Prevalence and Risk Factors of Uropathogens in Diabetic and Non-Diabetic Patients Attending a University Medical Centre in Awka Anambra State

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ABSTRACT

Diabetes is the most endocrinological disease associated with different life-threatening infections. Urinary Tract Infections (UTIs) are one of the most common infections affecting diabetic patients and a major cause of hospitalization and even death. The purpose of the study includes determining the prevalence of UTI, isolation and characterization of the different bacterial uropathogens and comparative evaluation of the risk factors associated with UTIs for both diabetic and nondiabetic patients attending Nnamdi Azikiwe University Medical center Awka, Anambra state. A total of 200, clean catch midstream urine (MSU) samples were collected aseptically (100 each from diabetic and 100 from non-diabetic patients). The samples were cultured in different nutrient media. These plates were incubated at 37℃ for 24hrs. The isolates were identified using colony morphology, Gram staining reaction and biochemical tests. The demographic data was obtained from the result of the structured standardized questionnaires and data collated where statistically analysed using statistical package (SPSS) to show their relationship with UTI. This study revealed the overall UTI prevalence of 72/200 (36%) among diabetic and non-diabetic patients from 18years and above. The prevalence among diabetic participants is (61.1%) and that of the non-diabetic is (38.9%). *Escherichia coli* was the most prevalent bacterial uropathogen with (34.6%) in diabetics and (46.43%) in non-diabetics, followed by *Staphylococcus saprophyticus* (31.8%) in diabetics and (14.39%) in non-diabetics. *Klebsiella pneumoniae* (11.4%) for diabetics, (10.71%) in non-diabetics. *Pseudomonas aeruginosa* (9.1%) for diabetics and (17.86%) for non-diabetics. *Proteus mirabilis* 4(9.1%) for diabetics and (10.7%) for non-diabetics. The findings demonstrated that age, female gender, married individuals, diabetes, and hospitalization were all statistically associated with UTI and UTI was more prevalent in diabetic patients than non-diabetic patients. Proper knowledge of risk factors of UTI in diabetic and nondiabetic patients may allow intervention and easy management of UTI in diabetic patients.

Keywords: Diabetic, Non-Diabetic, Uropathogens, Urinary Tract Infections, Prevalence, Antibiotics

INTRODUCTION

Urinary tract infections (UTI) can be defined as inflammatory disorder of the urinary tract caused by the abnormal growth and colonization of pathogens (uropathogens). It is among the most common infections worldwide, with substantial morbidity, mortality, and economic burden[1,2,3]. Urinary Tract Infections can be classified according to:

- Site of the infection e.g., urethra (urethritis), bladder (cystitis), or kidney (pyelonephritis).
- Clinical manifestation of the infection e.g., asymptomatic or symptomatic, complicated or uncomplicated, acute or chronic.

This clinical manifestations of UTIs depend on the portion of the urinary tract involved, the etiologic organisms, the severity of the infection, and the patient's ability to mount an immune response to it. Bacteria pathogens that

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causes urinary tract infections are mostly *Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Enterococcus faecalis* and *Staphylococcus saprophyticus*[4,5]. The prevalence of UTIs varies from country to country and geographical location. In Nigeria, in a study conducted among 12,458 urine samples, reported prevalence of community acquired and nosocomial UTIs were 12.3% and 9.3%, respectively. The prevalence in females and the prevalence in males were 14.6% and 7.4%, respectively[6]. In Uganda, the prevalence of UTIs was found to be 29/218 (13.3%) and had a 20–60% drug resistance rate among antenatal mothers in Mulago hospital, Uganda[7]. Urinary Tract Infections were found to have a prevalence of 54/139 (38.8%), and age, female gender, and married individuals had statistically significant relations with the disease among adults attending the assessment centre, Mulago Hospital[1]. In 2021, the prevalence of 84.2% was shown by[9] in Enugu Nigeria. It is estimated that uropathogenic *E. coli* from the gut is the cause of 80–85% of community-acquired urinary tract infections,[10] with *Staphylococcus saprophyticus* being the cause in 5–10%. Healthcare-associated urinary tract infections (especially urinary catheterization) involve a much broader range of pathogens including: *E. coli* (27%), *Klebsiella* (11%), *Pseudomonas* (11%), the fungal pathogen *Candida albicans* (9%), and *Enterococcus* (7%)[11]. These strains have virulence factors that help them survive within the urinary tract and evade host immune responses[12]. Uropathogens differ in terms of the virulence factors and pathogenic mechanisms that allow them to colonize and infect the urinary tract. These virulence factors are grouped into two categories:

- bacterial cell surface virulence factors e.g., adhesins such as fimbriae, flagella, capsules etc.
- bacteria secreted virulence factors e.g., toxins, enzymes, surface proteins etc[13].

