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BACTERIOLOGY OF URINARY TRACT INFECTION AND ANTIBIOTIC SUSCEPTIBILITY PATTERN AMONG DIABETIC PATIENTS

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Abstract: Urinary tract infection is one of the most commonly occurring infections among the patients with diabetes mellitus. The present study was focused on the antibiotic susceptibility of the UTI pathogens isolated from the diabetic patients. A total 40 UTI organisms were isolated from 125 urine samples collected from the diabetic patients attending the Mayo Institute of Medical sciences, study period of six month from November, 2013 to may, 2014. The incidence of UTI was recorded to 32%. *Escherichia coli* (55%) was found to be the major cause of UTI. About 5 different types of organisms isolated from the UTI samples were randomly chosen to test against the UTI antibiotics of Himedia. The antibiotic susceptibility pattern revealed that GNB was most effective to imipenem 95.33%, gentamicin and nitrofurantoin 80%. GPC were most effective to vancomycin 100% tetracycline 85% and linezolid 83.5%. These data may be used to determine trends in antimicrobial susceptibilities, to formulate local antibiotic policies and to assist clinicians in the choice of antibiotic therapy to prevent misuse, or overuse, of antibiotics.

Key words: Diabetic, Multi Drug Resistance (MDR), Urine tract Infection (UTI).

INTRODUCTION

Urinary tract infection (UTI) is the second most common clinical indication for empirical antibiotic treatment in primary and secondary health care settings, and urine samples constitute the largest single category of specimens examined in most medical microbiological laboratories. [1] Diabetes mellitus is a complex metabolic syndrome caused by lack of insulin resulting in inappropriate high blood glucose levels. ^[2] The incidence of diabetes mellitus (DM) throughout the world is increasing strikingly and is becoming a serious public health problem especially in the developing countries.^[3] Patients with diabetes have a 10-fold increased risk of UTI when compared to nondiabetics.^[4] With the growing number of diabetic patients, the prevalence of diabetic kidney disease will also increase.^[5]. Hyperglycaemia and hypertension are the major risk factors for initiation of chronic kidney disease.^[6] Diabetic patients are at a higher risk developing acute pyelonephritis, renal abscess, abnormalities of bladder scarring and pyelitis. People with diabetes have dysfunctional bladders which contract poorly so generally accepted that infections are frequent causes of morbidity and mortality. ^[7,8] Escherichia coli causes approximately 90% of acute UTI in diabetic patients other bacilli involved, i.e. Proteus species, Klebsiella species, Enterobacter, Enterococci, Staphylococcus aureus, Staphylococcus saprophyticus, Serratia and Pseudomonas.^[9, 10] The emergence of antibiotic resistance in the management of UTI is a serious public health issue, A protocol for empirical treatment of simple lower UTI with first and second generation cephalosporins while gentamicin for the

*Corresponding Author: Dr. Bajarangi Lal Chaudhary, Tutor, Department of Microbiology, Mayo Institute of Medical Sciences, Barabanki, UP, India. treatment of clinical pyelonephritis. The management of UTI in patients with diabetes is essentially the same as patients without diabetes.^[11, 12] The aim of the present study was to assess the prevalence of UTI pathogen among diabetic patients, sugar level, pyuria and susceptibility patterns of diabetic's patients.

MATERIAL METHODS

This study on diabetic patients was carried out in the Department of Microbiology, Mayo Institute of Medical Sciences Barabanki, UP. Over a period of six months from November 2013 to May 2014. A total of 125 diabetic patients from various out-patient departments and admitted in wards at Mayo Institute of Medical Sciences, Barabanki, were taken for the study. Known diagnosed diabetics who were already started on antibiotics and who took antibiotic within last 2 weeks were excluded. Urine samples were collected by standard "mid-stream clean catch" method from all the pregnant women, in a sterile, wide mouthed container that can be covered with a tightly fitted lid. Microscopic examination of a wet film of uncentrifuged urine was carried out to detect the presence of pus cells, erythrocytes, microorganisms, casts etc. The samples were processed using standard microbiological procedures. The specimens were cultured on dried plates of McConkey's agar, Sheep Blood agar and Cystine Lactose Electrolyte Deficient Agar, by standard loop method and incubated at 37°C overnight. Culture results were interpreted as being significant and insignificant, according to the standard criteria. The organism was identified by routine



