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Microbiology

PREVALENCE OF UROPATHOGENS AMONG DIABETIC PATIENTS AND THEIR ANTIBIOGRAM AT A RURAL TERTIARY CARE TEACHING HOSPITAL IN DAKSHINA KANNADA DISTRICT OF KARNATAKA, INDIA.

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ABSTRACT **Background:** Urinary tract Infections are very common among patients with diabetes mellitus. Emergence of resistant strains in UTI has become a challenge as it tends to increase the cost of treatment, morbidity and mortality among patients with diabetes. The objective of the present study was to assess the prevalence of UTI among diabetic patients and to study the resistance pattern among the isolated uropathogens.
Materials and Methods: A retrospective study was conducted to collect details of uropathogens in diabetic patients from 2016 to 2020. Urine samples were collected and examined by microscopy and culture techniques. Isolated microorganisms were identified microscopically, morphologically and using biochemical tests. Antibiotic susceptibility tests were done on Mueller-Hinton agar by the Kirby-Bauer disk diffusion method as per Clinical and Laboratory Standard Institute Guidelines.
Results: The proportion of culture positive urine sample was 44.86%. The most common organism isolated was E Coli (59.21%) followed by Klebsiella pneumoniae (24.69%) and Enterobacter aerogens (4.23%). All these organisms showed maximum resistance to Amoxycillin, Aztreonam and Piperacillin. Nitrofurantoin showed better activity against most uropathogens followed by aminoglycosides.
Conclusion: Both penicillin and cephalosporin group have developed significant resistance. Nitrofurantoin can be used for empirical treatment of UTI in those who can take oral medications.

KEYWORDS : Diabetes Mellitus, Urinary Tract Infection, Antibiogram.

INTRODUCTION

Diabetes mellitus is a chronic non communicable metabolic disorder characterised by increased blood glucose level resulting from defects in insulin secretion, insulin action or both[1]. The chronic increase in sugar levels is associated with dysfunction and failure of various organs, especially the heart, blood vessels, eyes, kidneys and nerves. Patients with diabetes are also at an increased risk for Urinary Tract Infection (UTI)[2,3]. The increased risk among diabetic patients is because of a combination of host factors and local factors. Globally it was estimated that about 150 million people are affected by UTI each year. The prevalence is more common in women than in men and it is estimated that 50-60% of women suffer from UTI at least once during their lifetime[4-6].

The common pathogens associated with UTI are Escherichia Coli, Staphylococcus saprophyticus, Klebsiella pneumonia, Proteus mirabilis, Enterococcus species, Pseudomonas aeruginosa[7-11] and group B streptococcus[8]. Among them E Coli is considered to be the most commonest whether the patient is diabetic or not. Studies have also shown that lower proportion of UTI is caused by E Coli in diabetic patients[12].

The increased risk of UTI among diabetic patients coupled with increase in incidence of DM worldwide in recent years, may impose a substantial burden on medical costs[13].High rates of antibiotic prescriptions leading to inappropriate use of antibiotics, irrational prescription of antibiotics by unqualified practitioners, untrained pharmacists and nurses all over the country lead to increasing resistance pattern[14,15].

Therefore this study was designed to determine the bacterial profile and antimicrobial resistance patterns among diabetes mellitus patients attending a rural tertiary care centre at Dakshina Kannada district of Karnataka, India.

MATERIALS AND METHODS

A retrospective study was conducted in a rural tertiary care teaching hospital in Dakshina Kannada district of Karnataka, India. Patients with confirmed Diabetes Mellitus whose had symptoms of urinary tract infection and were either admitted or who were outpatients were sent for routine examination and culture of urine. The data of such patients from 2017 till 2020 were collected and analysed.

Sample processing:

Urine of diabetic patients who has not received antibiotic therapy during the previous 14 days were collected by a clean-catch midstream, catheterization, or use of urine bags in a sterile container. Wet mount examination of uncentrifuged urine was performed.

Urine culture was done by a semi-quantitative method on Mac Conkey's agar, CLED medium, blood agar medium and were incubated for 18–24 hours at 37°C. The uropathogens were identified by standard biochemical reactions.

The urine specimen with a growth of $\geq 10^5$ CFU/mL of a single microorganism with a predominant species was considered significant and defined as positive urine culture.

Negative urine culture was defined as no growth, insufficient growth, or a mixed microbial flora with no predominant organism.

