

## ORIGINAL ARTICLE

# Common Pathogen and their Drug Sensitivity Pattern in Urinary Tract Infection at Chandka Medical College Hospital Larkana

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## ABSTRACT

**Objective:** To study the pattern of existing common pathogen of Urinary Tract Infection and their drug sensitivity pattern.

**Methods:** It was a cross sectional study held in Medical Unit-I, CMC Teaching Hospital, Shaheed Mohtarma Benazir Bhutto Medical University(SMBBMU), Larkana with collaboration of Pathology Laboratory CMC Larkana, Aga Khan University Hospital Lab, Rahila Research Lab and Chughtai Lab. All the participants meeting inclusion criteria were enrolled. The reports of Urine culture were collected from above mentioned laboratories which include bio data, causative organism, their count and drug sensitivity pattern. The results were copied on proforma by researcher himself. SPSS version 25 was applied for data analysis.

**Results:** Total 302 participants were registered in the study. Out of them 75.8% of them were female and 24.2% were male. Mean age of the patients was  $40 \pm 9$  years. E-coli was found in 52.3%, Enterococcus in 13.2% and Klebsiella pneumonia in 9.6% cases. Meropenem was found sensitive in 92.4%, while cefoperazone sulbactam, Amikacin and Fosfomycin were found to be sensitive in 86.6%, 85%, 76.2% respectively. Ampicillin and Vancomycin was used in 50 cases for Enterococci. Ampicillin was found sensitive in 70% of cases where as vancomycin was found sensitive in 100% of cases with no vancomycin resistant Enterococci. For Enterobacteria Moxifloxacin was found resistant in 84.4% of cases, Ampicillin in 83.5%, Nalidix acid in 78% cases. While Ceftazidime and Amoxiclav was found resistant in 71.1% and 54.1% respectively.

**Conclusion:** E-coli, Enterococcus and klabsella were the most pathogens found in this study. The drug sensitivity pattern showed that Meropenem, Cefoperazone Sulbactam, Amikacin, Fosfomycin and Vancomycin were found commonly sensitive while Moxifloxacin, Ampicillin, Ceftazidime and Amoxiclav was found resistant.

**Keywords:** Urinary Tract Infection, Culture and Sensitivity, Meropenem, Vancomycin, Cefoperazone Sulbactam CMC @ SMBBMU, Larkana.

## INTRODUCTION

Urinary tract infection (UTI) is the most common bacterial infectious disease in public with a high incidence rate and has economic burden. It is assessed that 15 billion individuals with UTIs are infected worldwide each year and cost over \$ 6 billion. A UTI is described as bacteriuria with urinary symptoms such as dysuria, suprapubic tenderness and urgency. A UTI can distress the lower, upper, and sometimes both upper and upper urinary tract. UTIs are more communal in women than in men because the female urethra has been found to be structurally less effective at preventing the entry of bacteria. Adult women (40-50%) have a lifetime history of developing at least one UTI episode, and a third of these women have documented three or more episodes within 12 months of significant positive urine cultures. The risk of an episode recurrence is greater when the first infection is with E. coli than any other pathogen. The incidence of UTI in women increases by 5% per decade, and by about 7% during pregnancy. Sexual activity and Pregnancy in women also increase the jeopardy of urethral infections, as bacteria can be passed into the urethra while during intercourse and childbirth. The ability to not completely empty the bladder, the low concentration of urine leftward in the bladder leads to bacterial growth, which finally results in UTI. Uncomplicated