methods from the samples showing significant bacteriuria. [13, 14] The isolates were tested for their antimicrobial susceptibility and the results were interpreted according to the guidelines of Clinical and Laboratory Standards Institute. Gram negative isolates were tested against amikacin, ampicillin, ampicillin/ Sulbactam, piperacillin, piperacillin-tazobactam, cephotaxime, ceftazidime, cefoxitin, norfloxacin, nitrofurantoin, gentamicin, ciprofloxacin, levofloxacin and imipenem. Gram positive isolates were tested with erythromycin, oxacillin, cefoxitin, Linezolid, vancomycin, teicoplanin, rifampin, chloramphenicol, cotrimoxazole, ciprofloxacin, gentamicin, amikacin and tetracycline (Hi Media, India).[15] Escherichia coli ATCC 25922 and Staphylococcus aureus ATCC 25923 was used as a control strain.

Glucose Test (sugar)

A clean test tube was filled with 5 ml of Benedict's solution and gently heated for few minutes. 0.5ml urine was added, mixed well and boiled for 5minutes in a water bath. After 5 minutes the tube was cooled and observed for the colour reaction. The percentage of glucose concentration in the urine was indicated by the colour change.^[16]

RESULT AND DISCUSSION

Table 1. A total of 125 urine samples were collected, in which OPD 85(68%) and IPD 40(32%) male cases were 75 and female 50. The overall prevalence of urinary tract infection was 40 (32%) and the prevalence rate was higher in females 25 (62.5%) then males 15 (37.5%). Study by R Simkhada showed among the 100 included patients, 53% were female and 47% were male. The overall prevalence of urinary tract infection was 21(21%) Among 53 females 15 (28.3%) had growth and among 47 male 6 (12.76%) had growth. [17] Table 2 and 3. Urine sugar level was assessed by glucose test and recorded 0.55 sugar levels was observed in 27 samples, 1% sugar in 36 samples, 1.5% sugar in 16 samples, 2.0% sugar in 11 samples and Nil sugar level in 35 samples respectively. The higher percentage of urine sugar level has also observed in male 75 then male 50. Microscopic examination of the urine sample revealed that 80 (64%) of the specimen showed significant pyuria while 45 (36%) showed in significant pyuria Table 4. The prevalence of UTI over the age-sex distribution was assessed. In females, 31-40 age groups were more prevalent to UTI (48%) male (46.6%6), followed by 41-50 age groups (28%) male (33.33%). Study by B. Pargavi showed 0.55 sugar levels was observed in 39 samples, 1% sugar in 50 samples, 1.5% sugar in 43 samples, 2.0% sugar in 26 samples and Nil sugar level in 42 samples respectively. The higher percentage of urine sugar level has also observed in females 112 then 88. Microscopic examination of the urine sample revealed that 74(37%)of the specimen showed significant pyuria while 126

(63%) showed in significant pyuria. The prevalence of UTI over the age-sex distribution was assessed. The higher percentage of prevalence was observed in females 64.9% and 35.15%. In females, 31-40 age groups were more prevalent to UTI, followed by 41-50 age groups. In males, maximum number of positive cases was observed in 41-50 age groups. ^[18]

Table 5. In the present study we found that Escherichia coli 22(55%), Klebsiella pneumoniae 7 (17.5%), Pseudomonas aeruginosa 2(5%), Enteroccocus species 4 (10%), Staphylococcus aureus. 5 (12.5%). Study by Gizachew Yismaw et al., showed E. coli (31.7%), coagulase negative staphylococci (CONs) (22%), Klebsiella spp. (14.6%), Enterococcus spp. (11%) and Staphylococcus aureus (8.5%). ^[19] Table 6 and 7 show most effective antibiotic against GNB were imipenem 95% followed by gentamicin 80%, tetracycline 85%, nitrofurantoin 80%, norfloxacin 75% and GPC were vancomycin 100%, linezolid 80% and tetracycline 80%. Study by Gizachew Yismaw et al., showed most effective antibiotic were ciprofloxacin 85.1%, gentamicin 63.8%, amoxicillin-calvulanicacid 59.6%, chloramphenicol 34.1%, ampicillin 31.9% and trimethoprim sulphamethoxazole 17% tetracycline 17%.[20]

Sex wise distribution of patients



Urine `sugar level of diabetic patients

0								
S.N.	Urine sugar level	Female	Male					
1	+(0.5%)	10	17					
2	++(1.0%)	15	21					
3	+++(1.5%)	6	10					
4	++++(2.0%)	4	7					
5	Nil sugar level	15	20					
	Total	50	75					

Prevalence of UTI over the age distribution and sex.

