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Short Communication

Prevalence and Antimicrobial Susceptibility of Gram Negative Bacteria Isolated From Urinary Tract Infections

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ABSTRACT

Prevalence and antimicrobial resistance pattern of pathogens involved in urinary tract infections (UTI)could be used to monitor therapeutic measures and subsequent change in antibiotics administration. Urine samples (n = 100) were collected aseptically from patients suspected of UTI originating from different hospitals (n = 4) of Lahore City and subjected to conventional microbiological procedures for isolation and identification of bacteria, and antimicrobial susceptibility.Of the total examined, 71 samples showed positivity to bacterial growth.*Escherichia coli* (50%) was the most prevalent bacteria found in urine samples followed by *Pseudomonas aeruginosa*(20%), *Klebsiella pneumonia* (17%) and*Proteus mirabilis*(13%).All isolates showed high resistance to vancomycin and ampicillin whereas efficacy of amikacin against all the pathogens was incredibly excellent.

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Urinary tract infections (UTI) represent serious threats to human health all around the world affecting millions of people each year(Reed and Kemmerly, 2009). These are the most common nosocomial as well as community acquired infections,resulting in high morbidity and increased economic loss in terms of treatment (Ojo and Anibijuwon, 2010). UTIs are widespread in both males and females; nevertheless, females are more susceptible than males (Mohsin and Siddiqui, 2010; McGregor et al., 2013). In early childhood, persistent urinary tract infections may usually emerge and 1 to 8% of children may experience UTI at least once between the age of 1 and 11 years (Kõljalg et al., 2009).

The causative agents of UTI may include bacteria, virus and fungi(Ojo and Anibijuwon, 2010). Of these, gram negative bacilli are the most prevalent uropathogens including *Escherichia coli*, *Klebsiella pneumoniae*,*Pseudomonas aeruginosa* and *Proteus mirabilis*that resultin bacteremia and hospital acquired infections (Tabibian et al., 2008; Kolawole et al., 2009).

Because of recommended empirical antimicrobial regimen, antimicrobial resistance is one of the most important and alarming risk factors in urinary tract infections(Karlowsky et al., 2002).A little is known of the causative agents and antimicrobial susceptibility of pathogens associated with UTIs in nosocomial and community acquired infections originating from Lahore City. The study, therefore, has been conducted to determine the prevalence and antimicrobial susceptibility of pathogens involved in UTIs originating from different hospitals of Lahore City.

From four tertiary care hospitals in Lahore named Jinnah Hospital (JH), Ittefaq Hospital (IH), ShaikhZayed Hospital (SZH) and Lahore General Hospital (LGH), patients (n = 100) suspected of urinary tract infections were included during the period from March to June, 2012. Urine samples were collected aseptically from male (n = 50) and female (n = 50) patients andtransferred to the Institute of Molecular Biology and Biotechnology, The University of Lahore, Lahore, Pakistan at refrigerated temperature. The Proportions of the samples collected from each hospital is given in Table 1.

On basis of colony morphology,bacterial pathogens were isolated from urine samples onCysteine Lactose Electrolyte Deficient (CLED) agar (Merck, Darmstadt, Germany) and these isolated colonies were further purified on MacConkey agar (Merck, Darmstadt, Germany). Bacteria having different colony morphology from each other were further identified by different biochemical tests and results were interpreted using the guidelines of Clinical and Laboratory Standards Institute 2012(CLSI, 2012).

All isolated bacterial pathogens were subjected for susceptibility testing for most commonly used antimicrobial agents in case of urinary tract infections. These includeampicillin (10µg), aztreonam (30µg) (β lactam), cephalexin (30µg) (cephalosporin), vancomycin(30µg) (glycopeptide) and amikacin (30µg) (aminoglycoside). For antibiotic sensitivity test, Disc Diffusion Test was conducted on Muller Hinton Agar (Merck, Darmstadt, Germany) using antibiotics on paper discs (Oxoid, Hampshire, UK); zone of inhibition were measured and results were interpreted according to guidelines of Clinical and Laboratory Standards Institute 2012 (CLSI, 2012).

Data obtained in this study was evaluated statistically using Fisher's exact test. For proportion comparison between two groups of patients, two tailed p value ‹0.05 was considered statistically significant.

