Prevalence of urinary tract infections and its antibiogram in diabetic and non-diabetic patients attending tertiary care hospital in Maharashtra

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Abstract

Objective: To compare the prevalence of UTI in diabetic and non-diabetic patients and to compare its antibiotic resistance pattern.
Materials and Methods: A cross-sectional study was conducted in 228 diabetic and 228 non-diabetic patients from November 2016 to January 2018. After obtaining an informed consent, clinical data was collected using pre-structured questionarre. Clean catch mid-stream urine sample were collected and processed for identification of uropathogens through culture using standard microbiological procedure. Antibiotic susceptibility test was carried out using Kirby Bauer Disk Diffusion method.
Result: The prevalence of UTI in diabetic patients is 15.35% which is greater compared to 12.28% in non-diabetic patients. E.coli was found to be most predominant organism in both diabetic and non-diabetic patients. The most frequently isolated organism in case of diabetic were E.coli (51.42%), K.pneumonie (17.14%), MRSA (8.57%), Pseudomonas aeruginosa (5.71%), MSSA (2.85%), Citrobacter species(2.85%), CONS (2.85%), Candida (2.85%) and two samples showed mixed flora. In case of non-diabetic patients, organisms isolated were E.coli (50%), K.pneumonie(14.28%), MRSA (10.71%), Pseudomonas aeruginosa (10.71%), MSSA (3.57%), Citrobacter species(3.57%), CONS (3.57%) respectively. E.coli isolates from UTI of diabetic patients showed significantly higher resistance rates to CIP, CTX, CAZ, GEN, NIT compared with those from non-diabetic patients. The overall multidrug resistance was observed in 32 out of 35 bacterial isolates in diabetic patients (91.4%).
Conclusion: Prevalence of UTI among diabetic and non-diabetic pts is comparable with published articles. Because of great proportion of asymptomatic bacteruria in diabetic pts, urine culture should be performed in all diabetic pts. Most common uropathogen is E.coli.

Keywords: Diabetes, non-diabetic, Urinary tract infections, Antibiotics, Uropathogens.

Introduction

Diabetes mellitus is worldwide health problem with an expected prevalence of 593 million by 2035.It is one of the top ten causes of death in world and is due to its complications. One of the common complication of diabetes is its effect on genitourinary system. Various impairment in immune system, poor metabolic control and incomplete bladder emptying due to autonomic neuropathy may contribute in pathogenesis of urinary tract infections (UTI) in diabetic patients. The spectrum of UTI in these patients range from asymptomatic bacteriuria to lower UTI (cystitis), pyelonephritis and severe urosepsis. The emergence of multidrug resistant uropathogenic strains has restricted the choice of antimicrobial agents. The study was undertaken to investigate the prevalence of asymptomatic bacteriuria and urinary tract infections in clinically diagnosed patients with diabetes and non diabetic patients and antimicrobial resistance pattern of bacterial isolates from urine samples of diabetic and non-diabetic patients.

Objectives

To compare the prevalence of UTI in diabetic and non-diabetic patients and to compare its antibiotic resistance pattern.

Materials and Methods

A cross-sectional study was conducted in department of microbiology at tertiary care hospital in Maharashtra from November 2016 to January 2018. The study included 228 diabetic (118 females and 110 males) and 228 non-diabetic (138 females and 90 males) patients. All proven diabetics with fasting glucose>126mg/dl and postprandial (2hrs) glucose >200mg/dl were included in the study. Patients with history of diabetes and those who were on treatment for same were also included. Controls consisted of patients with comparable age and sex with no history of diabetes and fasting blood sugar <110mg/dl. Exclusion criteria included pregnancy, underlying renal pathology or chronic renal disease or use of antimicrobial 2 weeks prior culture. After obtaining an informed consent, clinical data was collected using pre-structured questionarre. Patients were educated how to collect clean-catch mid-stream urine in a sterile wide mouth container and sample processed within 1 hour of collection. Using a standard quantitative loop, loopful of urine sample inoculated on MacConkey, blood and nutrient agar. Plates were incubated at 37 degree celcius for 24 hrs. Based on morphology of colonies, gram staining reaction biochemical test were carried out. Significant bacteriuria was defined as the presence of ≥105 colony forming units (CFU) per milliliter of urine. A symptomatic urinary tract infection was defined as the presence of bacteriuria in a patient with fever or urinary symptoms. Asymptomatic bacteriuria (ASB) was defined as bacteriuria without fever or urinary symptoms. The Kirby Baur disc diffusion method was used to determine the antimicrobial susceptibility of

isolates. Antibiotics against which sensitivity was tested includes amoxycillin, amoxyclav, ciprofloxacin, norfloxacin, cotrimoxazole, gentamycin, amikacin, nitrofurantoin, ceftazidime, meropenem, piperacillin-tazobactum.