To successfully establish an infection in the urinary tract, uropathogens must be able to adhere to host cells, colonize the urethra, adhere to the surface of the bladder epithelium, and, in some cases, form biofilms with the creation of bladder intracellular communities (IBCs)[14]. Several factors such as gender, pregnancy, certain health conditions, catheterization, diabetes, age, hospitalization, marital status, family history and genetics, lifestyle such as; sexual activity[15], personal hygiene[16], birth control and contraceptives[17,15] and immunocompromised status are among risk factor that contributes to development of UTIs[18]. Because of certain anatomical factors, women face a much higher risk of UTIs (compared to men). The higher risk of infection in females might be due to their anatomy and reproductive physiology[19]. Several chronic health problems may increase UTI risk as well. They include conditions associated with compromised immune response (such as diabetes), which can weaken your body's ability to defend itself, age-related issues like Alzheimer's disease, those with spinal cord injuries or nerve damage around the bladder, which can prohibit complete emptying of the bladder, people with kidney stones, enlarged prostate, people, with vesicoureteral reflux (VUR) or any other issue that blocks the normal flow of urine and encourages bacterial growth or other abnormalities of the urinary tract, people that recently used a urinary catheter, or with bowel incontinence[2].

Diabetes mellitus (DM) one of the risk factors of UTIs is an endocrine syndrome with disordered metabolism and hyperglycemia[20]. The hyperglycemic nature of diabetic patients impairs multiple immune pathways[21,22]. These changes make diabetic patients prone to several infections including urinary tract infection (UTI)[23]. A comparative study conducted in Nigeria diabetic patients had 70% of the isolated organisms, while non-diabetic patients had 56% of the isolated organisms indicating that patients with DM are highly prone to developing Urinary tract infections[24]. Urinary tract infection (UTI) is the most common infectious disease in diabetic type 2 patients[25]. The purpose of this study therefore is to evaluate the prevalence, risk factors and of bacterial uro-pathogens in diabetic and non-diabetic patients attending a University Medical Centre in Awka, Anambra State.

METHODS

Study Area: This study was carried out at Nnamdi Azikiwe University Medical Centre Awka Anambra State Southeast Nigeria. This Medical Center is located inside Nnamdi Azikiwe University situated along Enugu -- Awka-- Onitsha express way Anambra State Nigeria. This medical centre provides secondary health care services to staff, students and their families and can provide the records of both diabetic and non-diabetic patients in the community.

Study Population and Duration: This study population consist of all confirmed diabetic patients (those patients whose blood sugar level are collected from the laboratory record and are confirmed diabetic) and non-diabetics

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adult patients that visited the Medical Centre during the time of the study and consented to the study. The study lasted between July and October 2023.

Inclusion Criteria

- All confirmed diabetic adult patients, 18 years and above, male and female who visited the facility for health care treatment during the time of study who consented to the study.
- All non-diabetic adult patients that have symptoms of UTI **and** all adult patients that have symptoms of diabetics.

Exclusion Criteria

- Children and adolescents who are diabetic or non-diabetic.
- Patients on anti-microbial treatment 2 weeks before and during the study time.
- All adult nondiabetic patients not having symptoms of UTI.

Ethical Approval: Ethical approval to carry out sample collection and analysis for this study was obtained from the ethical committee of the university with ref no (NAU\AREC\2024\0037).

Informed Consent: This was obtained from all participants involved in the study. Each participant was asked to read and sign a consent form before the start of data collection.

