ETIOLOGY AND ANTIBIOGRAM ASSAY OF URINARY TRACT INFECTION IN DIABETIC PATIENTS

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ABSTRACT

Background: Diabetes Mellitus (DM) has become an important international health issue and a substantial financial burden for poor countries. Urinary tract infection (UTI) is among the most prevalent health issues experienced in any age group of patients with diabetic complications. Individuals with diabetes have a higher risk of UTIs than people without the disease.

Abstract: The aim of this study was to determine the etiology and antibiogram assay of urinary tract infection in diabetic patients

Material and Methods: This prospective cross-sectional study was carried out at the Department of Medicine Hayatabad Medical Complex Peshawar from March 2023 to March 2024. A total of 240 participants including both diabetics and non-diabetics were included. Patients whose urine sample had not shown growth on two samples or were already on antibiotic therapy were excluded. Urine cultures having 10^5 CFU or more were included. For each growth positive specimen of uropathogens, drug sensitivity testing was performed using the modified Kirby-Bauer disc diffusion technique. The software Stata 12.0 (College Station, Texas, USA) was used to perform the necessary statistical analysis.

Results: Overall there were 240 patients in our study. Amongst the diabetic patients, 81 were male and 34 were female while in non-diabetics participants there were 70 male and 55 females. Patients with diabetes had an average age was 52.9 ± 9.1 years, while individuals without diabetes had an average age of 53.1 ± 8.6 years. Among all, the most prevalent uropathogen was *Escherichia coli* (56.8%) followed by *Klebsiella pneumoniae (*25.2%). Participants with diabetes were shown to have comparatively higher prevalence of *Proteus Spp* and *Pseudomonas spp*. The patterns of antimicrobial sensitivity in both groups were in decreasing order of susceptibility: 95 percent compared to 100%

colistin > Amikacin (84% compared 85%) > Piperacillin/Tazobactam (78% compared to 85%) > Meropenem (93% versus 98%) > Cefoperazone/Sulbactam (87% versus 86%)

Conclusion: In our study the most prevalent bacteria was found to be *E.coli* in both groups followed by K. *pneumoniae.* Participants with diabetes were shown to have comparatively higher prevalence of *Proteus Spp* and *Pseudomonas Spp.* Between the two groups; there was no discernible variation in the patterns of antibiotic sensitivity.

Keywords: Diabetes, Urinary tract infections, Antibiogram, Antibiotic resistance

Introduction
Diabetes Mellitus (DM) has become an important international health issue and a substantial financial burden for poor countries [1]. Globally, there were 451 million diabetes cases in 2017, and by 2045, the number is predicted to rise to 691 million. About 26.3 percent of the local population over the age of nineteen has diabetes, according to the most recent national diabetes research carried out in Pakistan [2]. Urinary tract infection (UTI) is among the most prevalent health issues experienced in any age group of patients with diabetic complications. Individuals with diabetes have a higher risk of UTIs than people without the disease [3]. Serious UTIs and their consequences have the potential to significantly increase morbidity and death. Additionally, there is a correlation between UTI and increased medical expenses due to its treatment. One potential cause of UTI in diabetic patients may be hyperglycemia-induced neuropathy, which can lead to neurogenic bladder, urine stasis, and an increased risk of infection. [4, 5]. In addition, hyperglycemia encourages a variety of organisms to grow and colonize. A previous study reported that *E. Coli* is the most often occurring isolate, followed by *Enterococci, Pseudomonas, Citrobacter,* Serratia, Gram-positive Cocci, *Proteus,* and *Candida*[6]. In addition to periodic screening, identification of the causative agent, and appropriate care based on susceptibility pattern, strict glycemic control in diabetes mellitus may help reduce the incidence of UTI and its associated complications as well as death [3]. In a country like Pakistan, the antibiotics are used without prescription and this lead to high antibiotic resistance and therefore pressures in community and healthcare settings are rising [7]. Furthermore, there is inappropriate data on the microbiological etiology and antibiotic resistance pattern of UTIs in diabetic individuals in Pakistan. Therefore the current study was conducted to determine the Etiology and antibiogram assay of urinary tract infection in diabetic patients.