UTIs occur in healthy subjects in the absence of structural or functional abnormalities in the urinary system. Escherichia coli (E. coli) is the most often isolated pathogen in approximately 75% of uncomplicated UTI. Complicated urinary tract infections (CUTI), defined as UTIs associated with factors that impair the host's urinary system or defenses, are often caused by gram-negative pathogens. Treatment of asymptomatic bacteriuria is usually recommended only during pregnancy and in the preoperative evaluation of men prior to urological procedures. Resistance rates of all antibiotics: penicillin, piperacillin + tazobactam, cefuroxime, ciprofloxacin, ceftazidime, cefotaxime, gentamicin, imipenem in the whole bacterial spectrum higher than 10% in all regions. A descriptive cross-sectional study was held in the medicine Unit-I of Ayub Teaching Hospital in Abbottabad, Pakistan. 236 patients were admitted, had more than 8-10 pus cells in urine assessed by culture and sensitivity, and 75 patients were positive for culture. From them, 34 (45.3%) are men and 41 (54.7%) are women. E.Coli was the dominant isolate extant in 49 (65.3%) patients, trailed by Klebsiella in 9 (12%) patients. Thus, the purpose of my research was to assess the pattern of drug sensitivity in patients with UTI in the Medical Unit-I of the CMC Hospital Larkana.

## MATERIAL AND METHODS

This cross-sectional study was conducted on 302 patients with urinary tract infection at the Department of Medicine, Medical Unit-I, Chandka Medical College Hospital Larkana for the period of six months from August 2018 to February 2019. The patients aged between 18 years to 65 years of either gender with the sign and symptoms of UTI, clinical signs and symptoms of UTI or having taken treatment for last 48-hours but with persistent symptoms, urine microscopy suggestive of UTI (positive nitrites, positive leukocyte esterase) and Patients with positive urine culture were included in the study. While the patients who does not present with signs and symptoms of UTI, Negative urine cultures and who have undergone any urinary tract procedure at least 1-month prior to this study were excluded from the study. The ethical review committee of the institute has given approval of the study. After taking the informed written consent from the patients, all those cases were encompassed in the study those fulfilled the inclusion criteria. Culture was obtained by pathology department of CMCH Laboratory, Aga Khan University Hospital Lab, Rahila Research Lab and Chughtai Lab. The results were documented on the Performa by researcher himself.

SPSS version 25 was applied for data analysis. Frequency and percentage were calculated for qualitative data like gender, clinical data i.e. (Fever, frequency, urinary urgency, gross hematuria, suprapubic pain, urinary incontinence, cost vertebral angle tenderness) urinalysis, presence of micro-organism and drug sensitivity. Mean  $\pm$  SD (standard deviation) was calculated for numerical parameters such as age.

## RESULTS

During the study period, a total of 302 urine specimens were analyzed in this study based on inclusion criteria. Table 1 shows the baseline characteristics of the studied samples. In this study, we found that females were more affected than males with female to male ratio was 3.1:3. The isolate bacterial growth 229 (75.8%) urine cultures were from female patients and rest 73 (24.2%) male patients. The age of the patients presenting with UTIs ranged from 30 to 60 years with mean age  $\pm$  SD was 40.85 $\pm$ 15.9 years. Table I.

Table I: Baseline characteristics of urine/study samples (n = 302)

Gender	Number	Percentage
Male	73	24.2
Female	229	75.8
Age groups		
20-30 years	96	31.8
31-40 years	68	22.5
41-50 years	61	20.2
51-60 years	43	14.2
More than 60 years	34	11.3
Location		
Out of Larkana	252	83.4
Larkana	50	16.6
Colonycount		
50000 to 100000	34	11.3
More than 100000	268	88.7

Table 2 reports the outcomes of Pathogens. Out of 302 urine samples, the most common pathogen isolated was *E. coli* causing 158(52.3%) of infection followed by *Enterococcus* 40(13.2%), *Klebsiella pneumonia* 29(9.6%), *Enterococcusfaecalis* 19(6.3%), *Klebsiellaspacie* 17(5.6%) and *Candida species* 10(3.3%).

