How to Cite:
Priyadarshini, A., Shah, J., Patadia, H., & Gangawane, A. K. (2022). Prevalence and antibiotic sensitivity of uropathogens isolated from type-ii diabetic patients having urinary tract infection (UTI): A retrospective study from a rural tertiary care hospital. *International Journal of Health Sciences*, *6*(S6), 2511–2523. https://doi.org/10.53730/ijhs.v6nS6.9798

Prevalence and antibiotic sensitivity of uropathogens isolated from type-ii diabetic patients having urinary tract infection (UTI): A retrospective study from a rural tertiary care hospital

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***Abstract*---**Background: Patients with Diabetes Mellitus are more prone to Urinary tract infection (UTI) than non-diabetic patients. Diabetes Mellitus has certain negative effects on the genital system and increases the incidence of urinary tract infection in diabetic patients. Design: Record based retrospective study. Methods: Records of patients with type-II diabetes having symptoms of UTI were reviewed from August 2021 to January 2022. Result: Out of 210 diabetic patients, the UTI rate was higher in females 59% than male 41%. The most common agents for causing UTI were E.coli followed by Pseudomonas aeruginosa, Klebsiella spp., Candida albicans and Candida non-albicans, Enterococcus, S.aureus and other organisms. About 70.68% Gram-negative isolates were resistant against ampicillin, 75.17% resistant against gentamycin, and 48.16% resistant against amoxicillin-clavulanic acid. Gram-positive isolates

were 83.33% resistant against penicillin and 83.33% resistant against ciprofloxacin. However, both gram-negative and gram-positive were susceptible to nitrofurantoin. The overall multidrug resistance was observed in 201 out of 210 (95.71%) bacterial and candiduria isolates, while 3.33% of the isolates were resistant to one only antibiotic. Conclusion: Most common etiological agent is E.coli with high drug resistance to ampicillin and susceptible to nitrofurantoin. Therefore, performing urine culture and regular monitoring of UTI is essential.

***Keywords*---**antibiotic resistance, bacteriuria, diabetes, E.coli, Urinary tract infection.

Introduction

An infection of the urinary tract, such as the kidney, bladder, or urethra is known as urinary tract infection. They usually occur in the bladder or urethra, but more serious infection involves the kidney. Urinary tract infection is a significant health problem in diabetic patients because of the multiple effects of this disease on the urinary tract infection(Woldemariam et al., 2019). The prevalence of diabetes mellitus is increasing throughout the world and becoming a serious problem, patient with diabetes mellitus are at increased risk of UTI as higher glucose concentration in the urine may create the culture medium for the growth of the uropathies(Nigussie & Amsalu, 2017).

Patients with DM are at higher risk for having urinary tract infection and its subsequent difficulties (Ijaz et al., 2014; Nigussie & Amsalu, 2017; Zubair et al., 2019).UTI are more common in type-2 diabetes due to insulin resistance, impaired insulin secretion, and excess glucose production(Nitzan & Chazan, 2015). Factors that increases risk of UTI in diabetic patient are age, metabolic control, complications, hypertension (Nitzan & Chazan, 2015). Major Complications in patients having UTI in diabetic patient are bacteraemia, renal abscess, and pyelonephritis. Early diagnosis and proper medication are necessary to treat UTI in diabetes(Kumar, n.d.). UTI is most common in females than male, bacteriuria is most common in Diabetic than non-diabetic patient because of combination of host and local risk factors (Nigussie & Amsalu, 2017). The infection is most severe when patients have some underlying condition such as Diabetes mellitus. Symptoms include frequent urine, dysuria, and suprapubic pain for lower UTI, fever, chill, etc (Nitzan & Chazan, 2015). Several studies have shown that the most common etiological agent found to be *E. coli* followed by *Klebsiella species*, *Proteus species*, *Enterobacter species* and *Candida spp.*(Woldemariam et al., 2019).

Materials and Methods

Sample Size

This retrospective study was conducted from the test results of urine samples collected from patients admitted to Parul Sevasharam Hospital, Vadodara from

August 2021 to January 2022. A total of 210 patients files were assessed during the study period.

Inclusion Criteria

All patients above 30 years of age having type- II diabetes and who were infected with urinary tract infection from August 2021 to January 2022 were included in this study.