Data Collection: A standardized and validated questionnaire was used to collect socio demographic data from patients. Information captured include age, gender, marital status, occupation, residence, state of origin, ethnicity, history of kidney transplant, birth control and smoking, circumcision status, length of insulin or other diabetes regime in use, previous history of UTI, family history of diabetes and blood glucose status and any other health conditions. Blood glucose status of the diabetic participants was collected from the laboratory records with the permission of the Head of laboratory services.

Sample Size Determination: The sample size was determined by using Cochran's formula. The formula states as follows:

$$n = \frac{z^2pq}{e^2}$$

Where n= sample

z= Standard deviation at 95% which corresponds to confidence interval of 1.96

p= Proportion of the population having the desired characteristics, the proportion of the population(p) with a prevalence of 84.2% shown by[9] in Enugu, Nigeria was used.

q= (1-P), proportion of the population without the desired characteristics.

e= Degree of precision i.e., the margin of error that is acceptable (5% that is 0.05).

The sample size was calculated as

$$n = \frac{(1.96)^2 \times 0.842 \times (1-0.842)}{0.05^2}$$

A total of 200 samples was used.

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Sample Collection: Clean, sterile specimen bottles are issued to participants on summiting the questionnaire. A total of 200 urine specimens consisting of 100 clean- catch midstream urine of diabetic subjects and 100 clean-catch midstream urine of non-diabetic urine were collected for this study. Participants were duly informed on how to collect 5ml of clean catch MSU (mid- stream urine) with as little contamination as possible into a wide necked sterile, dry and leak-proofed specimen bottle. The containers were labeled with the date, serial numbers, time of collections and transported immediately to Applied Microbiology and Brewing departmental laboratory in iced pack and cultured within one hour of collection. Other processing and evaluation were performed after that.

Urine Cultures: Macroscopic examination of the urine samples was done to take note of the appearance of the urine sample. A standardized platinum wire loop that holds 0.002ml volume of urine was used. The calibrated standardized platinum wire loop was flamed and allowed to cool before being immersed vertically into a thoroughly mixed urine sample. A loopful was then carefully taken out vertically from the specimen bottle and spread on the surface of dried blood agar plates, CLED agar plates, mannitol salt agar plates and Eosin Methylene Blue agar plates which were prepared according to manufacturer's instruction. The plates were incubated aerobically at 37ºC for twenty- four hours. Bacterial colony forming units were counted and colony count of approximately10^5CFU/ml accompanied by symptoms was regarded as UTI. The isolates were subcultured on nutrient agar plate and incubated at 37°C for 24hrs to obtain pure culture of the isolates. Pure cultures of the isolates were inoculated on nutrient agar slants in tubes and incubated at 37ºCfor 24hrs. these were stored for further use.

Identification of Bacterial Uropathogens

Identification of the uropathogens was performed using the recommended procedure of culture and biochemical tests. As follows; Gram staining, Citrate Utilization Test, Indole test, Coagulase test, Catalase test, Motility test, Urease test, Oxidases test, Methyl red test, Voges – Proskauer test, Triple sugar iron agar test, Sugar fermentation test[26].

Statistical Analysis: Univariate ANOVA was carried out to determine significant differences between groups (patients and organisms). P value < 0.05 shows a significant difference between/among groups, while p value > 0,05 shows no significant difference.

RESULT

Demographic characteristics of diabetic and non-diabetic participants

Out of 204 samples collected, only 200 samples were processed for culture and susceptibility test which gives a 98.04% response rate. All the study participants were aged between 18 and 91 years. All the participants in the study lived in an urban area. All the participants had educational level of above secondary school. Among the participants, 110 (55%) are married, 81 (40.5%) are single, while 9(4.5%) are widowed. Also 134(67%) are employed, 69(34.5%) are students and 7(3.5%) are retired. Among the study participants,30(15%) reported history of UTI, and 12(6%) reported prior use of an indwelling catheter. The demographic characteristics of the participants are presented in (Table 1).