Result

Out of total 456 urine sample, 63 were culture positive. Among the 228 urine samples from diabetic patients 35 were culture positive whereas among 228 non-diabetic patients 28 were culture positive. The prevalence of UTI in diabetic patients is 15.35% which is greater compared to 12.28% in non-diabetic patients. Among the culture positive cases, 10 males (9.09%) and 25 females (21.18%) showed culture positivity in case of diabetic patients and 9 males (10%) and 19 females (13.76%) in case of non-diabetic patients. Prevalence of UTI was found to be more in females compared to males in both diabetic and non-diabetic. Out of total 35 culture positive cases in diabetics only 11 (31.42%) showed symptoms rest were asymptomatic

(68.57%). Diabetics were asymptomatic compared to non-diabetic which were symptomatic. E.coli was found to be most predominant organism in both diabetic and non-diabetic patients. The most frequently isolated organism in case of diabetic were E.coli (51.42%), K.pneumonie(17.14%), MRSA(8.57%), Pseudomonas aeruginosa (5.71%), MSSA (2.85%), Citrobacter species (2.85%), CONS (2.85%), Candida (2.85%) and two samples showed mixed flora. In case of non-diabetic patients, organisms isolated were E.coli (50%), K.pneumonie (14.28%), MRSA (10.71%), Pseudomonas aeruginosa (10.71%), MSSA (3.57%), Citrobacter species (3.57%), CONS (3.57%) respectively. E.coli isolates from UTI of diabetic patients showed significantly higher resistance rates to CIP, CTX, CAZ, GEN, NIT compared with those from non-diabetic patients. The overall multidrug resistance was observed in 32 out of 35 bacterial isolates in diabetic patients (91.4%).

Table 1: Pattern of urine culture in DM and Non DM

	DM (%)	Non DM (%)	Total
Culture positive	35 (15.35%)	28 (12.28%)	63
Culture negative	193	200	393
Total	228	228	456

Table 2: Genderwise distribution of urine culture isolates from DM and Non DM

	DM		Non DM	
Gender	Males	Females	Males	Females
Culture positive	10(9.09%)	25(21.18%)	9(10%)	19(13.76%)
Culture negative	100	93	81	119
Total	110	118	90	138
	228		228	

Table 3: Pattern of bacterial isolates causing UTI

Organism	No. of isolates					
	Diabetic			Non Diabetic		
	Male	Female	Total (%)	Male	Female	Total (%)
E.coli	4	14	18(51.42%)	5	9	14(50%)
K.pneumonie	2	4	6(17.14%)	2	3	5(17.85%)
MRSA	2	1	3(8.57%)	1	2	3(10.71%)
P.aeruginosa	1	1	2(5.71%)	1	2	3(10.71%)
MSSA	0	1	1(2.85%)	0	1	1(3.57%)
Citrobacter sp	0	1	1(2.85%)	0	1	1(3.57%)
CONS	0	1	1(2.85%)	0	1	1(3.57%)
Candida	0	1	1(2.85%)	0	0	0
Mixed flora	1	1	2(5.71%)	0	0	0
Total	10	25	35	9	19	28