The antibiotic susceptibility testing (AST) was carried out using the Kirby Bauer disc diffusion method. The antibiotic discs (Himedia) used for coliforms included Nitrofurantoin(30 μg), Norfloxacin(10 μg), Nalidixic acid(30μg), Cefazolin(30 μg), Cefuroxime(30 μg) , Cefepime(30 μg), ceftazidime(30 μg), Aztreonam(30 μg),Amikacin (30 μg), Gentamicin (10 μg),High level Gentamicin(120 μg) ,AmoxyClav(20/10 μg), Amoxycillin(10 μg) Ciprofloxacin(5 μg), Ofloxacin(5 μg) Imipenem (10 μg), Meropenem (10 μg), Piperacillin(100 μg), Co-Trimoxazole(1.25/23.75μg) and Vancomycin(5μg).

The interpretation of results was based on the recommendations of the Clinical Laboratory Standards Institute (CLSI)[16].

Permission was obtained from Institutional Ethics Committee before the start of the study.

STATISTICAL ANALYSIS

Data was entered in Microsoft Office Excel 2007 and IBM SPSS version 21 was used for analysis. The data is represented in the form of frequencies and percentages. Chisquare test was used to find statistical significance among categorical variables.

RESULTS

A total of 1634 samples were received from patients with symptoms of urinary tract infection from the year 2016 to 2020 and were processed at Department of Microbiology of the tertiary care centre. Of these 1634 samples, 733 samples were culture positive. Thus the proportion of culture positive samples was 44.85%.

The age wise proportion of culture positive cases in each year is tabulated in Table 1. The maximum proportion of culture positive cases was seen in patients with 81-90 years age group. The culture positivity was almost 50% or more in patients above 70 years of age group.

Among the culture positive samples, E.Coli was the most common organism that was isolated every year. The proportion of samples with positive E.Coli was 59.21. Klebsiella pneumoniae was the next common isolate to be identified, followed by Enterobacter aerogens accounting for 24.69% and 4.23%. The proportion of isolates in culture positive samples is tabulated in Table 2.

E.Coli was most resistant to Amoxycillin, Aztreonam and Piperacillin. The proportion of resistance was 85.71%, 85.02% and 84.79% respectively. Klebsiella pneumoniae was most resistant to Aztreonam, Piperacillin and Amoxycillin respectively accounting for 85.08%, 81.77% and 72.38%. Enterobacter aerogens was most resistant to Piperacillin, Cefuroxime and Aztreonem respectively accounting for 80.65%, 77.42% and 74.19%. The maximum sensitivity for these organisms was observed for Meropenem, Imipenem and Nitrofurantoin. Amikacin, Gentamicin, Nalidixic acid and Nitrofurantoin were the other antibiotics which were found to be sensitive against these organisms.

Table 1: Prevalence of culture positive UTI among diabetic patients

S NO.	AGE GROUP	NO. OF SAMPLES	CULTURE POSITIVE SAMPLES	PERCENTAGE
1	21 – 30 Years	29	7	24.13
2	31 – 40 Years	78	33	42.30
3	41 – 50 Years	353	148	41.92
4	51 – 60 Years	422	216	51.18
5	61 – 70 Years	381	169	44.35
6	71 – 80 Years	275	122	44.36
7	81 – 90 Years	78	33	42.30
8	91 – 100 Years	18	5	27.77
	TOTAL	1634	733	44.86

Table 2: Frequency of urinary isolates among culture positive cases in patients with diabetes

Isolates	No. of Isolates	Percentage
E.Coli	434	59.21
K.pneumoniae	181	24.69
E.aerogens	31	4.23
P.aerogenosa	26	3.55
S.aureus	14	1.91
Proteus spp	10	1.36
Enterococci spp	9	1.23
Acinetobacter spp	8	1.09
Candida	6	0.82
Citrobacter spp	5	0.68
Providencia spp	4	0.55
Non Lactose fermenting GNB	4	0.55
M.morgagni	1	0.14
Total	733	100