Exclusion Criteria

Non-diabetic patients, age below 30 years and patients with other disease like genital tract disease, neurological or stroke disease which interfere in urine outcome were excluded from this study.

Data Collection

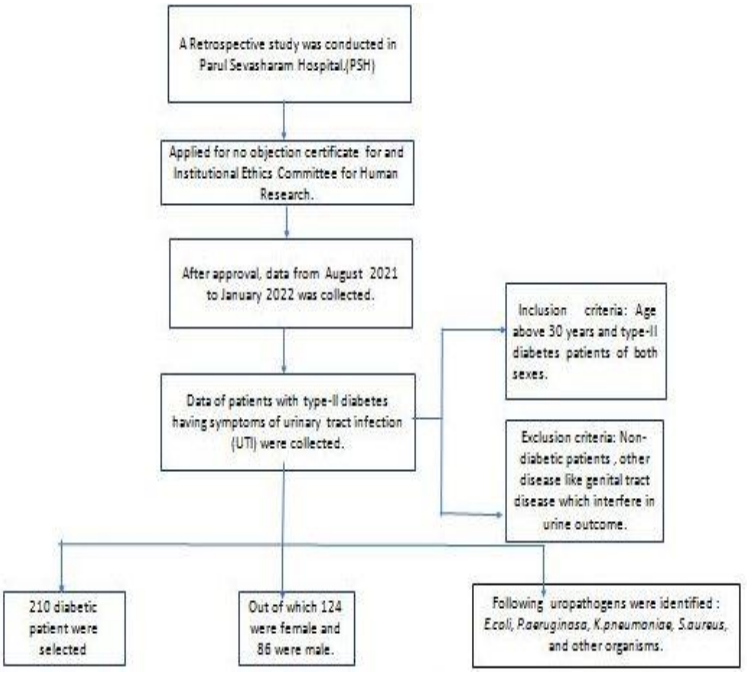
A unified and predesigned data collection form was designed to collect data from patients' electronic medical records and laboratory reports with pre-specified data variables from Parul Sevasharam Hospital. The collected data were only used for the benefits of the study. We obtained sex, age of patients, patients identification number, bacterial isolates and antibiotic sensitivity / resistance through the data collection. The privacy and integrity of collected data were ensured.

Urine Collection

The laboratory processed all of the urine samples. Mid-flow sample of urine (10ml) was collected in sterile wide mouth container.

Urine Analysis

Urine specimen were grown on Blood agar/ MacConkey agar plates and cultured for 24 hours to 48 hours at 37°C using a validated loop of 1 µl. The isolates were then Gram stained and classified as Gram positive cocci or Gram negative rods. The VITEK System was used to perform comprehensive confirmation and antibiotic sensitivity test. The collected data were examined and interpreted in accordance with the Clinical Laboratory Standards Institutes criteria (CLSI). Data collection of this study is summarized in Figure-1.



Ethical Approval

The study was approved by Institutional Ethics Committee for Human Research (IECHR). The details and information gathered were kept private.

Statistical Analysis

Microsoft Excel 2007 was used to perform statistical analysis on the data. Study findings were explained through graphs and table. Retrospective study statistics shows uropathogenic percentage and antibiotic sensitivity / resistance pattern. Table-s and graphs are presented as frequency count and percentages.

Results

Characteristics of the study participants

Two hundred ten diabetic patients were analyzed in this report. Out of 210 patients 124/210 (59%) were female and 86/210 (41%) were male. The mean age of the patients was 52.36 ±11.59 years (range, 30-79) years. A total of 128/210 (60.95%) patients had the history of diabetes with less than five years. The random blood glucose level of study participants was >130 mg/dl to <200 mg/dl in 175/210(83.33%) and greater than 200mg/dl in 35/210(16.66%) (Supplementary Table-1)

Table 1
Socio-demographic features of the study participants

Characteristics	Classification of variables	Total (n=210) n(%)
Age (years)	30-39	39(18.57%)
	40-49	51(24.28%)
	50-59	49(23.33%)
	60-69	55(26.19%)
	70-79	16(7.6%)
Sex	Male	86(41%)
	Female	124(59%)
Duration of diabetes	<5 years	128(60.95%)
	≥5 years	82(39%)
glucose level	130 to <200mg/dl	175 (83.33%)
	≥200mg/dl	35(16.66%)

Etiology of isolates

Figure-2 indicates *E.coli* (123/210) as the predominant organisms followed by *Pseudomonas aeruginosa* (34/210), *Klebsiella* (24/210), *Candida albicans* and *Candida non-albicans* (8/210, 6/210) respectively, *Enterococcus* (2/210*), S.aureus* (4/210) and other organisms (10/210) were isolated from 210 diabetic patients.

