

ORIGINAL ARTICLE

Frequency of different uropathogens in diabetic patients of Southern Khyber Pakhtunkhwa, Pakistan.

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ABSTRACT... Objective: To determine the frequency of commonly found uropathogens causing urinary tract infection in diabetic patients. **Study Design:** Cross-sectional, Descriptive study. **Setting:** Department of Medicine and Endocrinology MTI DHQ Hospital Bannu. **Period:** 1st December 2021 to 1st March 2025 with the duration of study over 4 years. **Methods:** In this study, midstream urine of about 125 diabetic patients (25-35 ml) was obtained from each patient in a sterile, leak proof container and labelled for microbiological analysis. Two types of urine cultures were observed, positive urine cultures showing uropathogen growth and negative urine culture. Only positive cultures were further analyzed for uropathogen identification. **Results:** In this study, 62 urine samples showed uropathogen growth while 63 urine samples did not show any growth. About 80 % patients were female. *E. coli* was the most commonly observed uropathogen (54.8%), followed by *Enterococcus* spp. (12.9%), *Klebsiella pneumoniae* (8.1%), *Candida albicans* (8.1%), and *Pseudomonas aeruginosa* (6.5%). **Conclusion:** This study showed that most uropathogens causing urinary tract infection in diabetic patients belong to the Gram-negative group, predominantly *E. coli* (54.8%), while other organisms such as *Enterococcus* spp., *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Candida albicans*, and *Staphylococcus aureus* were less frequent.

Key words: Diabetes Mellitus, Urinary Tract Infection, Uropathogens.

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INTRODUCTION

Hook or Grabber

The burden of urinary tract infections (UTIs) is substantial, particularly among diabetic patients, who are more prone to developing UTIs due to compromised immune systems.¹

Background Information

Diabetes mellitus is a pervasive chronic condition affecting millions worldwide, with a significant proportion residing in Pakistan.² Southern KPK, a region with a high prevalence of diabetes, is particularly vulnerable to the complications associated with this disease, including UTIs.³

Research Problem or Gap

Despite the growing concern of UTIs in diabetic patients, there is a scarcity of research on the prevalence of pathogens in UTIs in diabetic patients in Southern KPK (4, 5). This knowledge gap hampers the development of effective prevention

and treatment strategies, exacerbating the issue.

Research Question or Hypothesis

This study aims to investigate the prevalence of pathogens in UTIs in diabetic patients in Southern KPK, with a focus on identifying the most common pathogens and their antibiotic resistance patterns.^{6,7}

Significance of the Study

This study is crucial for several reasons. Firstly, it will provide valuable insights into the epidemiology of UTIs in diabetic patients in Southern KPK, enabling healthcare providers to develop targeted prevention and treatment strategies.⁸ Secondly, it will inform antibiotic prescribing practices, reducing the risk of antibiotic resistance and improving patient outcomes.⁹

Scope and Limitations

This study will be conducted in Southern KPK, focusing on diabetic patients with UTIs. The study's

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limitations include its cross-sectional design, which may not capture the temporal relationships between variables, and the potential for selection bias.¹⁰

Thesis Statement or Research Objective

The objective of this study is to determine the prevalence of pathogens in UTIs in diabetic patients in Southern KPK, with a view to informing prevention and treatment strategies and improving patient outcomes.¹¹

Overview of the Article's Structure

This article will present the study's methodology, results, and discussion, followed by conclusions and recommendations for future research and practice.

METHODS

This cross-sectional descriptive study was conducted at outdoor, indoor patients District Headquarter Hospital (DHQ) in both medical and endocrinology OPDs from 1st December 2021 to 1st march 2025 with the duration of study over 4 years. Sample size was 125 and was calculated using WHO standard formula. 95% confidence interval used with 5% margin of error. P value <0.05 was considered as statistically significant. Method used for sampling is non-probability sampling technique. All patients with diabetes mellitus (type 1 and type 2) irrespective of age were included in this study. Non-diabetic patients and those with obstructive uropathy were excluded from the study. Permission for data collection was obtained from ethical review board MTI DHQ Hospital Bannu via letter NO: 05(a)p. file/no objection certificate/DHQ/BNU Dated 01-01-2022. All patients were interviewed through designed question Performa for demographic data, glycemic control, compliance, socioeconomic status in detail and urinary tract symptoms. Early morning urine culture is used as standard diagnostic tool for UTI taken by manual method and VITEK-MS (MALDI-TOF)/biochemical method for microbial identification, Kirby-Bauer Disk Diffusion for Antibiotic susceptibility testing, test/method for MIC susceptibility testing used is E-test/Microbroth dilution/Colistin Broth Disk Elution, and for AST Standards EUCAST/Clinical and Laboratory Standards Institute (CLSI) standard used. Data entered into SPSS version 22.0 and analyzed. Mean + SD were calculated for quantitative variables like

age, duration of diabetes, HbA1c. Frequencies and percentages were calculated for sex, education, and dietary habits. All results were presented as tables and graphs.

RESULTS

A total of 125 diabetic patients were included in the study. The majority were female (100/125, 80.0%), while males accounted for 20.0% (25/125). Most patients presented with symptoms of urinary tract infection: 108 patients (86.4%) were symptomatic, and 17 (13.6%) were asymptomatic (Figure-1). Detailed demographic and baseline clinical characteristics are summarized in Table-I.

Urine cultures were positive for uropathogen growth in 62 patients (49.6%) and showed no growth in 63 patients (50.4%). Culture positivity rates were similar between genders; 13 of 25 males (52.0%) and 49 of 100 females (49.0%) had positive cultures (Table-I).