Table II: Distribution of patients according to pathogenic organisms (n = 302)

Pathogens	Number	Percentage
<i>E. coli</i>	158	52.3
<i>Klebsiellapneumonia</i>	29	9.6
<i>Enterococcus</i>	40	13.2
<i>Proteusmirablis</i>	7	2.3
<i>Staphaureus</i>	4	1.3
<i>Streptococcus</i>	7	2.3
<i>Coagulasenegativestaph</i>	2	0.7
<i>Klebsiellaspacie</i>	17	5.6
<i>Proetusvulgarias</i>	3	1.0
<i>Pseudomonasspacie</i>	3	1.0
<i>Pseudomonasaeruginosa</i>	4	1.3
<i>Candidaspacies</i>	10	3.3
<i>Candidaalbicans</i>	4	1.3
<i>Providencia</i>	7	2.3
<i>Acenobacterspacie</i>	2	0.7
<i>Citrobacterfriendi</i>	1	0.3
<i>Enterococcusfecalis</i>	19	6.3
<i>Morganelamorgania</i>	1	0.3

Table 3 reports the outcome of antibiotics. For Ampicillin there were 227(75.2%) samples tested and found resistant, for Amoxiclav 100 (33.1%) cases were tested and found resistant, for Tazobactumpiperacillin there were 172 samples tested and 57.0% were sensitive, for Cefotaxime 151 cases tested and 50.0% were found resistant, for Cefepime 93 cases were tested and 30.8% found sensitive, for Gentamicin 108 samples were tested and 35.8% found resistant and for Moxifloxacin 14 samples were tested, 4.6% found resistant.

Table III: Sensitivity patterns of the pathogens to different antibiotics

Ampicillin	Number	Percentage
Sensitive	45	14.9
Resistant	227	75.2
Not tested	30	9.9
Co-Amoxiclav		
Sensitive	127	42.1wss
Resistant	100	33.1
Not tested	75	24.8
Pipercillin-Tazobactum		
Sensitive	172	57.0
Resistant	20	6.6
Not tested	110	36.4
Cefotaxime		
Sensitive	69	22.8
Resistant	151	50.0
Not Tested	82	27.2
Cefepime		
Sensitive	93	30.8
Resistant	93	30.8
Not Tested	116	38.4

Cefoperazone-Salbactum		
Sensitive	194	64.2
Resistant	30	9.9
Not Tested	78	25.8
Nalidixic acid		

Sensitive	20	6.6
Resistant	71	23.5
Not Tested	211	69.9
Tobramycin		
Sensitive	48	15.9
Resistant	70	23.2
Not Tested	184	60.9
Ceftazidime		
Sensitive	13	4.3
Resistant	32	10.6
Not Tested	257	85.1

Aztreonam		
Sensitive	70	23.2
Resistant	121	40.1
Not Tested	111	36.8
Meropenem		
Sensitive	159	52.6
Resistant	13	4.3
Not Tested	130	43.0
Imipenem		
Sensitive	180	59.6
Resistant	13	4.3
Not Tested	109	36.1
Gentamicin		
Sensitive	108	35.8
Resistant	98	32.5
Not Tested	96	31.8
Amikacin		
Sensitive	196	64.9
Resistant	33	10.9
Not Tested	73	24.2

Ofloxacin		
Sensitive	27	8.9
Resistant	44	14.6
Not Tested	231	76.5
Fosfomycin		
Sensitive	160	53.0
Resistant	50	16.6
Not Tested	92	30.5
Nitrofurantoin		
Sensitive	145	48.0
Resistant	72	23.8
Not Tested	85	28.1
Co-trimoxazole		
Sensitive	43	14.2
Resistant	106	35.1
Not Tested	153	50.7

Moxifloxacin		
Sensitive	3	1.0
Resistant	14	4.6
Not Tested	285	94.4

E. coli was the commonest organism 158 (52.3%) isolated, predominantly in 20-30 years age group 51 (32.3%); Enterococci were revealed in 40(13.2%) cases, mostly in 31 to 40 years age group 14 (35.0% cases); Klebsiella pneumoniae were isolated in 29(9.6%) cases, mainly in 31-40 years age group (27.6%). Table IV.