Out of one hundred urine samples, seventy one samples were found positive for bacterial growth. Among 71 positive samples, 46 (65%) were of female patients and 25 (35%)urine samples were of male patients. On the basis of biochemical testing, four

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types of bacterial populations were identified; the distribution of these bacterial isolates is shown in Table 2.

Table 1: Proportion of urine samples from different hospitals

Gender	JH	IH	SZH	LGH	Total
Male	21	16	6	7	50
Female	9	6	22	13	50
Total	30	22	28	20	100

More than 50% samples were found positive for *E. coli* following by *P. aeruginosa* (20%), *K. pneumoniae* (17%) and *Pr. mirabilis* (13%). Statistically, no significant difference of prevalence of bacterial isolates was observed between two groups of patients (male and female) of all hospitals.Bacterial pathogens isolated from patients with UTI expressed high resistance versus antibiotics tested in this study. All ofthemshowed resistance to vancomycin and ampicillin whereas amikacin was able to retain excellent activity against these pathogens. However, 75% of *E. coli*, 66% of *Pr. mirabilis*, 34% of *P. aeruginosa* and28% of *K. pneumoniae* isolates were found resistant to aztreonam. Similarly, cephalexin was found sensitive for all of *P. aeruginosa,*67% of *Pr. mirabilis*, 34% of *K. pneumoniae* and 31% of *E. coli*isolates. Detailed results of antimicrobial resistance pattern by disc diffusion method are shown in Table 2.

Table 2: Prevalence and percentage of antimicrobial resistance in bacteria

Isolates	Distribution of isolates			Antimicrobial resistance (%)				
	Male (n=25) (%)	Female (n=46) (%)	*p*-value	AK	AZ	CF	AM	VN
Escherichia coli(n = 36)	13 (52)	23 (50)	1.00	0	75	31	100	100
Klebsiella pneumoniae (n = 12)	5 (20)	7 (15)	0.7422	0	28	66	100	100
Pseudomonas aeruginosa(n = 4)	4 (16)	10 (21)	0.7568	0	34	0	100	100
Proteus mirabilis(n = 9)	3 (12)	6 (13)	1.00	0	66	33	100	100

AK = Amikacin, AZ = Aztreonam, CF = Cephalexin, AM = Ampicillin, VN = Vancomycin

Among all the suspected patients for urinary tract infections, *E. coli* was found most prevalent bacteria in all hospitals. The prevalence of *E. coli* isolates was parallel to what has been reported in previous studies from Poland and Iran.More than 50% prevalence of *E. coli* isolates among UTI suspected patients in present study was slightly higher than the previous reports from Poland and Iran where the prevalence had been found 39% and 44% , respectively (Hryniewicz et al., 2001; Behzadi et al., 2010). In comparison to previous studies from Portugal and Iran, slightly higher prevalence of *K. pneumoniae*(13% and 10% vs 17%) and *P. aeruginosa*(5% vs 20%) was foundfrom different hospitals of Lahore City, whereas, the occurrence of *Pr. mirabilis* (13%) in UTIs from Portugal and Lahore City was similar to each other (Kalra and Raizada, 2009; Behzadi et al., 2010).The prevalence of *E. coli*, *P. aeruginosa* and *Pr. mirabilis* in Lahore City was almost similar to findings of previous study from Rawalpindi, Pakistan, however the occurrence of *K. pneumoniae*(17%) isolates contributing UTIs in this study was higher than the previous where it was reported about 8% (Mahboob et al., 2011).

The situation of antimicrobial potency of commonly used antibiotics in different hospitals included in thecurrent study was alarming as most of the isolates were resistant to the antibiotics which were used in case of UTI, however, amikacin still could be used as a drug of choice in such cases. Absence of resistance against amikacin in UTI bacteria isolated from different hospitals of Lahore City contradicted the previous reports where emergence of resistance against amikacin had been recorded in neighboring country India (Eshwarappa et al., 2011). On the other hand, emergence of resistance against most of the antimicrobial agents used in several hospitals could be reasoned due to their indiscriminate prescription.

Conclusively, this study shows the prevalence of gram negative bacteria in most of urinary tract infections in several hospitals of Lahore City and emergence of antimicrobial resistance against most of the antimicrobial agents is appearing a foremost object of letdown of therapeutics in hospitals.

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CONFLICT OF INTEREST

None to declare.

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