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Occurrence of multi-Drug resistance of E. coli isolated from Infections of Urinary tract in Najaf City

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Abstract: Background: *Escherichia coli* is a common bacterial species connected with nosocomial infections including urinary tract infections and pneumonia. **Study Aim:** The aim of this study is to examine the incidence of genes encoding AMEs enzymes in aminoglycosides resistant *E. coli* isolates isolated from urinary tract infection in Najaf hospitals. **Methods:** 68 samples were isolated from patients with UTI in Najaf City from the whole study period**.** The 23 isolates were exposed for the susceptibility of 3 antibiotics disks of 1categories by utilizing test of disk diffusion. **Results:** This study reported that 21 (91.3 %) were resistant to 1 or more aminoglycosides antibiotics. Also, this result reported that 20 (86.95%) of XDR isolates harbored *aac(6')-Ib* gene. **Conclusions:** The study showed the importance of aminoglycoside resistant isolates of E. coli as a cause of UTI infections in Najaf City.

Keywords: *Escherichia Coli,* UTIs, XDR, CLSI, VITEK-2 Compact System

INTRODUCTION

Escherichia coli is a common species of bacteria connected with nosocomial infections involving, pneumonia, infections of urinary tract [1]. Aminoglycoside are important antibiotic type utilized in the treatment of severe infections caused by Gram-negative bacteria, including ESBL producing *E. coli* [2]. They prevent protein synthesis of bacteria by linking irreversibly to the bacterial 30S ribosomal subunit, thereby leading to death of the cell.

Resistance of bacteria to aminoglycoside may be because of mutation as such as acquisition of genetic elements (transposons, integrons and plasmid) having resistance genes. Aminoglycoside resistance is mediated by two various ways, including reduce accumulation of an intracellular antibiotic and alteration of an enzymatic drug [3].

Production of AMEs is one of the most commonly happening way of resistance to the aminoglycoside among *E. coli*. Enzymes in the AAC groups inhibit aminoglycoside antibiotics by acetylation, APH can phosphorylate aminoglycoside and ANT cause aminoglycosides adenylation [4].

MATERIALS AND METHODS

Collection of specimens

across sections procedure on patients visited in the period of September 2024 to December 2024. 65 urine specimens were isolated from patients from period of research and the specimens were taken to the laboratory.

Isolation and identification of *E. coli*

Microbiological standard diagnostic criteria were used to isolate and identify the clinical isolates of *E. coli*, which

included colony morphology, and conventional tests of biochemical. The VITEK-2 automated system has been utilized to diagnose *E. coli*.

Aminoglycoside Susceptibility Testing

The 23 isolates were exposed for the susceptibility of 3 antibiotics disks of 1categories by utilizing test of disk diffusion which utilized to measure inhibition zones in agreement with the recommendations of laboratory and clinical Standards system [5].

Aminoglycoside Molecular Screening

This thesis was carried out to discover the dissemination of the aminoglycoside modifying enzymes among the XDR *E. coli* isolates taken from center of burn in Najaf during period of 3 months. The early detection of aminoglycoside resistance genes may inactivate the dissemination of these isolates of XDR *E. coli* on the future.

RESULTS

Aminglycosides-Resistant XDR *E. coli* Isolates

Present study showed that rate of resistance of 23 isolates of XDR *E. coli* against groups of aminoglycosides:

Amikacin, tobramycin, and gentamycin. This study reported that 21 (91.3 %) were resistant to 1 or more aminoglycosides antibiotics. The summary of resistance profiles for all tested isolates is shown in Table 1. Overall, isolates were divided into five phenotype groups. First group (A1), 13 (56.5%) isolates exhibited resistant to all aminoglycosides tested. Second group (A2), 6 (25%) isolates manifested resistant to gentamicin and amikacin but sensitive to tobramycin. Third group (A3), 1(4.3 %) isolates were tobramycin and gentamycin resistance but susceptible to amikacin. Fourth group (A4), 1 (4.3 %) isolate was resistant to gentamicin but susceptible to amikacin and tobramycin. In contrast, the fifth group (A5), 2 (8.3%) isolate was susceptible to all aminoglycosides tested.

In addition, PCR was used to screen all XDR isolates for the presence of the selected aminoglycoside acetyltransferases (AAC), *aac(6')-IIb*, *aac(3)-II* specific primers. The occurrence of aminoglycoside resistance genes among the isolates are shown in Table 2. However, present study found that one type of aminoglycoside resistant genes [*aac(6')-IIb*] were found in 20 (86.95%) isolates and 3 (13%) of the XDR isolates investigated were positive for *aac(3)-II* gene (Figure 1).

Table 1: Aminoglycosides Resistance Patterns of 23 XDR *E. coli* Isolates.

