

Molecular Epidemiology and Characterisation of Extended Spectrum Beta Lactamase Producing *E. coli* in Female Patients with Urinary Tract Infection

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Background: Urinary tract infections form the common community and hospital acquired- infection in Iraq, with impact on health care delivery. The emergence of antimicrobial resistance which increased in its prevalence with time attributed the treatment failure and recurrent infection.

Aim: The aim of this study was determine the prevalence of extended spectrum beta lactamase and ESBL resistance genes of *E. coli* in female in Kirkuk city.

Materials and Methods: A prospective cross-sectional study was conducted during the period from 1st of June 2015 to the end of January 2016. The study included in the study is 563 women, of them 425 (75.5%) were outpatients and 138 (24.5%) were inpatients. Their age range between 18 and 80 years, with a mean age of 33.59 ± 15.29 years. Bacteria isolation, identification and ESBL production were performed using conventional methods. Polymerase chain reaction was used to determine ESBL genes in *E. coli* with extended spectrum beta lactamase production.

Results: The overall infection rate in our study cohort was 41.6% and *E. coli* was the predominant isolate which form 57.7% of the positive culture. Gram negative bacteria were the predominant cause of urinary tract infection and form 82.5%, while gram positive bacteria isolated form 17.5% of cases. *E. coli* isolates were highly susceptible to imipenem, amikacin and nitrofurantoin, while demonstrated resistance rate of 87.4% to ampicillin, and 79.3% to amoxicillin, and a rate of 53.3% - 85.2% to 3rd generation cephalosporins and 25.2% to 69.6% to quinolones.

Staphylococcus aureus urinary isolates show a high resistance rate to tobramycin, cefixime, piperacillin, nalidixic acid, ampicillin, ceftazidime, trimethoprim, gentamycin, azitreonam, amoxicillin, cefprozil, carbencillin, norfloxacin, cefotaxime and cefaclor. *Staphylococcus aureus* urinary isolates were highly sensitive to ciprofloxacin, imipenem, amikacin, nitrofurantoin, gemifloxacin and ceftriaxone.

Klebsiella pneumonia urinary isolates demonstrated a high resistance rate to amikacin, nitrofurantoin, ciprofloxacin, amoxicillin, tetracycline, gemifloxacin, gentamycin, ceftazidime, cefaclor, carbencillin, cefprozil, norfloxacin, ampicillin, azitreonam, tobramycin, cefixime, and trimethoprim. *Klebsiella pneumonia* show low resistance to imipenem only from 22 tested antibiotics.

Proteus demonstrated a lower resistance rate than *E. coli*, *Staphylococcus aureus* and *Klebsiella pneumonia* to the tested antibiotics. The *Proteus* high rate of resistance demonstrated against tetracycline, nitrofurantoin, ampicillin, trimethoprim, cefixime, ceftriaxone, nalidixic acid and norfloxacin.

Delivery method, education level, economic status, child number, operation history, and marital status significantly influenced urinary tract infections in the

present study. AU ROC and OR confirmed these associations and education level, economic status are a protective factors for UTI, while marriage is a risk factor. An important finding of this study is the significant association between urine pus cell scale and culture positivity as demonstrated by both area under ROC curve and OR.

The overall ESBL frequency rate was 71.8%, while it was higher in female student group (78%), then in diabetic women (74.4%) and 67% in pregnant women. The present study show that resistance rate of ESBL producer and MARI (Multiple antibiotic resistance indexes) of *E. coli*, *Staphylococcus aureus*, *K. pneumonia* and *Proteus mirabilis* were higher than ESBL negative bacterial isolates. Unfortunately, the multidrug resistance mean value was 6.52 and 98.82% of the isolates demonstrated resistance to more than 3 antibiotics groups. The multidrug resistance mean value was significantly higher in ESBL positive as compared to ESBL negative. In addition, the frequency of MDR (Multiple drug resistance) was significantly higher in ESBL positive than in ESBL negative isolates.

The OXA ESBL gene was detected in all tested *E. coli* isolates, followed by CTX –M gene [93.3%], TEM [66.7%] and SHV [60%] and the presence of these genes significantly influenced the emergence of antibiotic resistance.

Conclusion: *E.coli* was the predominant cause of UTI in adult women in Kirkuk city. *E. coli*, *Staphylococcus*, *Klebsiella pneumonia* and *Proteus mirabilis* were with high rate of resistance to the tested antibiotics and with ESBL production rate. The high rate of antibiotic resistance and multidrug resistance of the uropathogens is of clinical importance since these antibiotics are widely used in the treatment of UTI in our society and thus this resistance rate may contribute to a high rate of treatment failure and recurrent infection. Delivery method, education level, economic status, child number, operation history, and marital status significantly influenced urinary tract infections in the present study.