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## **Study of bacterial and hospital acquired factors of urinary tract infections in patients in district Chakwal**

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**Abstract**--Majority of hospital acquired infection included Urinary Tract Infection (UTIs) worldwide. If the causes of UTI are well understood, the condition may be easily managed with timely management. In current study, the UTI factors and frequency of pathogenic bacteria in all patients were observed and also the bacterial cultures were identified to check the percentage of infection caused by different gram positive and negative bacteria. For this study, 300 urine samples were collected aseptically and subjected to routine microbiology analysis. Different gram negative and gram-positive bacteria were isolated and identified from the urine samples. The gram-negative bacteria, *Escherichia coli* was the most dominant and frequently identified bacteria in UTI emerged as the most dominant bacterial uropathogens, followed by *Staph aureus*, *Klebsiella spp.*, *Proteus spp.*, and *Enterococcus*. This study found significant associations ( $p < 0.05$ ) with UTI with age 19 years to 50 years, male and female gender, married and single people, genitourinary tract anomalies, diabetes and indwelling catheter use for 6 days.

**Keywords**--pathogens, urinary track infections, hospital, etiology.

**Introduction**

There are many hospitals acquired infection, in which the most frequently observed were urinary infection. The possibility urinary tract infection increased day by day as the number of patients also increases in hospitals. The number of most patients were those who are immunocompromised and have deep history of illness. These infections also lead to many numbers of deaths in worldwide countries. There are many Asian and African countries where urinary tract infection is most commonly occurred (Nighat et al. 2022). The Asian counties included India, Bangladesh, Pakistan, Indonesia, Nepal, Afghanistan and Iraq where as in African countries like Uganda, Ethiopia and Nigeria were the most affected countries. Infections of the urinary tract are inflammation conditions of the urinary system caused by abnormally developing microorganisms. These infection leads to many other diseases like dysuria, fever, and lower abdominal pain (Maclean 2001). UTI can be acquired by both hospital and community. The community acquired or hospital acquired both infections are very harmful for the patients. The community-acquired UTI is the second most common microbiological illness in a community setting (Anger et al. 2019). The nosocomial infections are infectious diseases of the urinary tract that develop after a patient has been hospitalized for 48 hours and has not been incubated at the time of

admission. The pathogenic organisms and duration and severity of infection are the main reasons of severe UTI and it also affect the patient's immune system. Asymptomatic, chronic, acute, or uncomplicated urinary tract infections are all possible (Liu et al. 2018). Both symptomatic and silent UTIs pose a significant risk to public health care, lowering life expectancy and increasing absenteeism. The symptoms of a urinary tract infection (UTI), such as fever, burning while vomiting, irritation, pruritus, cramps and lesions and umbilicus pain, and purulence, are appropriate to the needs on the infected person. Gender, maturity level, race, genital mutilation, HIV, metabolic syndrome, catheterization, urogenital anomalies, pregnancy, infants, the adults, and inpatient hospital status can all contribute to recurrent UTIs (Long and Koyfman 2018). After *E. coli*, the most frequently isolated pathogenic organism in UTIs is *K. pneumoniae*, followed by *Staphylococcus*, *Pseudomonas*, *Proteus*, *Enterococcus*, and *Enterobacter*. About 150 million of peoples were affected by UTIs and many of them also died due to high risk infections. The first 48 hour of infection were very critical if the patient did not recover the chances of death are more. About 5.5% of deaths occurred were due to the UTIs in the world. The women were more susceptible to the UTI than men (Bullens et al. 2022). A study in Africa discovered a prevalence of community and nosocomial UTIs in males and females, the males had a frequency of 7.4%, while females had a frequency of 14.6% (O'Grady et al. 2019; Zubair et al. 2019). The factors like female gender, age, and marital status all had a statistically significant association with infections. The prevalence *Escherichia coli* in UTIs was the most common whereas *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Citrobacter* species, *Enterobacter*, *Acinetobacter* and *P. aeruginosa* were the most common bacteria. *Staphylococcus aureus* was found to be the most common bacterial uropathogens in a study of UTIs in diabetic patients (Long and Koyfman 2018; Tang et al. 2019).

## **Material and Methodology**

### **Study area and design**

Midstream urine (MSU) specimens were collected from Capital Health Hospital in Chakwal district and stored at 4 C. From May to October 2022, a cross-sectional medical survey was conducted. The study included both outpatients and inpatients who had UTIs or were highly suspect of having them. The study included only patients who had UTIs or were highly suspect of having them, lived in the Chakwal district, and were treated at the Capital Health Hospital. Patients who were terminally ill, refused to provide urine samples, or had received antibiotics in the previous two weeks were excluded from the study. Patients who met the selection criteria were obtained through simple random sampling from each hospital's inpatient and outpatient departments (Nighat et al., 2022).

### **Assessment of HIV status of patients**

The blood sample was used to check the HIV status of the patients. The test strip bore the patient's unique identification number. When using a blood sample, one drop of chase buffer was placed on the specimen pad, and 50 ml of the specimen was collected using a Pasteur or precision pipette. The following is how the results

of the tests were interpreted: Two lines of varying intensity appear in both the patient test region and the control region.