Table 1: Demographic characteristics of diabetic and non-diabetic participants

Demographic characteristics	Diabetics n (%)	Non-Diabetics n (%)	Total n (%)
Total no of samples	100(50)	100(50)	200(100)
Female	66(33)	56(28)	122(61)
Male	34(17)	44(22)	78(39)
Location(urban)	100(50)	100(50)	200(100)

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Educational level (above secondary)	100(50)	100(50)	200(100)
Married	76(38)	34(17)	110(55)
Single	19(9.5)	62(31)	81(40.5)
Widowed	5(2.5)	4(2)	9(4.5)
Employed	85(42.5)	45(22.5)	130(65)
Student	8(4)	55(27.5)	63(31.5)
Retired	7(3.5)	0(0)	7(3.5)
Outpatient	62(31)	67(33.5)	129(64.5)
Impatient	38(19)	33(16.5)	71(35.5)
No of isolates	44(22)	28(14)	72(36)
Female	29(14.5)	21(10.5)	50(25)
Male	15(7.5)	7(3.5)	22(11)
Married	40(20)	9(4.5)	49(24.5)
Single	4(2)	19(9.5)	23(11.5)
Employed	32(16)	13(6.5)	45(22.5)
Student	5(2.5)	15(7.5)	20(10)
Retired	7(3.5)	0(0)	7(3.5)
Impatient	15(7.5)	10(5)	25(12.5)
Outpatient	29(14.5)	18(9)	47(23.5)

Table 2: Biochemical test results of isolates from diabetic and non-diabetic patients

Isolate	**Gram stain**	**Catalase**	**Coagulase**	**Motility**	**Oxidase**	**Citrate**	**Voges Proskaeur**	**Indole**	**Methyl red**	**Urease**	**Sugar fermentation**										**Hydrogen sulphide**	**Gas**	**Haemolysis**	**Isolates**
											Glucose	**Sucrose**	**Lactose**	**Maltose**	**Mannitol**	**Sorbitol**	**Fructose**	**Galactose**	**Xylose**	**Arabinose**				
1	GPC	+	-	-	-	-	-	+	-	+	-	+	+	+	+	-	+	-	+	-	+	+	-	*Staphylococcus spp*
2	GNB	+	-	+	+	+	-	-	+	-	+	+	-	+	+	-	-	-	-	-	-	-	+	*Pseudomonas spp*
3	GNB	+	-	-	-	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	-	-		*Klebsiella spp*
4	GNB	+	-	+	-	-	-	+	+	-	+	+	+	+	+	+	-	+	+	+	-	+	+	*E. coli*
5	GNB	+		+		+			+	+	+	+	+	+					+		+	+		*Proteus spp*

Keys: GNB- Gram Negative Bacillus, Gram Positive Cocci

Prevalence of uropathogens among diabetic and non-diabetic patients

Among the 200 urine samples investigated (both for diabetics and non-diabetic participants), 72 samples had bacteria growth in culture with significant bacterial growth with five different bacterial species. The overall occurrence of the isolates is presented in (Table 3)

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Most of the isolated bacteria were Gram-negative organisms with *E. coli* being the most frequently isolated organism 17(38.6%) in diabetic patients compared to 13(46.43%) in non-diabetic patients. This is followed by *Klebsiella pneumonia* 5(11.4%) in diabetic patients and 3(10.71%) in non-diabetic patients. *Pseudomonas aeruginosa* was more frequent in non-diabetic 5(17.86%) as against 4(9.1%) in diabetic patients. *Proteus mirabilis* is the least Gram-negative organism isolated with 4(9.1%) from diabetic patients and 3(10.71%) from non-diabetic patients. *Staphylococcus saprophyticus* is the only Gram-positive organism isolated with 4(14.29%) isolates in non-diabetics and 14(31.89%) in diabetic patients as presented in (Table 4)

Table 3: Overall occurrence of the uropathogenic isolates

	Diabetic N (%)	Non-Diabetic N (%)	Total N (%)
Total No of Isolates	**44(22)**	**28(14)**	**72(36)**
Total No of Samples	**100**	**100**	**200**

Table 4: Prevalence of uropathogens among diabetic and non-diabetic patients

Bacterial isolates	Diabetics n (%)	Non-diabetics n (%)	Total n (%)
E. coli	**17(38.6)**	**13(46.43)**	**30(41.7)**
Klebsiella pneumonia	**5(11.5)**	**3(10.91)**	**8(11.1)**
Proteus mirabilis	**4(9.1)**	**3(10.91)**	**7(9.7)**
Pseudomonas aeruginosa	**4(9.1)**	**5(17.86)**	**9(12.5)**
S. saprophyticus	**14(31.8)**	**4(14.28)**	**18(25.0)**
Total	**44(22)**	**28(14)**	**72(36)**

