

Prevalence of Adhesive Pap Gene (Pyelonephritis Associated Pili) among Uropathogenic *Escherichia Coli* Strains Isolated from Out Patients and in Patients with Urinary Tract Infection in Ain Shams University Hospital

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبّانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

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List of Contents

Subject	Page No.
List of abbreviations.....	I
List of figures	IV
List of tables.....	V
Introduction	1
Aim of the work	3
Review of literature	4
Urinary tract infections	4
• Healthcare – associated urinary tract infections	7
• Pathogenesis of UTI	10
<i>Escherichia coli</i>	14
Pathogenic types of <i>Escherichia coli</i>	15
Virulence Factors of Uropathogenic <i>E.coli</i>	15
A. Virulence factors associated with the surface of bacterial cell.	
1. Type 1 fimbriae	18
2. P pili (PAP)	18
3. S/F1C pili	21
4. Lipopolysaccharide (LPS)	21
5. Dr adhesin family	22
6. Flagella	22

B. Virulence factors, which are secreted and exported to the site of action	23
1. The toxin α -haemolysin (Hly A)	23
2. Cytotoxic necrotizing factor 1 (CNF1)	23
Bacterial biofilm	24
Host defences against uropathogens	31
Treatment of Uropathogenic <i>E.coli</i>	35
Patients and methods	40
Results	57
Discussion	72
Summary	82
Conclusion	88
Recommendations	89
References	90
Arabic Summary	—

List of Abbreviations

Abbr.	Full term
β-lactam	Beta lactam
ASB	Asymptomaic bacteriuria
CAMP	Cyclic adenosine monophosphate
CAUTI	Catheter-associated Urinary tract infection
CDC	Centers for disease control and prevention
CLED	Cystine lactose electrolyte deficient
CLSI	Clinical and laboratory standards institute
CTX	Cefotaxime
CTX/KV	Cefotaxime /clavulanic acid
DNA	Deoxyribonucleic acid
<i>E.coli</i>	<i>Escherichia coli</i>
EPS	Extracellular polymeric substances
ESBL	Extended spectrum B-lactamas
EXPEC	Extra intestinal pathogenic E.coli
GBS	Group-B-Streptococci
HAIS	Health care-associated infections
I	Intermediate

IBC..... Intracellular bacterial communities

IgA..... Immunoglobulin A

IL-6 Interleukin 6

IL-8 Interleukin 8

K.pneumoniae.. *Klebsiella pneumoniae*

LTCF Long term care facilities

MDR Multidrug resistant

MSU Mid stream urine

NHSN..... National health care safety network

NIH National institutes of health

P.mirabilis ... *Proteus mirabilis*

PAP Pyelonephritis Associated Pilli

PCR..... Polymerase chain reaction

QS..... Quorum sensing

R Resistant

S..... Sensitive

S.aureus *Staph aureus*

SD Standard deviations

Spp Species

SUTI..... Symptomatic urinary tract infection

TLRs Toll-like receptors

UPEC Uropathogenic *Escherichia coli*

USA United State of America

UTIs Urinary tract infections

List of Figures

<i>Figure No.</i>	<i>Title</i>	<i>Page No.</i>
Figure (1):	Healthcare – associated infections (HAIs)	8
Figure (2):	Pathogens causing UTI in uncomplicated (2a) complicated UTI (2b)	11
Figure (3):	Pathogenesis of UTI	13
Figure (4):	Structure of <i>E.coli</i> bacterium	14
Figure (5):	Virulence of uropathogenic <i>E.coli</i>	16
Figure (6):	Diagram of Ppilli	19
Figure (7):	Biofilm formation steps	25
Figure (8):	Detection of ESBL producing <i>E.coli</i> by ESBL.....	46
Figure(9):	Congo red agar plate showing biofilm forming black <i>E.coli</i> colonies	47
Figure (10):	Agrose gel electrophoresis for Pap gene in <i>E.coli</i> isolates	70
Figure (11):	Biofilm, PAP and ESBL among outpatients and Inpatients	71

List of Tables

<i>Table No.</i>	<i>Title</i>	<i>Page No.</i>
Table (1):	Criteria for Defining UTI Events in National healthcare safety network (NHSN) Component	6
Table (2):	Catheter –associated symptomatic urinary tract infection	9
Table (3):	Antibiotics used for antimicrobial susceptibility testing for isolated <i>E.coli</i> & their zones diameter breakpoint	44
Table (4):	Primers for the PCR assay	52
Table (5):	The reagents required for PCR	52
Table (6):	PCR conditions for pap gene amplification ...	53
Table (7):	<i>E.coli</i> isolates in inpatient and outpatient groups	57
Table (8):	Demographics & clinical data of <i>E.coli</i> positive inpatients and outpatients groups	58
Table (9):	Antibiotic susceptibility results of <i>E.coli</i> strains isolated from inpatients and outpatients groups	60