Material and Methods
This prospective cross-sectional study was carried out at the Department of Medicine Hayatabad Medical Complex Peshawar from March 2023 to March 2024. A total of 240 participants including both diabetics and non-diabetics were included. To gather basic demographic information a pretested semi-structured questionnaire and an interview schedule were used after taking the ethical approval. For glycemic control studies venous samples and routine urinary checkups midstream clear urine samples were collected. Microscopic investigation, culture, as well as sensitivity variations were obtained from respondents pursuing the OPD/IPD.
Exclusion criteria: Patients whose urine sample had not shown growth on two samples, were terminally sick, or were already on antibiotic therapy were excluded.
Inclusion criteria; Urine cultures having 10^5 CFU or more were given incubation for the detection of uropathogenic screening by means of biochemical tests.
For each growth positive specimen of uropathogens, drug sensitivity testing was performed using the modified Kirby-Bauer disc diffusion technique. The software Stata 12.0 (College Station, Texas, USA) was used to perform the necessary statistical analysis.
Results
Overall there were 240 patients in our study. Amongst the diabetic patients, 81 were male and 34 were female while in non-diabetics participants there were 70 male and 55 females. Patients with diabetes had an average age was 52.9 ± 9.1 years, while individuals without diabetes had an average age of 53.1 ± 8.6 years. As shown in (Table 1), a history of any predisposing risk factors was elicited
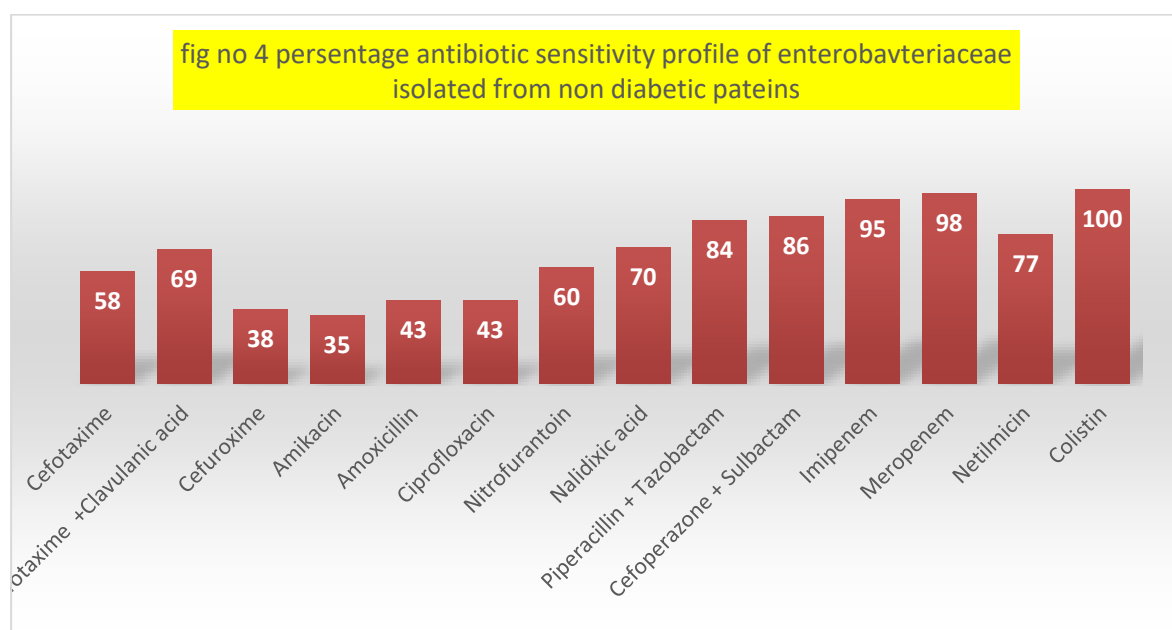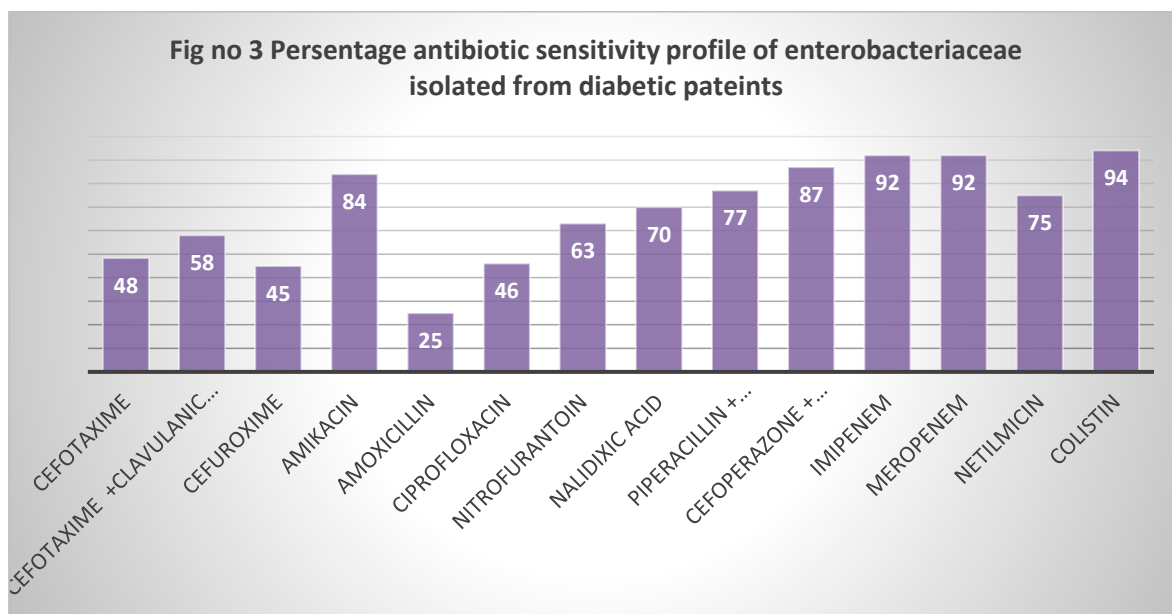
and only urinary tract calculi (UTC) was found more among the nondiabetics (*n* = 10), considering only 2 such participants with diabetes. Regarding the reappearance of urinary tract infections that required hospitalizations in the previous year, 34 individuals who had diabetes (27.2 percent) had a more favorable response than the eight individuals without diabetes (6.4%). Table no 2 shows the microbes isolated from both groups. Among all, the most prevalent uropathogen was *Escherichia coli* (56.8%) followed by *Klebsiella pneumoniae (*25.2%). Participants with diabetes were shown to have comparatively higher prevalence of *Proteus Spp* and *Pseudomonas spp*. The patterns of antimicrobial sensitivity in both groups were in decreasing order of susceptibility: 95 percent compared to 100% colistin > Amikacin (84% compared 85%) > Piperacillin/Tazobactam (78% compared to 85%) > Meropenem (93% versus 98%) > Cefoperazone/Sulbactam (87% versus 86%) as shown in fig no 3 and 4.