Prevalence of the isolates among the diabetic and non-diabetic patients in relation to gender

Overall, for both male and female patients, prevalence was higher among diabetic than non-diabetic. The prevalence was quite high among females 50/166 (41%) than males 22/78 (28.2%) for both diabetic and non-diabetic patients with 11(25%) as the highest among female and 7(15.91%) the highest among men. The overall prevalence in female is 29(65.91%) while that of male is 15(34.1%) for diabetic patients as against the non-diabetic with overall prevalence of 7(25%) in male and 21(75%) in female as presented in (Table 5). The p-value is 0.00 and therefore is significant at ($p<0.05$).

Relationship between the prevalence of the isolates among diabetic and non-diabetic patients in relation to age

Relationship between the prevalence of the isolates among the diabetic and non-diabetic subjects in relation to age is presented in (Figure 2). The highest prevalence was from age group 46-65yrs with total prevalence of 16(22.2%) followed by the age group of 25-45yrs 15(20.8%). The least prevalence was from the age group 18—24yrs 4(5.6%) among diabetic patients compared to non-diabetic patients with the least prevalence from age group above 65yrs (0.00%). Prevalence of *E. coli* is higher in non-diabetic among the age group of 24-45 with prevalence of 8(53.3%) and 24-45 with prevalence of 5(41.7%), compared to age group (46-65) with higher prevalence of 7(43.8%) in diabetic. The relationship between the UTI prevalence and diabetes status was statistically significant at $p = 0.00$.

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Relationship between the prevalence of the isolates among the diabetic and non-diabetic subjects in relation to marital status

The prevalence of the uropathogenic isolates from diabetic and non-diabetic patients in relation to marital status is presented in (Tables 7). The prevalence was higher among married patients with total prevalence of 40(90.91%) in diabetic patients, while single patients have higher prevalence with 19(67.86%) in non-diabetic patients. The least prevalence is among single diabetic patients 4(9.09%). *Escherichia coli* has the highest prevalence of 16(36.36%) among married diabetic patients and 9(32.14%) among single non-diabetic patients. The p-values were significant at (p<0. 05) for both diabetic and non-diabetic patients in relation to the marital status.

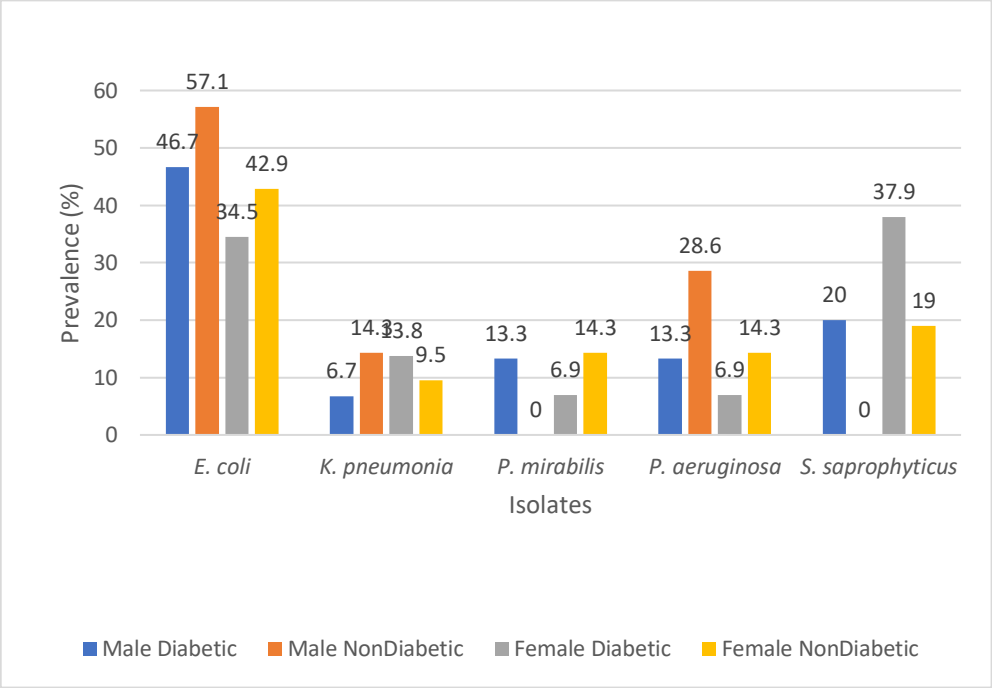

Fig. 1: Prevalence of uropathogenic isolates among diabetic and non-diabetic patients in relation to gender. P = 0.00