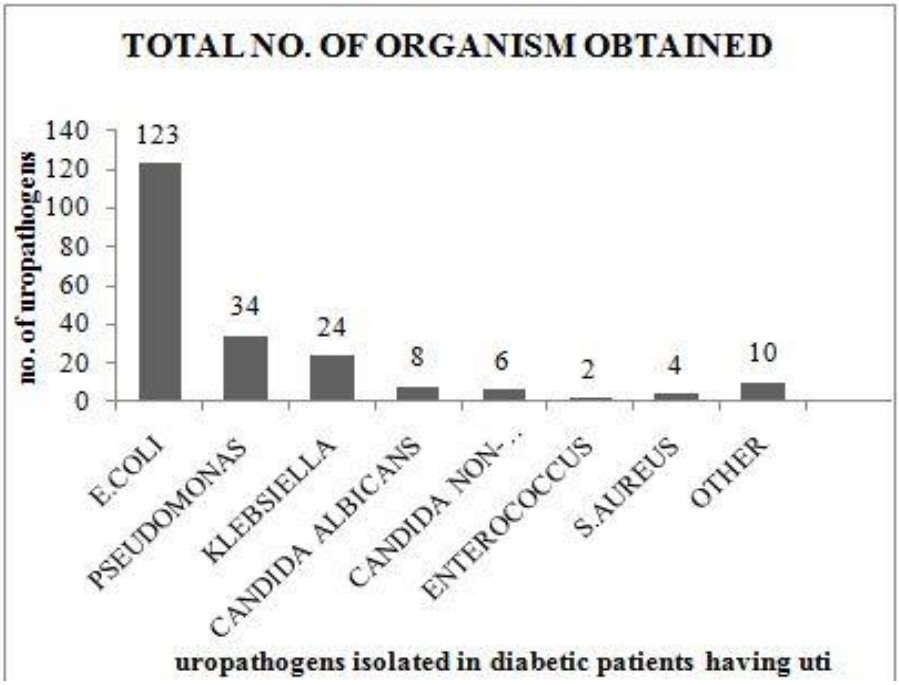


Figure 2. Bacterial isolates from urine culture of diabetic patients

Prevalence of uropathogens

Six bacterial species were isolated from urine cultures (Supplementary Table-2). *E.coli* 123/210(58.29%) was found to be predominant bacterial followed by *Pseudomonas* 34/210(16.11%), *Klebsiella* 24/210(11.37%), *Enterococcus* 2/210(1%), *S.aureus* 4/210(1.89%) and others found in small number. Out of 14/210 (6.6%) Candiduria isolates, 8(4%) were *Candida albicans* and 6(3%) were *Candida non-albicans*. In diabetic individuals, females had more uropathogens than males.

Table 2
Distribution of uropathogens in relation to gender of UTI patients

UROPATHOGENS ISOLATED	SPECIES	FEMALE (%)	MALE (%)	TOTAL (%)
BACTERIAL	*E.COLI*	77(62.60%)	46(37.39%)	123(58.29%)
	PSEUDOMONAS	16(47.05%)	18(52.94%)	34(16.11%)
	KLEBSIELLA	16(66.66%)	8(33.33%)	24(11.37%)
	ENTEROCOCCUS	1(50%)	1(50%)	2(1%)
	S.AUREUS	2(50%)	2(50%)	4(1.89%)
	OTHERS	5(50%)	5(50%)	10(4.73%)
CANDIDA	*CANDIDA ALBICANS*	4(50%)	4(50%)	8(4%)
	CANDIDA NON-ALBICANS	3(50%)	3(50%)	6(3%)

Frequency of age and gender wise distribution

Figure-3 indicates the frequency distribution of gender of the participants, 59% represents female patients and 41% were male patients. Among the survey participants prevalence of female patients were more than male patients.