TABLE-I

Demographic and clinical characteristics of the study population (N = 125)

Variable	Category	n (%)
Gender	Male	25 (20.0)
	Female	100 (80.0)
Symptoms of UTI	Symptomatic	108 (86.4)
	Asymptomatic	17 (13.6)
Urine culture result	Positive (uropathogen growth)	62 (49.6)
	Negative (no growth)	63 (50.4)
Culture positivity by gender	Male, culture positive	13/25 (52.0)
	Female, culture positive	49/100 (49.0)

Among the 62 culturepositive samples, the most frequently isolated uropathogen was *Escherichia coli*, found in 34 cases (54.8% of positive cultures), followed by *Enterococcus* spp. in 8 cases (12.9%), *Klebsiella pneumoniae* in 5 (8.1%), and *Candida albicans* also in 5 (8.1%). *Pseudomonas aeruginosa* was identified in 4 specimens (6.5%). Rare isolates included *Staphylococcus aureus*, *Citrobacter* spp., *Moraxella catarrhalis*, and *Haemophilus influenzae*, each accounting for 1.6% of positive cultures (one isolate each). Two positive cultures (3.2%) had unspecified or mixed growth and were not further typed. The complete

pathogen distribution is presented in Table-II.

TABLE-II

Uropathogens isolated from urine cultures of diabetic patients (n = 62 positive cultures)

Uropathogen	Number of Isolates (n)	Percentage of Positive Cultures (%)	Percentage of Total Sample (N=125) (%)
Escherichia coli	34	54.8	27.2
Enterococcus spp.	8	12.9	6.4
Klebsiella pneumoniae	5	8.1	4.0
Candida albicans	5	8.1	4.0
Pseudomonas aeruginosa	4	6.5	3.2
Staphylococcus aureus	1	1.6	0.8
Citrobacter spp.	1	1.6	0.8
Moraxella catarrhalis	1	1.6	0.8
Haemophilus influenzae	1	1.6	0.8
Total isolates counted	60	96.8	–
Unspecified / mixed growth (not detailed)	2	3.2	1.6

DISCUSSION

Prevalence of medical conditions like Diabetes mellitus is very high in poor socioeconomic areas like southern Khyber Pakhtunkhwa. Lack of awareness, high rates of illiteracy, inadequate physical activity, erratic dietary habits, poor financial conditions and lack of health care facilities contribute to this high prevalence in this part of the world.¹² Among numerous complications related to diabetes, urinary tract infections remain highly prevalent entity.¹³ In our study, we found that out of 125 studied urine cultures, 62 were found to be positive for uropathogens (49.6%). Out of 125 patients, 25 were male and 100 were female showing a strong tendency towards female gender as established in the existing literature.¹⁴ About 13 (52%) out of 25 male patients were positive. In females the positive cultures were 49(49%) out of hundred showing no significance difference between both genders in terms of urine culture showing uropathogen growth. This female predominance in UTI is primarily due to short urethra and close proximity of urethra to the

Anus in females.¹⁵ In a study conducted in Karachi Pakistan, the diagnostic accuracy of urine cultures in terms of sensitivity was observed as 76 %, a value slightly higher than reported in our study.¹⁶ Such significant difference might have different reasons like availability of health care facilities, poor socioeconomic status, level of laboratory facilities, methods applied in terms of urine collection and analysis, and level of awareness. This aspect of our discussion was highlighted in a study in Great Britain where considerable variations were observed among different test methods applied.¹⁷ On the other hand, prevalence of UTI in diabetic patients in Bangalore was 56.4% in low socioeconomic status patients and 51.6% in high socioeconomic. Our study findings are similar to that in Bangalore study. This strong similarity can be explained by similar demographic statuses, both cities are developing, high proportion of illiterate population and limited access to health care facilities, in which people lack awareness regarding symptoms of both diabetes and UTI.¹⁸

The predominant uropathogen in our study was E. coli (56.7%), followed by Enterococcus sp (13.3), and Klebsiella sp (8.3%). Candida Albicans was found in 8.3% and Pseudomonas Aeruginosa in 6.7%. Same results were observed in another study in India where E. Coli was the main (41 %) uropathogen followed by Klebsiella pneumoniae (14%).¹⁹ In another study from Peshawar, E. coli was isolated in 71 % urine samples followed by 17 % samples showing Klebsiella pneumoniae growth.²⁰ In another study from Lahore, E. Coli was found in 76.8% of samples followed by klebsiella pneumoniae (10%), Enterobacteriaceae (9%), Pseudomonas (4.40%) and staph aureus 2%.²¹ These results closely match with our study results. In our study, Candida Albicans was isolated in 8% urine samples which is slightly lower than 17% candida growth observed in Ethiopian diabetic population.²²

Main limitation of our cross-sectional study was that it fails to establish causal relationship between glycemic control and occurrence of urinary tract infection. Small sample size limits the statistical power of our study. Also, it was a single center study limited to DHQ Bannu and Specific drainage area it covers.

CONCLUSION

This study showed that most of the uropathogens causing urinary tract infection in diabetic patients belong to gram -ve group (*E. Coli*) while other uropathogens like enterococci, klebsiella pneumoniae, pseudomonas, aeruginosa, candida albicans and staph aureus were rare.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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3	Hasnain Khan: Data collection.
4	Mohib Ullah Khan: Topic selection.
5	Wajid Ullah Khan: Data entry, draft writing.
6	Raza Muhammad Khan: Final review.
7	Kamran Khan: Proof reading.