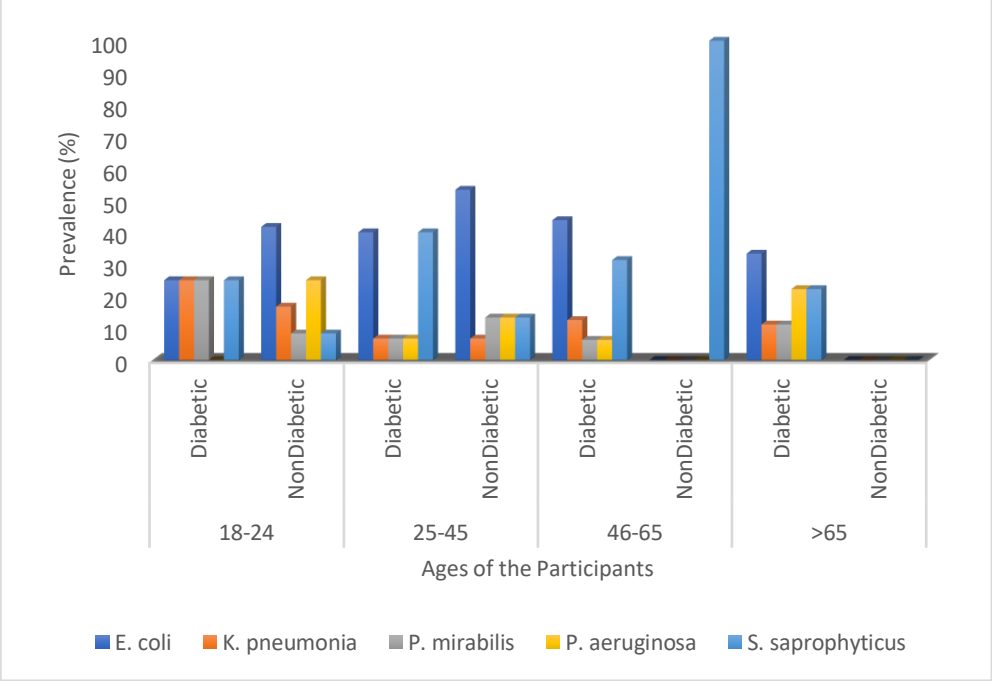

Fig. 2: Prevalence of uropathogenic isolates among diabetic and non-diabetic patients in relation to age. P = 0.00

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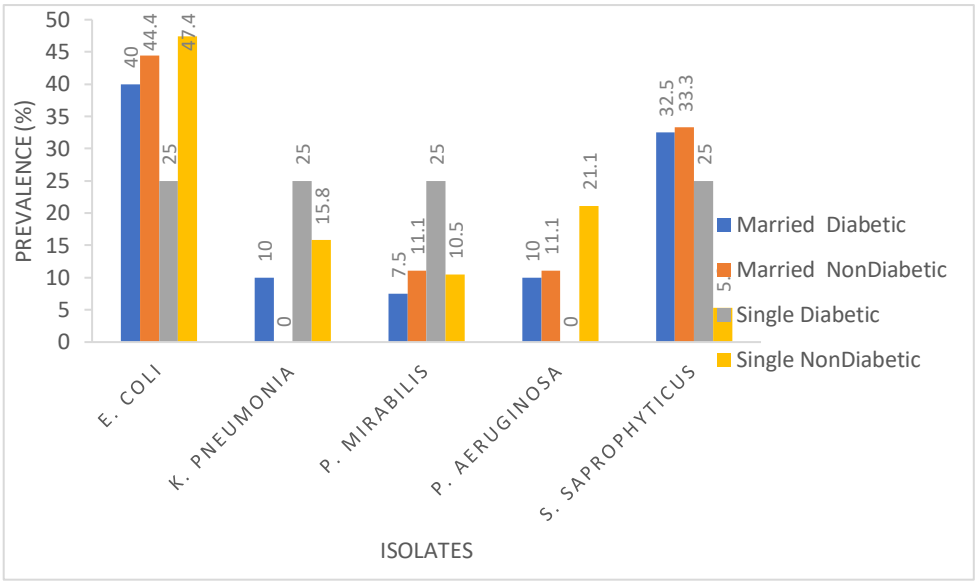