Table 4: Prevalence of asymptomatic bacteriuria in Diabetic patients

	DM	%
Asymtomatic	24	68.57%
Symptomatic	11	31.42%
Total	35	100

Table 5: Antibiotic resistance pattern among diabetic and non-diabetic

	E.coli		P.aeruginosa		MRSA		K.pneumoniae		Citrobacter species		MSSA		CONS	
Antibiotics	DM	Non DM	DM	Non DM	DM	Non DM	DM	Non DM	DM	Non DM	DM	Non DM	DM	Non DM
Amoxycillin	77.4	75.1	-	-	48.7	40.2	77	75.4	53.3	52.4	40.6	34.4	48	42.2
Amoxyclav	69.3	64.2	-	-	24	25.5	33.6	31.2	46.7	45.2	21	20.1	25.6	25
Cotrimoxazole	63.4	65.1	-	-	44.8	40.33	83.4	85.2	60	71.1	44.5	41	41.5	35.2
Gentamycin	23.6	20.11	42.3	39.2	35.3	31.31	33.4	30.2	29.4	27.5	23.8	20.1	41.1	34.2
Amikacin	4.7	3.8	31	25.1	-	-	13.4	11.2	18.7	15.5	-	-	-	-
Ciprofloxacin	59	65.2	21.6	31.2	43	60	30	44.2	26.8	33.2	41.7	61.1	49	58.4
Norfloxacin	4.6	4.1	15	13.2	31.5	30.11	16.2	15.3	20	19.2	29.9	30	37.5	35.1
Nitrofurantoin	1.4	1.1	-	-	3	2.55	23.3	22.3	13.4	13.1	2.5	2.1	11.3	11.1
Ceftriaxone														
SCeftazidime	25.7	22.22	11.6	10.1	-	-	57.8	56.2	46.7	45.5	-	-	-	-
Meropenem	5	3.5	11.6	5.1	-	-	5.5	5.1	5.4	3.2	-	-	-	-
Piperacillin-tazobactum	42.6	40.2	20	18.2	-	-	26.6	25.8	26.6	25.9	-	-	-	-

Discussion

This study reveals a high prevalence of UTI in diabetic compared to non-diabetics. This agrees with findings of Horcajada et al, Geerlings et al, Obeagu et al. This study shows prevalence of UTI in diabetic patients as 15.35%. This is in comparision with other studies where prevalence varies between 9 to 25% (Teodors Chita et al, R Goswami et al, Khalid A et al). It is in contrast to study by B. Pargavi et al, J Janifer et al, Obeagu et al where prevalence is slightly high. The variation in prevalence can be explained by difference in geography, host factors and practices such as social habits of community, standard of personal hygiene and health education practices. Higher incidence of bacteriuria was recorded in diabetic females (21.18%) than non-diabetic females (13.76%). This is in accordance with other reports stating high prevalence of UTI in females (Aswani Shriniwas et al, Teodara Chita et al, Vijayakumar Sarvepalli et al, Raz and Stamm et al, Geerlings et al). E.coli was found to be the most common organism isolated from urine of both diabetic and non-diabetic patients. This result is consistent with findings of other studies like Aswani Shriniwas et al, Obeagu et al, Maharjan N M et al. This may be due to much stronger adherence of virulent type 1 fimbriated E.coli to uroepithelial cells of diabetic patients. Our study showed mixed growth in two cases of diabetic patients. In the present study one patient had UTI due to candida. Fungal UTI among diabetic population are more common in patients with prolonged hospital stay, catheterization and prolonged antibiotic use. Gram negative bacteria showed higher resistance to amoxycillin, amoxy-clavulanic acid, cotrimoxazole, ciprofloxacin and susceptibility to nitrofurantoin, norfloxacin, meropenem. Gram positive organism were resistant to amoxy-clavulanic acid, cotrimoxazole, ciprofloxacin and susceptible to nitrofurantoin. In this study, 91.4% of isolated uropathogens showed multi drug resistance (MDR) against two and more antibiotics tested. This is in comparision with results of Dimiss Nigussie et al, Gondar et al. The reason for high incidence of MDR may be irrational use of antibiotic, patients poor adherence to prescribed antibiotics and circulation of high level drug resistant uropathogens. This study had some limitations. Selection bais may be introduced. Because of lack of resources HBA1C and immunological factors like cytokine production and neutrophil function cannot be performed.

Conclusion

Prevalence of UTI among diabetic and non-diabetic pts is comparable with published articles. Because of great proportion of asymptomatic bacteriuria in diabetic pts, urine culture should be performed in all diabetic pts. Most common uropathogen is E.coli but fungal infection is also common. Multidrug resistance to commonly used antibiotics in study area is alarming. Therefore, performing urine culture of UTI in diabetic pts is necessary for proper treatment.

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