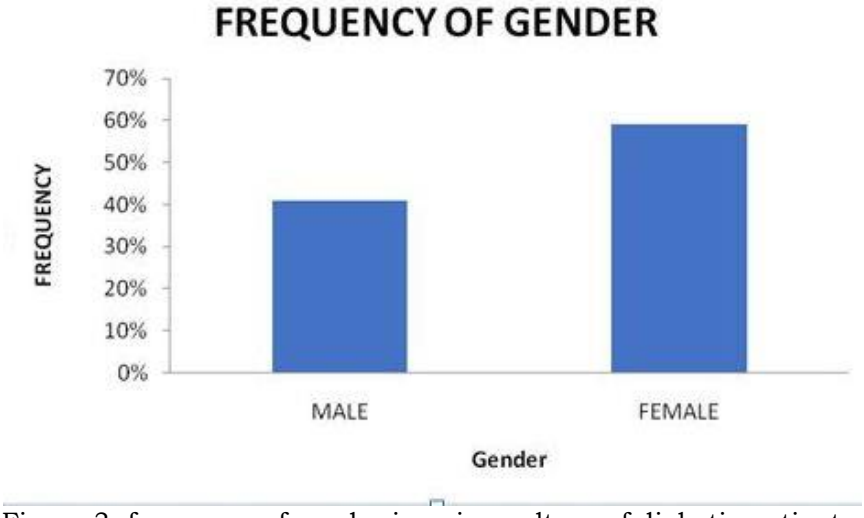


Figure 3. frequency of gender in urine culture of diabetic patients.

Figure-4 shows age distribution of the participants. The percentage of participants in each age group was as follows: 30-39(18.57%); 40-49(24.28%); 50-59(23.33%); 60-69(26.19%) and 70-79(7.60%). Patients from 40-69 age group were predominantly suffering from urinary tract infection.

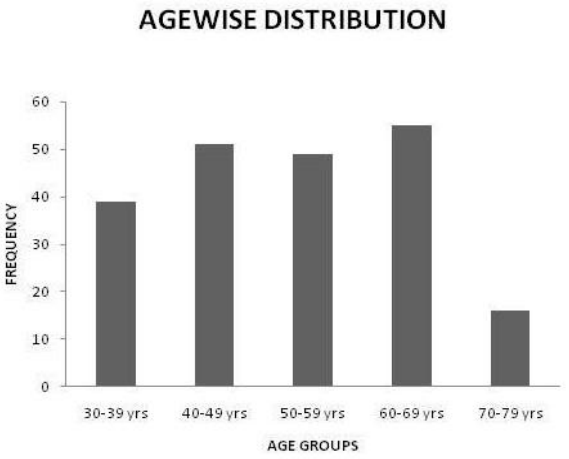


Figure 4. Frequency of age wise distribution in urine culture of diabetic patients

Antibiotic resistance patterns

Table-1 shows the antibiotic resistance patterns of Gram-negative bacteria to several antibiotics. Amongst Gram- negative isolates, 70.68% were resistant against ampicillin, 75.17% resistant against gentamycin, 48.16% resistant against amoxicillin-clavulanic acid, and 60.28% resistant against cefoxitin. However, 59.16% of the isolated Gram-negative bacteria were susceptible to nitrofurantoin. Among Gram- negative bacteria, the predominant isolate was *E.coli* 58.29% of all isolates which showed 91.86% resistance against ampicillin, followed by 74.79% resistance against nalidixic acid, 74.79% resistance against ticarcillin, 67.47% resistance against cephalothin, 65.04% against cefixime and 59.34% resistance against gentamycin was observed. Low resistance to nitrofurantoin 8.13% and norfloxacin 25.20 % was observed. However, 90.24% of the isolated *E.coli* was susceptible to nitrofurantoin.

The antibiotic resistance pattern of Gram-positive bacteria to various antibiotics was shown in Table-2. Gram-positive isolates were 83.33% resistant against penicillin and 83.33% resistant against ciprofloxacin. However 83.33% were susceptible to nitrofurantoin. Among Gram-positive bacteria, the predominant isolates were S.aureus (4/210) which showed 100% resistance against penicillin, erythromycin, vancomycin, tetracycline and tigecycline. However 75% of Gram-positive bacteria were sensitive to gentamycin and nitrofurantoin were observed.
Antibiotic resistance patterns of Candiduria to various antibiotics were shown in (Supplementary Table-3). Candiduria isolates showed 50% resistance against fluconazole and amphotericin B. However, 64.28% of the isolated Candiduria were

susceptible to voriconazole and 57.14% were susceptible to caspofungin and micafungin. The overall multidrug resistance (MDR ≥two antimicrobial agents) was observed in 203 out of 210(96.66%) bacterial and candiduria isolates. While 7 (3.33%) of the isolates were resistant to only one antibiotic. There was no isolate sensitive and resistant to all the antibiotic agents tested. (Table-3)