Table IV: Age and Gender wise distribution of pathogenic organisms (n = 302)

	E. coli	Klebsiella pneumoniae	Enterococcus	Proteus mirabilis	Staphylococcus aureus	Streptococcus	Klebsiella species	Proteus vulgaris	Candida species	Candida albicans	Providencia	Enterococcus faecalis
ns												
Age groups:			11(27.5%)						1(10.0%)		2(50.0%)	3(42.9%)
20-30 years			14(35.0%)						2(20.0%)			
31-40 years	51(32.3%)	6(20.7%)	8(20.0%)	3(42.9%)	0(0.0%)	1(14.3%)	9(52.9%)	1(33.3%)	0(0.0%)			6(31.6%)
41-50 years	32(20.3%)	8(27.6%)		1(14.3%)	0(0.0%)	4(57.1%)	2(11.8%)	1(33.3%)	2(20.0%)	0(0.0%)	1(14.3%)	4(21.1%)
51-60 years	31(19.6%)	7(24.1%)	6(15.0%)	2(28.6%)	3(75.0%)	1(14.3%)	3(17.6%)	0(0.0%)		1(25.0%)		3(15.8%)
more than 60	21(13.3%)	4(13.8%)		1(14.3%)	0(0.0%)	1(14.3%)	1(5.9%)	1(33.3%)	5(50.0%)		0(0.0%)	6(31.6%)
	23(14.6%)	4(13.8%)	1(2.5%)	0(0.0%)	1(25.0%)	0(0.0%)	2(11.8%)	0(0.0%)		0(0.0%)	0(0.0%)	0(0.0%)
<b>Total</b>	<b>158(100.0%)</b>		<b>40(100%)</b>				<b>17(100%)</b>		<b>10(100%)</b>	<b>4(100%)</b>	<b>7(100%)</b>	
		<b>29(100%)</b>		<b>7(100%)</b>	<b>4(100%)</b>	<b>7(100%)</b>		<b>3(100%)</b>				<b>19(100%)</b>
Gender			13(32.5%)						5(50.0%)		1(14.3%)	
Male	128(81.0%)	7(24.1%)	26(65.0%)	4(57.1%)	1(25.0%)	7(100.0%)	13(76.5%)	1(33.3%)	5(50.0%)	4(100.0%)	6(85.7%)	5(26.3%)
Female		22(75.9%)		3(42.9%)	3(75.0%)			2(66.7%)				14(68.4%)

## DISCUSSION

Urinary tract infection (UTI) is the most common infectious disease, with an overall incidence of 18/1000 people per year in the general population. Due to the widespread and harmful use of antibiotics at the community level, we find increasing resistance to commonly used antibiotics. Effective management of patients with UTI caused by bacteria is identification of isolated bacteria and an effective antibiotic used to treat bacterial organisms.

This study focuses on the local state of uropathogens in the antimicrobial susceptibility model to support further monitoring of an environment where bacterial resistance is constantly changing and the treatment of UTIs.

In this study, the ratio of women to men more affected by women than men were 3.1: 3. Individual growth of 229 (75.8%) urine cultures was in women, and the remaining 73 (24.2%) in men. This observation was similar to a local study by Khan IU et al in Rawalpindi, which showed that most of the isolated urine was female (70%) because UTIs often occur in women due to a short urethra, and Cuhna MA et al. reported that the majority of samples were collected from patients in primary care settings and 79% were from women, Lawhale1 MA et al show that UTIs are more common in women (73.97%) than in men (26.02%), which is similar to previous studies. Female have short urethra and close proximity of female urinary system with vaginal and rectal mucosa with their rich bacterial flora and sexual intercourse have been described as a factor increasing the frequency of UTI in women. In our results, the mean age of UTI patients ranged from 30 to 60 years  $\pm$  SD 40.85  $\pm$  15.9 years. Most of the UTI patients (96/302; 31.8%) were between 20 and 30 years of age. According to Dahs M et al, the same results showed that young female patients aged 18 to 37 had the highest incidence of UTI (55.4%). This result is in line with previous studies. Compared to Lawhale1 MA et al UTI is most common in men aged 61-80 years (44.4%). Older men had a higher incidence of UTI than older women (19.54%). This trend is similar to the study by Shah et al and Sood et al.