Table (10): Antibiotic Susceptibility results of <i>E.coli</i> strains isolated from inpatients and outpatients with lower and upper UTI	62
Table (11): ESBL production by <i>E.coli</i> isolates among inpatients and outpatients groups	64
Table (12): ESBL production of <i>E.coli</i> isolated from patients with lower and upper UTI	65
Table (13): Biofilm formation among isolated <i>E.coli</i> strains from inpatients and outpatients groups	66
Table (14): The relation between biofilm and antibiotic resistance among <i>E.coli</i> positive inpatient and outpatient groups	76
Table (15): The presence of pap among <i>E.coli</i> isolates	69

ABSTRACT

Background: E.coli is the most common cause of urinary tract infection (UTI) both in the community and hospital settings. Uropathogenic E.coli (UPEC) possesses a number of virulence factors that allow it to colonize and persist in the urinary tract. Of particular interest are the P pili and biofilm formation. The emergence of drug resistant E.coli is a global threat to the public health. **Objectives:** To determine the biofilm producing ability, antimicrobial susceptibility pattern, ESBL production and the presence of the adhesive pap gene (pyelonephritis associated pili) in E-coli strains isolated from Outpatients and Inpatients diagnosed with UTI. **Methodology:** The study was conducted on 40 Inpatients and 40 Outpatients diagnosed with UTI attending Ain Shams University Hospitals. E. coli Isolates were tested for antimicrobial susceptibility using disk diffusion method, ESBL production by ESBL detection discs, in vitro formation of biofilm on Congo red media, and detection of Pap gene using conventional PCR technique. **Results:** The prevalence of antibiotic resistance was significantly higher in E.coli isolates from inpatients group than those from the outpatients group. The prevalence of ESBL production, biofilm formation and pap gene among E. coli isolates was 55%, 82.5% & 40% respectively. ESBL production and biofilm formation were significantly higher in the inpatients with upper UTI than in patients with lower UTI (90- 38.5%) & (100-61.5%) respectively. There was no statistically significant difference between the 2 groups as regards the prevalence of pap gene. **Conclusion:** The prevalence of biofilm producing, ESBL producing and antibiotic resistant E.coli strains is more in the inpatients population particularly those with upper UTI. Special concern should be addressed to the spread of ESBL producing E.coli in the community. Pap gene is expressed equally in the outpatients and inpatients groups which highlights its importance in the establishment of UTI.

Key words: E.coli, UTI, ESBL, pap, gene, congo red medium, virulence factors

INTRODUCTION

Urinary tract infection (UTI) is defined as microbial infiltration of the otherwise sterile urinary tract and is one of the most common bacterial infections world wide. UTIs encompass infections of the urethra (urethritis) ,bladder (cystitis), ureters (ureteritis) and kidney (pyelonephritis) (**Barber et al., 2013**). They account for ~150–250 million cases globally per year (**Asadi et al., 2014**). More than 50% of women will have at least one episode of UTI during their lifetime, furthermore, after an initial episode of UTI, women are more likely (20–40%) to get recurrent UTIs (**Grab et al., 2008**).

UTI patients are classified as either asymptomatic or symptomatic cases. Asymptomatic bacteriuria (ABU) occurs in a small number of healthy individuals and may not need treatment, which makes it different from symptomatic bacteriuria. It often affects pregnant women, with varying prevalence among different populations, depending on factors such as age, sex, sexual activity, and the presence of genitourinary abnormalities (**Grab et al., 2008**).

Uropathogenic *Escherichia coli* (UPEC) is the most common cause of urinary tract infections (UTIs) both in

community and hospital settings with significant morbidity and mortality worldwide (**Bien et al., 2012**).

UPEC strains encode widespread virulence factors closely related to colonization, persistence, and pathogenesis of bacteria in the urinary tract, the most important of these factors include adhesins or fimbriae, biofilm formation, and toxins such as hemolysin (**Dhakal et al., 2008**).

Type I and P are the most common fimbriae found in UPEC strains. They play an important role in binding and invasion to bladder (cystitis) and kidney (pyelonephritis) epithelial cells (**Wullt et al., 2000**).

Biofilm of UPEC provides a nutrient-rich environment which promotes growth and persistence of microorganisms at the site of infection, and protects bacteria from antimicrobial substances (**Hancock et al., 2010**). Moreover, UPEC strains often express and secrete a labile pore-forming toxin known as α - hemolysin that is mainly associated with more virulent UPEC strains (**Laura et al., 2012**).

Emergence of drug resistance to broad-spectrum beta lactams mediated by extended spectrum beta lactamases (ESBLs) and especially multi-drug resistant (MDR) clonal groups among UPEC strains increase the serious threat to global public health (**Hilbert, 2011**).

AIM OF THE WORK

This study aimed to determine the presence of the adhesive pap gene (pyelonephritis associated pili), the biofilm producing ability, antimicrobial susceptibility pattern and ESBL production in *E-coli* strains isolated from out patients and inpatients diagnosed with UTI in Ain Shams University Hospital.