Table1
Antimicrobial resistance pattern of gram - negative bacteria isolated from urine culture of diabetic patient

Bacterial isolates	Total	S/R/I	AMP	AMC	TIC	PIP	CEF	FOX	CFM	CAZ	CRO	ETP
E.coli	123	S	5(4.06)	67(54.47)	29(23.57)	46(37.39)	38(30.89)	48(39.02)	29(23.57)	16(13.0)	18(14.63)	29(23.57)
		R	113(91.86)	41(33.33)	92(74.79)	69(56.09)	83(67.47)	71(57.72)	80(65.04)	58(47.15)	57(46.34)	46(37.39)
		I	3(2.43)	5(4.06)	0	4(3.25)	0	2(1.62)	3(2.43)	1(0.81)	0	0
P.aeruginosa	34	S	0	0	0	2(5.8)	0	0	0	0	3(8.82)	8(23.52)
		R	0	27(79.24)	0	26(76.47)	0	0	0	0	27(79.41)	21(61.76)
		I	0	3(8.82)	0	4(3.25)	0	0	0	0	2(5.88)	1(2.94)
Klebsiella	24	S	1(4.16)	6(17.64)	2(5.88)	7(20.58)	3(8.82)	7(20.58)	0	3(12.5)	2(5.88)	8(33.33)
		R	22(91.66)	16(47.05)	21(61.76)	14(41.17)	20(58.82)	14(41.17)	0	19(79.16)	19(79.16)	14(58.33)
		I	0	1(2.94)	0	1(2.94)	0	0	0	0	0	0
OTHER	10	S	0	1(10)	0	2(20)	0	0	0	0	0	7(70)
		R	0	8(80)	0	5(50)	0	0	0	0	0	3(30)
		I	0	0	0	0	0	0	0	0	0	0
TOTAL	191	S	6(3.14)	74(38.74)	31(16.23)	57(29.84)	41(21.46)	55(28.79)	29(15.81)	19(9.97)	23(12.04)	52(27.22)
		R	135(70.68)	92(48.16)	113(59.16)	114(59.68)	103(53.92)	85(60.28)	80(41.88)	77(40.31)	103(53.96)	84(43.97)
		I	3(1.57)	9(4.71)	0	9(6.38)	0	0	3(1.57)	1(0.52)	2(1.04)	1(0.52)

(AMP Ampicillin, AMC Amoxicillin- clavulanic acid, TIC Ticarcillin, PIP Piperacillin, CEF Cephalothin, FOX Cefoxitin, CFM Cefixime, CAZ Ceftazidime, CRO Ceftriaxone, ETP Ertapenem)

Tables 1 continue...

Bacterial isolates	Total	S/R/I	AMK	NAL	GEN	CIP	NOR	OFX	FOF	NIF	TMP	MEM
E.coli	123	S	59(47.96)	22(17.88)	46(37.39)	82(66.66)	83(67.47)	52(42.27)	53(43.08)	111(90.24)	28(22.76)	0
		R	61(49.59)	92(74.79)	73(59.34)	31(25.20)	31(25.20)	66(53.65)	62(50.40)	10(8.13)	80(65.04)	0
		I	0	5(4.06)	1(0.81)	7(5.69)	5(4.06)	1(0.81)	3(2.43)	2(1.62)	0	0
P.aeruginosa	34	S	11(32.35)	0	9(26.47)	7(20.58)	0	0	0	0	0	16(47.05)
		R	21(61.76)	0	22(64.70)	23(67.64)	0	0	0	0	0	17(50)
		I	0	0	0	0	0	0	0	0	0	0
Klebsiella	24	S	9(37.5)	3(12.5)	17(70.83)	3(12.5)	4(16.66)	3(12.5)	5(20.83)	2(8.33)	7(20.58)	0
		R	13(54.16)	18(75)	5(83.33)	19(79.16)	18(75)	16(66.66)	13(54.16)	17(70.83)	13(54.16)	0
		I	1(4.16)	0	0	0	0	1(4.16)	2(8.33)	0	0	0
OTHER	10	S	5(50)	0	3(30)	3(30)	0	0	2(20)	0	3(30)	3(30)
		R	5(50)	0	6(60)	6(60)	0	0	6(60)	0	5(50)	7(70)
		I	0	0	1(10)	1(10)	0	0	2(20)	0	1(10)	0
TOTAL	191	S	84(43.97)	25(13.08)	75(39.26)	95(49.73)	87(45.54)	55(28.79)	60(42.55)	113(59.16)	38(19.89)	19(9.94)
		R	100(52.35)	110(57.59)	106(75.17)	79(56.02)	49(34.75)	82(58.15)	81(57.44	27(14.13)	98(51.30)	24(12.56)
		I	1(0.52)	5(2.61)	2(1.04)	8(5.67)	5(3.54)	2(1.04)	7(3.66)	2(1.04)	1(0.52)	0