S.N.	Age group	Male (%)	Female (%)	Total (%)
1	21-30	2 (8%)	1(6.66%)	3(7.5%)
2	31-40	12(48%)	7(46.66%)	19(47.5%)
3	41-50	7(28%)	5(33.33%)	12(30%)
4	>50	4(16%)	2(13.33%)	6(15%)
	Total	25(62.5%)	15(37.5%)	40(100%)

Pyuria of UTI patients.



Bacter	Bacterial isolates among diabetic patients.												
S.N.	Bacterial isolate	Male (%)	Female (%) Total (%) 7 (46.66%) 22 (55%) 3 (20%) 7 (17.5%) 1 (6.66%) 2 (5%) 2 (13.33%) 4 (10%) 2 (13.33%) 5 (12.5%) 15 (37.5%) 40 (100%)										
1	Escherichia coli	15 (60%)	7 (46.66%)	22 (55%)									
2	Klebsiella pneumoniae	4 (16%)	3 (20%)	7 (17.5%)									
3	Pseudomonas aeruginosa	1 (4%)	1 (6.66%)	2 (5%)									
4	Enterococcus spp	2 (8%)	2 (13.33%)	4 (10%)									
5	Staphylococcus aureus	3 (12%)	2 (13.33%)	5 (12.5%)									
	Total	Male (%) Female (%) 15 (60%) 7 (46.66%) ae 4 (16%) 3 (20%) inosa 1 (4%) 1 (6.66%) 2 (8%) 2 (13.33%) us 3 (12%) 2 (13.33%) 25 (62.5%) 15 (37.5%)											

Antibiotic sensitivity pattern of GNB.

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Organism	AK	A/S	Р	PIT	СТХ	CAZ	СХ	NX	NIT	GEN	CIP	LE	IPM	
E. coli	40	50	50	70	65	70	45	78	80	80	70	70	95	
Klebsiella spp	50	40	45	65	62	65	50	80	85	75	60	60	94	
Pseudomonas spp	42	60	62	70	55	57	62	75	85	75	58	58	97	

AK-amikacin; A/S-ampicillin/sulbactam, P-piperacillin, PIT-piperacillin tazobactam, CTX-cefotaxime, CAZ-ceftazidime, CX-cefoxitin, NX-norfloxacin, NIT-nitrofurantoin, GEN-gentamycin, CIP-ciprofloxacin, LE-levofloxacin, IPM-imipenem

Antibiotic sensitivity pattern of GPC.

	Organism	οх	СХ	Е	LZ	VA	TIP	RIF	C	COI	г сір	GEN	AK	TE	NX	NIT
	S. aureus	60	60	65	87	100	75	65	40	55	60	75	60	80	73	76
	Enterococcus spp	60	70	72	80	100	57	70	45	72	73	75	70	92	75	72
JX-ofle	vacin E-enthrom	vcin	17-line	biloz	TIP_to	iconlar	hin Ca	chlorar	nnhor	icol	COT-cot	rimovazo		AK-amik	acin	TE-totracy

OX-ofloxacin, E-erythromycin, LZ-linezolid, TIP-teicoplanin, C-chloramphenicol, COT-cotrimoxazole, AK-amikacin, TE-tetracyclin

CONCLUSION

This study confirms that diabetes predisposes humans to the risk of urinary tract infections due to the changes in bladder function and in circulation. UTIs are frequent in patients with diabetes most frequent uropathogen is *E. coli*. Imipenem was most effective against GNB and vancomycin and Linezolid was most effective against GPC. These data may be used to determine trends in antimicrobial susceptibilities, to formulate local antibiotic policies and to assist clinicians in the choice of antibiotic therapy to prevent misuse or overuse of antibiotics.

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