### **Assessment of Diabetic Status**

The diabetic test strips were used to check the patients blood sugar level. The results were observed with the optimum glucometer and recorded in 20 seconds. Children's fasting blood sugar levels range from 2.4 to 5.3 mmol/l, while newborns' levels range from 1.1 to 4.4 mmol/l. the normal sugar level of adults was between 3.3 to 7.4 mmol/l (Nighat et al. 2022).

### **Culturing of Urine Specimen**

The urine samples were collected in sterile vials. Urine samples were taken with a syringe from brand-new catheters in patients who had urinary catheters and placed in a sterile specimen tube. The pathogenic bacteria were isolated and also identified in a hospital microbiology lab. The urine sample was inoculated in nutrient agar medium and incubated for 24 hrs (Zubair et al. 2019; Nighat et al. 2022).

### **Data Analysis**

The data were analyzed by using SPSS version 20.1.

## **Results**

### **Characteristics of Patients**

After receiving informed consent and meeting the eligibility requirements, 300 patients who had UTIs or were highly suspect of having them were enrolled in the study. The study participants' age was from 1 years to 50 years, of the participants in the study were mostly female. UTI prevalence in Patients visiting three hospitals in the district provided 300 morning clean catch midstream pee samples. In 86/300 (28.66%) cases, significant bacteriuria was found. The prevalence of bacterial UTI was 35/86 (40.7%), highest in the age range of 20-29 (Table 1). Females were more likely than males to have a UTI, with 75/210 (35.7%) as opposed to 33/94 (35.1%). With 42/94 (44.6%) cases, *Escherichia coli* was the most common bacterial uropathogens, followed by *Staphylococcus aureus* (35%), *Klebsiella pneumoniae* (12%), *Enterococcus faecalis* (2.5%), *Proteus mirabilis* (4.5%), *Klebsiella oxytoca* (7.5%), and *Proteus vulgaris* (2%). (Table 2).

Table 1: Age-specific prevalence of bacterial uropathogens

Age range (years)	Positive UTI	Negative UTI	Total
1-5	5	18	40
6-10	7	38	44
11-20	12	29	35
21-30	25	33	94
31-40	15	28	48

41-50	22	35	39
Total	86	181	300

Table 2: Prevalence of bacterial uropathogens isolates from MSU

Uropathogens	Male	Female	Total
<i>E. coli</i>	10	24	34
<i>S. aureus</i>	5	19	24
<i>K. pneumoniae</i>	4	8	12
<i>P. vulgaris</i>	0	3	3
<i>E. faecalis</i>	3	2	5
<i>K. oxytoca</i>	2	3	5
<i>P. mirabilis</i>	1	2	3
Total	25	61	86

## Discussion

This study examined hospitalized patients in the Chakwal to ascertain the prevalence, risk factors, and severity of bacterial urinary tract infections. According to our data, 210/300 of patients visiting hospitals in district Chakwal had bacterial UTIs. The individuals with symptoms and non-symptoms represented 38/86 and 48/86 of UTI prevalence, respectively (Assawatheptawee et al. 2022). In Mulago, a previous study found a significantly higher predominance of considerable bacteriuria in asymptomatic individuals, with 32/40 cases. Provided that the study only gathered adult females, who always have a high risk of developing diseases, the higher percentage in the experiments conducted carried study is not remarkable (Hooton et al. 2018a, b). The presence of mostly present pathogen in UTI was *E. coli*, the percentage of this pathogen were about 70% in different studies. The highest prevalence of UTI by *E. coli* were observed in Uganda (Behzadi et al. 2010; Getaneh et al. 2021).

The second-most prevalent pathogenic bacteria were *S. aureus* isolated from UTI patients. Previous studies showed that about 27% of UTI were due to *Staphylococcus aureus* in different underdeveloped countries. The high prevalence of *S. aureus* in UTI found in Mulago, Uganda and Nigeria. The *S. aureus* prevalence rate was about 45% in these countries. Previous research has linked electronic instruments such as urethra catheters to an increase in Staph UTIs (Amiri et al. 2015). This study discovered a statistically significant link between UTIs and 19-year-old age, female gender, married persons, metabolic syndrome, upper gastrointestinal irregularities, hospitalization, catheter, and increased catheter duration. In a similar study conducted in Uganda in 2016, Kabugo et al. discovered that age and female gender had a statistically significant connection with UTIs (Behzadi et al. 2010; Hooton et al. 2018b).

The clinically important link between diabetes and UTIs could be contributed to altered immunogenicity in diabetics, which contains decreased mononuclear cells leukocyte features, modified leukocyte adherence, chemotactic, phagocytic cells, hampered strong antibacterial activity and bladder discharge. Furthermore, higher glucose concentrations in the urine in diabetic patients may end up

serving as a growth media for harmful microbes, leading to UTIs (Hooton et al. 2018a; Nighat et al. 2022).

## Conclusion

UTIs were discovered in 86/300 patients in Chakwal hospital. According to this study, the most important factors associated with UTIs are medical intervention, marriage status, peripheral intravenous duration, metabolic syndrome, genital tract irregularities, and female gender. We recommend routine UTI screening for patients who are undergoing treatment, have urogenital abnormalities, are diabetic, female, or married. UTI can be avoided at a lower cost if these routine inspections are implemented.

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