In this study, the most common pathogen isolated was *E. coli*, which caused 158 (52.3%) infections, followed by *Enterococcus* 40 (13.2%), *Klebsiella pneumoniae* 29 (9.6%), *Enterococcus faecalis* 19 (6.3%), *Klebsiella* species 17 (5.6%) and *Candida* species 10 (3.3%). *E. coli* and *Klebsiella* were also the most common microbes isolated in the Tandel PR study. These findings are consistent with recent reports by IramShaifala on gram-negative bacteria, particularly *E. coli* (33.1%) and *Klebsiella* (7.9%) protease (0.7%) *Staphylococcus aureus* (2.2%). In this study, the susceptibility pattern of *E. coli* showed that 129/158 (81.6%) of the isolates were sensitive to amikacin, 116/158 (73.4%) to imipenem, 117/158 (74.1%) to Cefoperazonesulbactam and 120/158 (75.9%) Fosfomycin. This is consistent with the studies by Khan IU et al. Similar results were disclosed, with susceptibility patterns to *E. coli* of 96.2% isolated bacteria sensitive to imipenem and 85.1% to amikacin. Resistance to ampicillin was found in 132/158 (83.5%) *E. coli* and *Klebsiella* spp., 27/29 (93.1%) *Proteus* spp. Waseem Ahmed et al show very high rates of resistance to inexpensive drug "Ampicillin" were found in the study against the most commonly bacteria. These findings are

well related to these studies. A study by Rodríguez et al. Showed that 40.8% of *E. coli* were resistant to ampicillin.

In our results, 93.4% of the samples were exposed to *E. coli* nitrofurantoin. This has been documented according to Shanmugapriya S et al who showed that nitrofurantoin was in favor of the use of most antibiotics in sensitive organisms (85%) in UTI empirical therapy.

In this study, among patients infected with the *E. coli* 30/158 isolate (19.0%) were men, and 128/158 (81.0%) were women. Regarding *K. pneumoniae*, 7/29 (24.1%) of patients with *K. pneumoniae* are men and 22/29 (75.9%) are women. *Enterococcus*, 13/40 (32.5%) The samples affected by *Enterococcus* were male, while 26/40 (65.0%) of the patients were female. This was similar to the study by Miroleymani SR et al who mentioned that *E. coli* is the most common pathogen, the incidence among women was significantly higher than the males in her study, and the incidence of *Klebsiella* as the second most common pathogen much higher in men. This finding correlates well with this study.

## CONCLUSION

Urinary Tract infection is much more common in our population. Females are more affected than males. Majority of the patients belonged to age group of 20-30 years. Most of the urine cultures grew more than 100000 CFU/ml microorganisms. *E. coli*, *Enterococcus* and *Klebsiella pneumoniae* are the most common bacterial isolates in all the patients infected with UTI. There is difference in type of microorganisms growth in the urine cultures in different age groups with *E. coli* is the predominant isolate in patients of twenties and *Enterococcus* and *Klebsiella* were found in patients of 31-40 years age group. All these isolates are more frequent in female population. *E. coli* showed sensitivities to Amikacin followed by fosfomycin, Cefoperazone-sulbactam, Imipenem, and Meropenim while it was resistant to conventional older anti-bacterials Ampicillin, Aztreonam, Co-Trimoxazole and Nalidixic acid. *Enterococcus* showed sensitivities to Penicillins and Nitrofurantoin. Regarding the *Klebsiella pneumoniae*, urinary cultures showed good sensitivities to Cefoperazone-sulbactam, Amikacin, Piperacillin-Tazobactam and Carbapenems in descending order.

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