(AMK Amikacin, GEN Gentamycin, NAL Nalidixic acid, CIP Ciprofloxacin, NOR Norfloxacin, OFX Ofloxacin, FOF Fosfomycin, NIF Nitrofurantoin, TMP Trimethoprim, MEM Meropenem)

Table 1 continue

Bacterial isolates	Total	S/R/I	LVX	CST	TGC	ZOX	CXM	CFP	FEP	IPM
E.coli	123	S	0	0	0	0	0	0	0	0
		R	0	0	0	0	0	0	0	0
		I	0	0	0	0	0	0	0	0
P.aeruginosa	34	S	7(20.58)	9(26.47)	7(20.58)	0	5(14.70)	0	0	0
		R	23(67.64)	19(55.88)	23(67.64)	0	26(76.47)	0	0	0
		I	0	4(11.76)	1(2.94)	0	1(2.94)	0	0	0
Klebsiella	24	S	0	0	0	2(8.33)	0	0	0	0
		R	0	0	0	20(58.82)	0	0	0	0
		I	0	0	0	0	0	0	0	0
OTHER	10	S	0	0	2(20)	0	2(20)	6(60)	6(60)	7(70)
		R	0	8(80)	8(80)	0	7(70)	3(30)	2(20)	3(30)
		I	0	1(10)	0	0	0	0	0	0
TOTAL	191	S	7(3.66)	9(4.71)	9(4.71)	2(1.04)	7(3.66)	6(3.14)	6(3.14)	7(3.66)

		R	23(12.04)	27(14.13)	31(16.23)	20(10.47)	33(17.27)	3(1.57)	2(1.04)	3(1.57)
		I	0	5(2.61)	1(0.52)	0	1(0.52)	0	0	0

(LVX Levofloxacin, CST Colistin, TGC Tigecycline, ZOX Ceftizoxime, CXM Cefuroxime, CFP Cefoperazone, FEP Cefepime, IPM Imipenem).

Table2
Antimicrobial resistance pattern of Gram -positive bacteria isolated from urine culture of diabetic patients

Bacterial isolates	Total	S/R/I	FOX	PENG	OXA	GEN	CIP	LVX	ERY	CLI	LZD	DAP	TEC	VAN	TET	TGC	NIT	RIF
S.aureus	4	S	0	0	3 (75)	3 (75)	1 (25)	1(25)	0	1 (25)	1 (25)	1 (25)	1 (25)	0	0	0	3 (75)	2 (50)
		R	3 (75)	4 (100)	1 (25)	1 (25)	3 (75)	3 (75)	4 (100)	2 (50)	3 (75)	3 (75)	3 (75)	4 (100)	4 (100)	4 (100)	1(25)	2 (50)
		I	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Entero coccus faecalis	2	S	0	1 (50)	0	0	0	0	0	0	1 (50)	2 (100)	0	0	0	1 (50)	2 (100)	0
		R	0	1 (50)	0	2 (100)	2 (100)	2 (100)	2 (100)	0	1 (50)	0	0	0	0	0	0	0
		I	0	0	0	0	0	0	0	0	0	0	0	0	0	1(50)	0	0
TOTAL	6	S	0	1 (16.66)	3 (50)	3 (50)	1 (16.66)	1 (16.66)	0	1 (16.66)	2 (33.33)	3 (50)	1 (16.66)	0	0	0	5 (83.33)	2 (33.33)
		R	3 (50)	5 (83.33)	1 (16.66)	3 (50)	5 (83.33)	5 (83.33)	6 (100)	2 (33.33)	4 (66.66)	3 (50)	3 (50)	4 (66.66)	4 (66.66)	4 (66.66)	1 (16.66)	2 (33.33)
		I	0	0	0	0	0	0	0	1 (16.66)	0	0	0	0	0	0	0	0