Fig. 3: Prevalence of uropathogenic isolates among diabetic and non-diabetic subjects in relation to marital status. P = 0.00

DISCUSSION

Urinary tract infections is among the most common infections worldwide, with substantial morbidity, mortality, and economic burden[1,2,3]. The clinical manifestations of UTIs depend on the portion of the urinary tract involved, the etiologic organisms, the severity of the infection, and the patient's ability to mount an immune response to it. The hyperglycemic nature of a diabetic patient impairs multiple immune pathways[21,22]. These changes make diabetic patients prone to several infections including urinary tract infection (UTI)[23].

The overall prevalence of 72(36%) obtained in this study is similar to the results obtained from Bushenyi District in Uganda which has prevalence of (32.2%) and is in contrast to the lower result obtained from National Hospital Abuja in Nigeria with a prevalence of (13.1%)[27,28]. Previous studies done in south Ethiopia showed lower result (33.9%) in 2019[29] and in Abakaliki, Nigeria (46%)[30]. and much lower result (7.1%) in 2005 to (34.1%) in 2009[31], (17.5%) in India[32], (9.71%) in USA[33] and also in Nigeria (17.8%). A higher prevalence of 84.2% shown by[9] in Enugu, Nigeria.

This study showed a higher prevalence of bacteriuria in diabetics 44(61.1%) than in non-diabetic patients 28(38.9%) which is likely because diabetes is a risk factor to UTI development. This is as a result of hyperglycemic nature of the diabetic patients which impairs multiple immune pathways and makes them prone to many infections including UTI. There was significant relationship with ($p<0.05$) between diabetes and urinary tract infection. In this study, age is an important risk factor for UTI development especially among the diabetic patients. This is evidenced by the occurrence of UTI among the age group from 25-65 and above. There was significant relationship ($p<0.05$) between the age of the patients and urinary tract infection. This means all age groups are not equally predisposed to this infection. The prevalence rate was highest in the age range of 46-65yrs 16(36.36%), and the least is the age group of 18-24yrs 4(9.09%), among the diabetic patients. While among the non-diabetic, the prevalence rate was highest in age group of 25—45yrs (53.57%). The increase in the percentage occurrence in the age group of 46-65years may be due to decreased immune response, and prostate disorders in men and hormonal changes in women[34,35] and 25-45years could be because this groups are sexually active and married people with cases of extra marital affairs will be a factor. The findings in the study are different from the report obtained from a study in Abakaliki, Nigeria which shows a higher prevalence in age group of 21-25yrs 10(80%), followed by 4(75%) in age group of 26-30yrs, 35-40yrs age group 4(57.14%), 45years and above 4(25%). The lowest is the age group 15-20yrs 3(33.3%), while age group between 41-45yrs have no cases of bacteriuria recorded[30].

Another risk factor in this study is gender. This study showed that UTI was higher in female patients for both diabetic and non-diabetic patients than male patients. The overall prevalence among female diabetic patients is

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29(65.91%) and diabetic male patients 15(34.1%) while in non-diabetic, female has the prevalence of 21(75%), and male is 7(25%). There was significant relationship ($p<0.05$) between the gender and UTI development. The findings of this result correspond to the results obtained from Saudi-Arabia with female (25.3%) and male (7.2%)[36,37], and also (53.3%) in female patients and (46.6%) in male patients still in Saudi-Arabia[37]. In Ethiopia similar report was obtained where female is (83,9%) and male (12.1%)[38]. In Abakaliki, Nigeria similar result was also obtained with female (47.7%) and male (36%)[30]. However it is universally averred that women are at higher risk of UTIs than men due to anatomic and physiologic factors like their shorter urethra which is closer to the anus, decrease in woman's estrogen levels due to menopause which increases risk of urinary tract infections due to the loss of protective vaginal flora[39].