Table 1: Risk Features for Urinary tract infection among both groups

Risk elements	Non diabetic	Diabetic	Total	P (Chi-square test)
BPH	12(44.4)	15(55)	27	0.54
Indwelling catheter	19 (54.2)	16(45)	35	0.58
Calculi	10 (83.3)	2(16)	12	0.018
Censure urethra	0 (0)	3(100)	3	-
Cervicitis	1 (100)	0 (0)	1	-
Generally (anyone)	24 (42.4)	33 (57)	57	0.175

Table 2: Isolated uropathogen causing UTI in both groups

Bacteria	Non-diabetic	Diabetic	Total
Acinetobacter	2 (66.57)	1(33.4)	3
Enterobacter sp	2 (50)	2 (50)	4
Enterococcus sp	6(47)	7(53)	13
Klebsiella sp.	40 (6.1)	23 (36)	63
Proteus sp.	3(25	9(75)	12
Pseudomonas sp	1(33)	7(87)	8
Staphylococcus sp	1(33)	2 (55)	3
Citrobacter sp	0	2(100)	2
Escherichia coli	70 (49)	72 (51)	142
Total	125	125	250

Fig no 3 Persentage antibiotic sensitivity profile of enterobacteriaceae isolated from diabetic pateints

fig no 4 persentage antibiotic sensitivity profile of enterobavteriaceae isolated from non diabetic pateins

Discussion

It was not mysterious that evidence from epidemiological studies have suggested in recent years that women with diabetes are more likely than non-diabetic women to have asymptomatic urinary tract infections or pyelonephritis.[8] Various prospective cohort studies have not shown any adverse effects on asymptomatic urinary tract infections; nevertheless, women and the elderly with asymptomatic UTI do have an increased risk of acquiring symptoms .[9, 10] the current study aimed to examine the clinical and microbiological characteristics of UTI in patients with diabetes and those without the disease. As previously mentioned, small urethras, stout body types, and other physical variables are known to cause UTIs in women; nonetheless, this study found a little male preponderance (60.8%). This might be due to the fact that both benign prostatic hyperplasia (BPH) and neurogenic bladder were prevalent in the male participants, as well as the fact that both groups' mean ages exceeded 52.18 ± 9.06. In both groups, the age & sex distributions were similar. Every decade that diabetes lasted, the rate of bacteriuria rise by 2.1 times. This is most likely due to autonomic neuropathy, which causes the bladder to empty partially, creating an environment that is conducive to infection. More follow-up research is needed to prove this, though. Not many studies [11, 12] suggested that, despite the fact that this study did not find an association, diabetics taking oral hypoglycemic medications were more likely to have a UTI. In both groups, TB and systemic

hypertension were the most prevalent illnesses. In a traditional medical environment with limited resources, it becomes critical to recognize the early and particular symptoms and indications of a common infectious disease to prevent any devastating consequences. Participants lacking diabetes reported frequent "fever," but those with diabetes reported more frequent "vomiting," "retention," and other symptoms that are often linked to UTIs. Just a small number of research focused on the symptomatology of UTIs in relation to those without diabetes and those with diabetes, and they came to the conclusion that fever accompanied by urinary urgency was common in both groups. It is interesting to note that when diabetics get UTIs of any severity, fever is not always present. For this reason, Clinicians must actively screen for diabetes in order to start empirical therapy as soon as possible. In our study 64 male & 31 female did not exhibit any of the symptoms. Not unexpectedly, benign prostate hypertrophy (BPH) was shown to be the most often recognized risk reason for Infection among both patients with diabetes and non-diabetics, followed by "implanted urethral catheter." These findings are consistent with previous investigations.[17]

Consistent with earlier research, [13] the most frequent microorganisms recovered from both groups were *Escherichia coli* (568.8%), subsequently followed by *K. pneumonia* (25.2%); however, individuals with diabetes were found to have comparatively higher prevalence of *Proteus* and *Pseudomonas strains*. Participants in both groups had a similar pattern of antimicrobial resistance, with maximal susceptibility to Colistin and minimal sensitivity to Amoxicillin. This is in line with what the other Indian has said [14–15,] The globe is facing a pandemic caused by the steadily growing incidence of diabetes mellitus, . The most common UTI symptom across all participants was urinary urgency (38%). Out of 125 individuals with diabetes, 75 had glycated hemoglobin levels higher than 8%. *Escherichia coli* was the most frequently detected pathogen in urine cultures across all subjects (56.8%), with *Klebsiella pneumoniae* coming in second (25.2%). The study revealed that individuals with diabetes had a comparatively higher prevalence of *Proteus* species and *Pseudomonas* species. Between the two groups, there was no discernible variation in the patterns of antibiotic sensitivity. When treating a simple UTI in an outpatient setting, clinicians must make an empirical treatment decision.

Conclusion

In our study the most prevalent bacteria was found to be *E.coli* in both groups followed by K. *pneumoniae.* Participants with diabetes were shown to have comparatively higher prevalence of *Proteus Spp* and *Pseudomonas Spp*. Between the two groups; there was no discernible variation in the patterns of antibiotic sensitivity. The antibiotics mentioned in this study may help physicians for early diagnosis and treatment of UTI

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