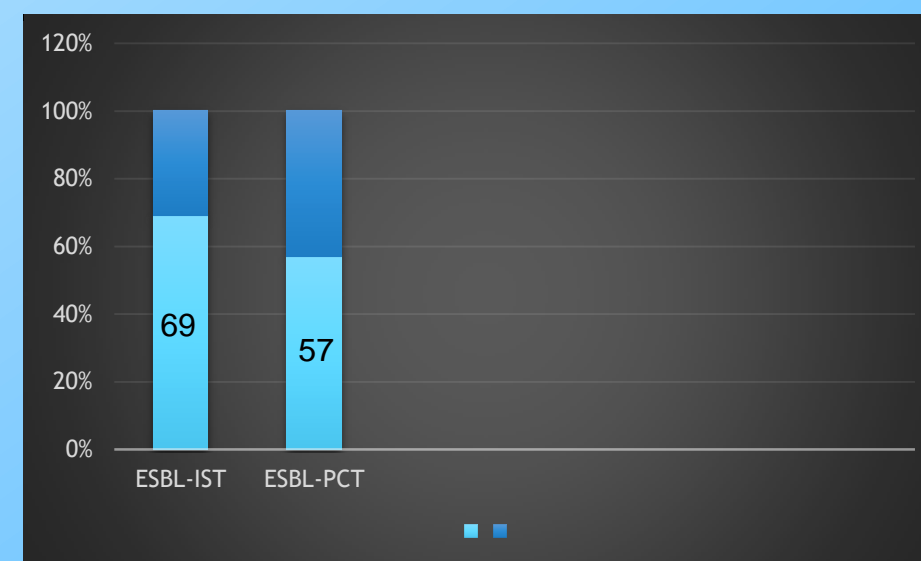


Figure 2: Percentage Frequency of ESBL producing *E.coli*

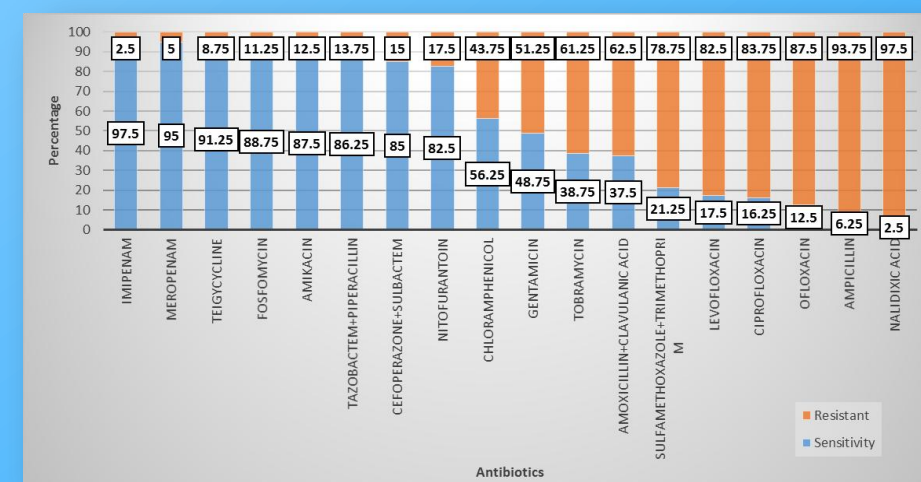


Figure 3: Susceptibility Pattern of ESBL-Producing *E.coli*

- High occurrence of 57% ESBLs producing *E.coli* was observed among the uropathogenic *E.coli*.
- 62.5% of ESBL producing *E.coli* were resistant to amoxicillin/ clavulanic acid which implies that these antibiotics can no longer be considered for empirical therapy in urinary tract infection.

- ESBLs producing isolates exhibited only 11.2% resistance to fosfomycin, demonstrating that it is a better option than other oral drugs. Fosfomycin which can safely be given orally and is highly effective against uropathogenic *E.coli*
- The resistance of *E.coli* to nitrofurantoin was 17.5%. It shows that nitrofurantoin is still effective against majority of the urinary isolates and can be used prophylactically for recurrent urinary tract infections.
- The resistance pattern of *E.coli* to cotrimoxazole was found to be only 78.7% in this study, making it a less favourable choice as an oral antibiotic in uncomplicated UTI.
- In regards to Quinolones and Fluoroquinolones, isolates in this study exhibited resistance of 97.5%, 87.5%, 83.75%, 82.5% against nalidixic acid, ofloxacin, ciprofloxacin and levofloxacin respectively. This high resistance makes them unsuitable treatment for ESBL producing *E.coli*.
- In regards to Aminoglycoside group of drugs, isolates showed 12.5% resistance to amikacin and 61.2%, 51.2% resistant to tobramycin and gentamicin respectively, reflecting that amikacin is most effective amongst its group members .
- Isolates in this study were sensitive to piperacillin/tazobactam conferring only 13.7 % resistance compared to 15 % resistance to cefoperazone/sulbactam
- Among carbapenems only 2.5% isolates were resistant to imipenem in our study. Isolates were 5% resistant to Meropenem highlighting the concern of antibiotic resistance in our region in ESBL producing uropathogens.
- Tigecycline exhibited 8.75% resistance .

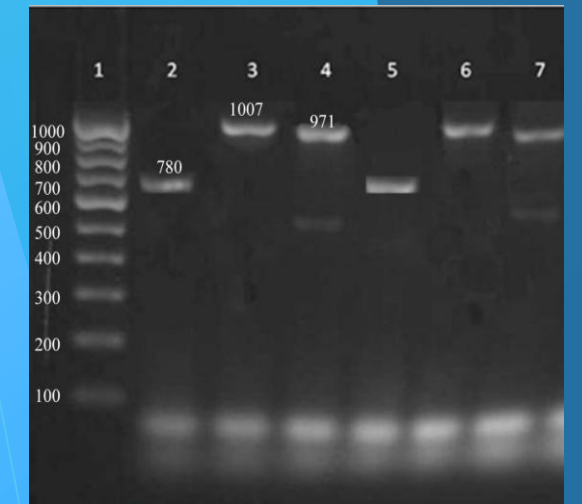


Figure 4 : Prevalence of the different type of beta lactamase encoding genes.

Gel Electrophoresis of Sample and Control harbouring CTX-M, SHV and TEM gene:- Lane 1 is 100 bp ladder. Lane 2 is CTX-M, Lane 3 is SHV, Lane 4 is TEM for Sample # ER-03. Lane 5 is CTX-M, Lane 6 is SHV, Lane 7 is TEM for Positive Control.

- PCR was performed using universal primers for detection of ESBL genes: CTX-M, TEM and SHV in uropathogenic ESBL producing isolates. In our study CTX-M, TEM and SHV were 75%, 60%, 25% respectively.
- 60% of isolates harbor more than one type of genes. Isolates which harboured groups of genes TEM+SHV, TEM+CTX and SHV+CTX were 10%, 35% and 5% respectively.
- 10% of isolates harbor all three genes. Whereas 25%, 5% isolates harbor single gene of CTX-M and TEM respectively. None of the isolates contains single SHV gene.
- In 10% of isolates, none of the above genes were detected, which implies that other genes encoding ESBL enzymes are also present in our region.