Table 3: Resistance pattern of isolates among culture positive samples

Antibiotic	E.coli (%)	K.pne (%)	E.aer (%)	P.aeu (%)	Staph (%)	Proteus (%)	Entero cocci (%)	Acinet (%)	Citro (%)	Provid (%)	NLF GNB (%)	M.mor (%)
AK	20.28	25.97	29.03	32.73	0.00	10.00	31.25	25.64	0.00	0.00	0.00	0.00
GEN	17.97	24.31	41.94	38.46	0.00	20.83	0.00	38.46	0.00	0.00	0.00	0.00
HGN	----	----	-----	-----	-----	------	22.22	------	-----	------	----	----
IPM	5.76	8.84	19.35	18.18	0.00	20.83	0.00	12.82	0.00	0.00	0.00	0.00
MRP	5.08	5.36	12.82	11.54	0.00	0.00	0.00	25.64	0.00	0.00	0.00	0.00
CZ	44.24	61.88	61.29	57.69	50.00	40.00	62.50	62.50	66.67	0.00	50.00	0.00
CXM	40.09	58.56	77.42	69.23	50.00	66.67	46.88	87.50	41.67	50.00	0.00	0.00
CAZ	61.06	72.93	70.97	73.08	50.00	60.00	31.25	76.92	50.00	83.33	40.00	100.00
CPM	64.98	71.27	64.52	69.23	50.00	50.00	62.50	51.28	41.67	0.00	0.00	0.00
AT	85.02	85.08	74.19	96.15	0.00	70.00	0.00	92.31	66.67	0.00	0.00	100.00
NIT	7.42	8.93	11.54	12.73	0.00	41.67	15.63	7.69	0.00	83.33	75.00	0.00
AMX	85.71	72.38	67.74	69.23	50.00	0.00	15.63	75.00	83.33	0.00	0.00	100.00
AMC	76.04	50.60	69.23	46.15	50.00	41.67	31.25	64.10	66.67	50.00	0.00	100.00
PI	84.79	81.77	80.65	80.77	50.00	50.00	0.00	76.92	33.33	83.33	0.00	100.00
CIP	62.21	46.41	45.16	65.38	50.00	41.67	31.25	37.50	41.67	83.33	0.00	0.00
NX	30.18	32.04	35.48	50.00	50.00	62.50	46.88	38.46	41.67	0.00	0.00	0.00
OF	45.21	30.39	58.06	57.69	50.00	50.00	31.25	50.00	41.67	50.00	0.00	100.00
NA	43.98	24.86	35.48	46.15	50.00	50.00	46.88	76.92	66.67	83.33	0.00	100.00
COT	40.32	54.14	61.29	42.31	50.00	41.67	31.25	64.10	66.67	50.00	0.00	100.00
VA	0.00	0.00	0.00	0.00	50.00	0.00	33.33	0.00	0.00	0.00	0.00	0.00

DISCUSSION

The current study was carried out to assess the proportion of urine samples of diabetics with positive culture and also to study the resistance pattern of antibiotics among the culture positive urine samples in a rural teaching hospital of Dakshina Kannada district of Karnataka. The proportion of UTI in patients with diabetes was found to be 44.86%.

The proportion of UTI in diabetes is found to highly variable. It was found to be 52.76% in a cross sectional study conducted in Karachi, Pakistan[17,] 36% in a study done at Kota, India[18,] 34.5% in a study done by Acharya D et al[19] at Nepal, 40% in a study

done by Praveen Kumar et al[20] at Tirupathi, India . Studies done by Hiwot Ketema et al[21] and Worku et al[22] showed much lower prevalence accounting for 14.90% and 10.90% respectively. This variation may be due to certain factors like differences in selection criteria of the study population, geographical variation, personal hygiene practices, health education and differences in screening tests used.

Most of the culture positive patients were in the age group of 51 – 60 years. This finding is similar to that seen in a study conducted at Pakistan[17]. There are studies which have shown a higher prevalence in lower age groups (31 -40 Years) like the

one done in Nepal[23]. This difference may be due to environmental and cultural differences. Like many other studies, the present study also showed a higher prevalence (58%) among females. The probable reason could be the anatomy of the genital tract in females and also poor hygienic conditions.

The present study showed that E Coli was the most common isolate (59.21%) among the uropathogens that were isolated followed by Klebsiella pneumonia (24.9%) and E aerogens (4.23%). Similar findings were reported by Chand AE[18] , BV Ramana et al[24] and Dhandapany et al[25]. The highest prevalence of E Coli might be due to its high affinity to adhere in the uroepithelial cells compared with other organisms, due to the presence of different virulence factors[18].

E.Coli was most resistant to Amoxycillin, Aztreonam and Piperacillin. The maximum sensitivity was observed for Meropenem,Imipenem and Nitrofurantoin. Amikacin, Gentamicin, Nalidixic acid and Nitrofurantoin were the other antibiotics which were found to be sensitive. Similar sensitivity pattern of E Coli was observed by Dorin et al[26], Vishal et al[27] and Dhandapany et al[25].

CONCLUSION

The proportion of culture positive sample in diabetic patients was 44.86%. Ecoli was the most commonest isolated organism followed by Klebsiella pneumoniae and Enterobacter aerogens. The patient can be started on Nitrofurantoin, Gentamicin or Amikacin empirically depending on whether they are outpatients or inpatients, after sending the sample for culture and sensitivity.

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