Five different bacteria specie are isolated from this study. Most of the isolated bacteria from this study were Gram-negative organisms with *E. coli* being the most frequently isolated organism 17(38.6%). followed by *Klebsiella pneumonia* 5(11.4%), *Pseudomonas aeruginosa* 4(9.1%) and *Proteus mirabilis* 4(9.1%) from diabetic patients, and *E. coli* 13(46.43%), *Pseudomonas aeruginosa* 5(17.86%), *Klebsiella pneumonia* 3(10.71%) and *Proteus mirabilis* 3(10.71%) from non-diabetic patients. *Staphylococcus saprophyticus* is the only Gram-positive organism isolated with 4(14.29%) isolates in non-diabetics and 14(31.89%) in diabetic patients. In overall, Gram negative showed the prevalence of 54(75%) while Gram positive showed the prevalence 18(25%). This might be due to the existence of a unique structure in Gram-negative bacteria which helps their attachment to the uroepithelial cells, multiplication, and tissue invasion resulting in invasive infection. This high prevalence of Gram-negative pathogens (91.3%) as against (8.7%) of Gram positive pathogens were reported by[40]. Similar reports also obtained in other studies in which Gram-negative bacteria were the most common UTI-associated pathogens with a rate of (73.1%) by[41], (75%) by[42]. However, contrary to our findings, relatively lower prevalence rates were reported from similar studies in Ethiopia, such as in Debre Tabor (41.9%)[43] and Bahir Dar (61.9%)[44]. *Escherichia coli* was the predominant isolate with (38.6%) in diabetic patients and (46.43%) in non-diabetic patients among the isolated uropathogens in our study. Different studies conducted in different parts of the globe also reported similar findings to our result with respect to *Escherichia coli* with a rate of 50% from Afikpo Ebonyi state, Nigeria[45], 42.7% from Chandanaish, Bangladesh[46], 47.5% from Bahir Dar Ethiopia[497]. The predominance of *Escherichia coli* in this and other studies is attributed to it being a commensal of the bowel, and owing to the fact that commensals of the intestine are more involved in the UTI due to its proximity to the genito-urinary area anatomically. Besides, *Escherichia coli* is also considered uropathogenic due to some virulence factors (the P-fimbria and S-fimbria adhesions) specific for colonization and invasion of the urinary epithelium[48,49]. However, our result contradicts with a study from Minna, Niger state where *Klebsiella pneumoniae* showed the highest frequency of occurrence (39.1%)[45]. On contrary, *Klebsiella pneumoniae* was the third frequently observed isolates (16.1%) next to the *Proteus* spp in our study. *Staphylococcus saprophyticus* was the second most isolated bacterial uropathogen with (31.8%) in diabetics and (14.39%) in non-diabetics. A different report of 9.1% prevalence rate for S. *saprophyticus* in Debre Tabor[45], in Bahir Dar[50], all in Ethiopia was also reported. Previous studies have linked the increasing *Staphylococcal* UTIs to increased use of instrumentation such as bladder catheters. The isolation of *Klebsiella pneumoniae* and *Proteus mirabilis* in diabetic and non-diabetic patients is in agreement with another study by[51] in Southwestern Uganda and in São Paulo Brazil[52] in Bahir Dar[53], in Dessie[54].

CONCLUSION

In conclusion, this study showed that the overall prevalence of UTI among diabetic and non-diabetic is 72(36%). The prevalence was higher in diabetic 44(61.1%) compared to non-diabetic 28(38.9%). The majority of isolated bacterial uropathogens were Gram-negative bacteria, and *Escherichia coli* was the most frequent isolate followed by, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Proteus mirabilis*. *Staphylococcus saprophyticus* was the only Gram-positive bacteria isolated from this study. Age, gender and marital status are important risk factors in UTI development among diabetic and non-diabetic patients. Therefore, periodic and continuous urine culture for screening and diagnosis is required to reduce the consequence of UTI among diabetic and non-diabetics.

Conflict of Interest: The authors declared that there is no conflict of interest in this work.

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