(FOX Cefoxitin, PENG Penicillin, OXA Oxacillin ,GEN Gentamycin, CIP Ciprofloxacin, LVX Levofloxacin, ERY Erythromycin, CLI Clindamycin, LZD Linezoid, DAP Daptomycin, TEC Teicoplanin, VAN Vancomycin, TET Tetracycline, TGC Tigecycline, NIT Nitrofurantoin, RIF Rifampin,)

Table 3
Multiple Antibiotic resistance trend of bacterial isolates from diabetic patients' urine cultures

Organisms	no(%)	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
E.coli	123(58.29%)	4(3.25)	9(7.3)	5(4.06)	3(2.43)	0	0	6(4.87)	8(6.5)	6(4.8)	14(11.3)
Pseudomonas	34(16.11%)	1(2.9)	0	0	0	1(2.9)	2(1.62)	7(20.58)	7(20.5)	6(17.64)	3(8.82)
Klebsiella	24(11.37%)	1(4.16)	0	0	0	1(4.16)	0	0	1(4.16)	0	1(4.16)
Candida albicans	8(4%)	0	1(12.5)	0	1(12.5)	2(25)	1(12.5)	0	0	0	0
Candida non- albicans	6(3%)	0	0	0	0	2(33.3)	1(16.6)	0	0	0	0
Enterococcus	2(1%)	0	0	0	0	1(50)	0	0	1(50)	0	0
S.aureus	4(1.89%)	0	0	0	0	0	0	0	0	0	0
Other	10(4.73%)	1(10)	0	0	1(10)	1(10)	1(10)	0	1(10)	0	0
Total	210(100)	7(3.33)	10(4.76)	5(2.38)	5(2.38)	8(3.8)	5(2.3)	13(6.19)	16(7.6)	12(5.71)	18(8.57)

Table- 3 continue

Organisms	no(%)	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
E.coli	123(58.29%)	12(9.75)	13(10.56)	13(10.56)	14(11.3)	9(7.3)	5(4.06)	2(1.62)	0	0	0
Pseudomonas	34(16.11%)	4(11.76)	2(5.88)	0	0	0	0	0	0	0	0
Klebsiella	24(11.37%)	2(8.3)	2(8.3)	1(4.16)	6(25)	3(12.5)	2(8.3)	1(4.16)	1(4.16)	0	1(4.16)
Candida albicans	8(4%)	0	0	0	0	0	0	0	0	0	0
Candida non- albicans	6(3%)	0	0	0	0	0	0	0	0	0	0
Enterococcus	2(1%)	0	0	0	0	0	0	0	0	0	
S.aureus	4(1.89%)	1(25)	1(25)	1(25)	1(25)	0	0	0	0	0	0
Other	10(4.73%)	0	1(10)	2(20)	1(10)	0	1(10)	0	0	0	0
Total	210(100)	19(9.04)	19(9.04)	17(8.09)	22(10.47)	12(5.71)	8(3.8)	3(1.42)	1(0.47)	0	1(0.47)

R1,R2,R3,R4,R5,R6,R7,R8,R9,R10,R11,R12,R13,R14,R15,R16,R17,R18,R19,R20 resistance to one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty).

Table 3
Antimicrobial resistance patterns of fungus isolated from diabetic patients' urine cultures

Fungi isolates	Total no	S/R/I	FLC	VRC	CAS	MFG	AMB	5FC
CANDIDA ALBICANS	8	S	4(50)	5(62.5)	5(62.5)	5(62.5)	4(50)	3(37.5)
		R	4(50)	3(37.5)	3(37.5)	3(37.5)	4(50)	4(50)
		I	0	0	0	0	0	0
CANDIDA NON-ALBICANS	6	S	3(50)	4(66.66)	3(50)	3(50)	3(50)	2(33.33)
		R	3(50)	2(33.33)	3(50)	3(50)	3(50)	2(33.33)
		I	0	0	0	0	0	2(33.33)
TOTAL	14	S	7(50)	9(64.28)	8(57.14)	8(57.14)	7(50)	5(35.71)
		R	7(50)	5(35.17)	6(42.85)	6(42.85)	7(50)	6(42.85)
		I	0	0	0	0	0	2(14.28)