Phenotype	Aminoglycosides resistant pattern	No. (%) of isolates	Isolate code No.
A1	Amikacin, gentamicin, tobramycin	13 (56.5)	1, 2, 9, 3, 8, 13, 21, 18, 12, 15, 10, 16, 12
A2	Amikacin, gentamicin	6 (26)	4, 5, 7, 6, 19, 23
A3	Gentamicin, tobramycin	1(4.3)	20
A4	Gentamicin	1 (4.3)	17
A5	No resistance	2(8.6)	11, 22

Table 2: Aminoglycosides-Resistant Genes In 23 Xdr Isolates oF E. coli

Type of enzyme	Type of gene	No. (%) of isolates	Isolate code No.
AACs	aac(6')-Ib	20 (86.95)	1, 2, 9, 3, 8, 13, 21, 18, 12, 15, 10, 16, 12, 4, 5, 7, 6, 19, 23, 20
	aac(3)-II	3 (13%)	14,17, 22

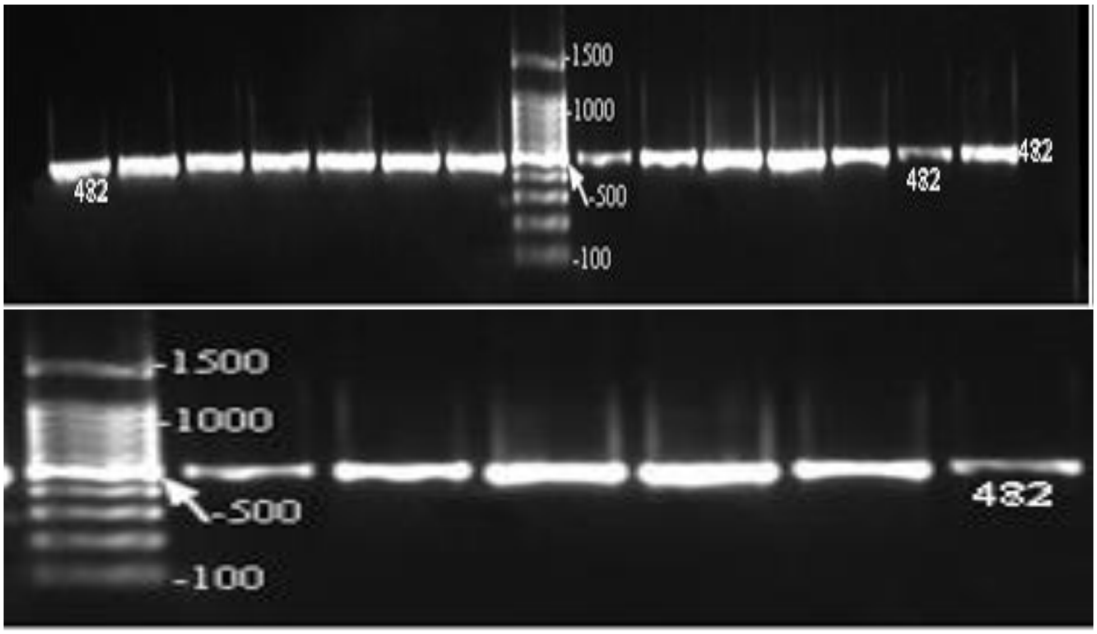


Figure 1: Gel of Agarose of PCR Mono-Plex Amplified Product Isolates DNA with *aac(6')-Ib* Primer. The Electrophoresis used for 120 min at 65 volt. Lane (L) is Marker of DNA Molecular Size (10,000 –bp ladder). (432 bp)

DISCUSSION

Aminglycosides Resistant among XDR *E. coli* Isolates

Although aminoglycosides represent a small fraction of antibiotic consumption in Iraqi hospitals as compared with β-lactam antibiotics and fluoroquinolones, they are still significant class of antibiotics in treating life threatening *E. coli* and other Gram negative bacterial infections. Therefore, detecting the level of aminoglycoside resistance is an important task. Some aminoglycoside remain active against many XDR *E. coli* isolates [6]. Present study also focused on resistance patterns to three antibiotics of aminoglycosides (gentamycin, tobramycin and amikacin) in isolates of XDR *E. coli*. According to the sensitivity testing, these result reported that 21 (91.3 %) of XDR isolates of *E. coli* were found to be resistant to at least 1 of aminoglycosides tested (Table 1). The occurrence phenotypes of aminoglycoside resistance in XDR *E. coli* isolates were divided into five groups: (A1) resistant to all aminoglycosides tested (56.5%), (A2) resistant to amikacin and gentamicin (26%), (A3) resistant to gentamicin and tobramycin (4.3 %), (A4) resistant to gentamicin (4.3%) and (A5) susceptible to all aminoglycosides tested (8.6%). An important striking feature found in present study is differences in aminoglycosides resistance phenotypes among isolates suggesting that aminoglycoside resistance in XDR isolates might be mediated by complex and multifactorial mechanisms. Despite these various resistance phenotypes, aminoglycosides are still valuable weapons in antimicrobial treatment, particularly in the management of life threatening infections of *E. coli* in Najaf hospitals.

In this study, occurrence of the selected aminoglycoside acetyltransferases (AAC), *aac(6')-IIb*, *aac(3)-II* were investigated. Present study show that 20 (86.95%) of XDR isolates harbored *aac(6')-IIb* gene, and 3(13%) harbord *aac(3)-II* gene (Table 3-2). This result is in accordance with data from Egypt [7] and Poland [8], where found *aac(6')-Ib* as one of the common frequently detected gene encoding ACC in *E. coli* clinical isolates.

CONCLUSION

The study showed the importance of aminoglycoside resistant isolates of *E. coli* as a cause of UTI infections in Najaf City. The vast majority of XDR isolates exhibited resistant to at least 1aminoglycoside.This study showed elevated occurrence of *aac(6')-IIb* gene among XDR isolates.

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