(FLC Fluconazole, VRC Voriconazole ,CAS Caspofungin, MFG Micafungin, AMB Amphotericin B, 5FC Flucytosine)

Discussion

The recent study was carried out to find out the frequency of UTI and antimicrobial susceptibility pattern among diabetic patients at Parul Sevashram Hospital, Vadodara. (D et al., 2012; Nigussie & Amsalu, 2017; Zubair et al., 2019). UTIs are more frequent and severe in patients with diabetes mellitus. High glucose levels in the urine, which can act as breeding ground for pathogenic microorganisms and cause immunologic impairment, lowering the human defense system, have been linked to an increased risk of bacteriuria in diabetics (Boyko et al., 2005). They are mostly caused by resistant pathogens (Ijaz et al., 2014). In this study we investigated the prevalence of uropathogens among diabetic patients. Several studies in the general population revealed that Gram-negative enteric bacteria were the most common etiological agents of urinary tract infection (Boroumand et al., 2006). E.coli was the most predominant organisms isolated (Bonadio et al., 2006; Chaudhury, 2017; Saleem & Daniel, 2011; Shill et al., 2010; Yismaw et al., 2012) and drug resistance to ampicillin and sensitive against nitrofurantoin (Jha et al., 2014).

In the present study, the frequency of UTI is higher in females (59%) than male (41%). Majority of studies concluded the prevalence of female UTI as compared to male which is in agreement to the other studies (Alhambra et al., 2004; Baqai et al., 2008; Oluwafemi et al., 2018). Our findings were consistent with earlier studies indicating a high frequency of urinary tract infection in females (Bonadio et al., 2006). The higher frequency rate recorded in females could be due to the closeness of the urethral meatus to the anus, short urethra, contraception, pregnancy and sexual intercourse which allows bacteria into the female urinary tract (Jha et al., 2014; Oluwafemi et al., 2018; Omoregie, 2008). In our study, UTI was more frequent in older age (age 40-69) that is 73.80%. This is comparable to the finding reported by Ijaz, Muhammad Ali, Saeed Khan *et. al.* (Ijaz et al., 2014)

The uropathogens isolated in this study showed high sensitivity to Nitrofurantoin, Ciprofloxacin and Ofloxacin while in the present study nitrofurantoin has higher sensitivity against Gram- positive and Gram-negative (Alabi O. S.1, Onyenwe N. E.2 & 1-4, 2014; Oluwafemi et al., 2018).

In the presence of co morbidities (DM), MDR isolates as a leading etiological factor (Bagir et al., 2019; Nigussie & Amsalu, 2017). MDR against more than two antimicrobial drugs was found in 96.66% of total isolates in our investigation, which contradicts findings about the incidence of MDR in DM patients. Furthermore, MDR against only two drugs was found in 4.76% of our total isolates. This spectrum reached to the incidences of MDR to a maximum of twenty antibiotics in some of the isolates (Table-3). Such high prevalence of antibiotic resistance is alarming and warrants immediate focus especially in patients of diabetes mellitus encountering UTI. This suggests that regular monitoring is essential to establish solid information on the resistance pattern of urine pathogens in diabetic individuals with urinary tract infection for appropriate empirical therapy. If unchecked or neglected, this can lead to major or even life-threatening complications to patients also many-a-times leading to recurrent infections from one or many types of uropathogens.

Conclusion

In this study, E.coli was the most common etiological agent for causing UTI in diabetic patients. Gram negative isolates shows 70.68% resistance against ampicillin and 75.17% resistance against gentamycin. Gram positive isolates were 83.33% resistance against penicillin and ciprofloxacin while nitrofurantoin was most sensitive in Gram negative and Gram positive isolates. Multi-drug resistance was observed in 96.66% of bacterial and candiduria isolates. Therefore, performing urine culture and regular monitoring of UTI is essential with an immediate focus on finding alternative therapies or preventive measures.

Acknowledgement

We would like to thanks Dr. Vaidehi Mehta, Associate Professor, Department of Microbiology, PIMSR and Dr Apurvakumar Pandya, Director, Parul Institute of Public Health, Parul University for their help.

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