

A COMPARATIVE STUDY OF PROFILE OF INFECTIONS IN DIABETIC AND NON-DIABETIC PATIENTS

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ABSTRACT

Background: Diabetes mellitus is a chronic disorder and its association with an increased propensity of infection has in general, been well recognized. Clinical data on the association of diabetes mellitus with common infections are virtually lacking, not conclusive and often biased.

Aims & Objective: The present study was done to determine profile of various infections with their etiological agents and antibiotic sensitivity pattern among diabetic and non-diabetic patients.

Materials and Methods: A Cross-sectional descriptive study was conducted at a tertiary care hospital in India. The study included 100 diabetic and 100 non-diabetic patients with suspected infections and samples were processed for culture and antibiotic sensitivity testing. The analysis was done using the software Statistical Package for Social Scientists (SPSS) 15.0.

Results: Infections encountered in diabetics were urinary tract infection (UTI) (32%), skin and soft tissue infection (12%), lower respiratory tract infection (LRTI) (8%), septicemia (3%) and ascites (1%) whereas prevalence of various infections in non-diabetic patients were UTI (13%), skin and soft tissue infection (19%), LRTI (10%), septicemia (2%), acute appendicitis (1%) and enteric fever (1%). Among various infections, prevalence of urinary tract infection was significantly higher in diabetics (32%) than non-diabetics (13%) (P value = 0.001). Resistance to fluoroquinolones among urinary isolates of *E.coli* was significantly higher (89.5%) in diabetic patients compared to (50%) in non-diabetic patients (P value = 0.02).

Conclusion: Prevalence of UTI was significantly higher in diabetics than non-diabetics where *E.coli* was the predominant pathogen in both the group of patients. Fluoroquinolones resistance was more common in diabetic than non - diabetics. We would like to recommend restriction of empirical use of fluoroquinolones in diabetic patients. Carbapenem, Amikacin, Piperacillin-tazobactam and Nitrofurantoin still has acceptable sensitivity against uropathogenic *E. coli* in both the group of patients and can still be used in treatment failure.

Key Words: Infections; Diabetes Mellitus; Urinary Tract Infection

Introduction

Worldwide the prevalence of diabetes mellitus is increasing day by day. The association of diabetes with an increased propensity of infection has in general, been well recognized. The reason for this increase include incompletely defined abnormalities in cell mediated immunity and phagocyte function associated with hyperglycemia, as well as diminished vascularization secondary to long standing diabetes. Hyperglycemia facilitates the colonization and growth of variety of organism including fungal infection. Many common infections like UTI are more frequent and severe in the diabetic population, whereas several rare infections like rhinocerebral mucormycosis, emphysematous infections of the gall bladder and urinary tract and "malignant" or invasive otitis externa are seen almost exclusively in the diabetic population.^[1] However, gram-negative organisms, *S. aureus* and *M. tuberculosis* are also more frequent pathogens. Diabetic patients also have a greater

risk of foot infections and postoperative wound infections.^[1] The purpose of this study was to determine profile of various infections with their etiological agents and antibiotic sensitivity pattern among diabetic and non-diabetic patients.

Materials and Methods

The study was conducted prospectively between June 2010 to January 2011 in the Department of Microbiology, Shree Krishna Hospital, Karamsad, a tertiary care hospital. Study was duly approved by institutional Human Resource Ethics Committee. The study included 100 diabetic and 100 non-diabetic patients with suspected infections who were admitted or visited the outpatient departments in the hospital. Various clinical specimens from both the group of patients were sent to Microbiology laboratory and processed for culture and antibiotic sensitivity testing. The antibiotic susceptibility testing was done by Kirby Bauer disc diffusion method.

Results

In diabetic patients out of 100 specimens, 54 specimens showed bacterial growth from which 59 organisms were isolated while 46 specimens did not show any growth. In non-diabetic patients out of 100 specimens, 48 specimens showed bacterial growth from which 51 organisms were isolated while 52 specimens did not show any growth. In the present study among diabetic patients, 57% were male and 43% were female and among non-diabetic patients, 62% were male and 38% were female. The ratio of males to females was 1.3:1 in diabetic patients and 1.6:1 in non-diabetic patients. Male preponderance was seen in both the group of patients. Out of the 100 diabetic patients studied, most of the male (n=19) and female patients (n=13) belonged to sixth decade of life (33.3%, 30.2%) while among 100 non-diabetic patients most of the male (n=11) and female (n=10) patients belonged to third decade of life (25.8%) and second decade of life (26.3%) respectively. Among various infections in both groups of patients, prevalence of UTI was significantly higher in diabetics (32%) than non-diabetics (13%) (p value = 0.001). In rest of the infections there was no significant difference between two groups. Predominant pathogen causing UTI was *E.coli* and rate of isolation in diabetic and non-diabetic patient was 57.6% and 76.9% respectively (p value=0.22). When comparison was made with respect to antibiogram of *E.coli*, it was found that resistance to fluoroquinolones was significantly higher among diabetic patients than non-diabetics (P value = 0.02). Ertapenem (0%, 20%), Piperacillin-tazobactam (21.1%, 30%), Amikacin (31.6%, 30%), Nitrofurantoin (31.6%, 30%) and Meropenem (47.4%, 40%) had least resistance among urinary isolates of *E.coli* in diabetic and non-diabetic patients respectively. Among diabetic patients other organism causing UTI were *K.pneumoniae* (9.1%), *P.aeruginosa*, *A.baumannii*, *Enterococci*, *C.nonalbicans* (6.1% each) and *C.albicans*, *E.cloacae* and *P.rettgeri* (3% each). Among non-diabetics other organism causing UTI were *K.pneumoniae* (15.4%) and *P.mirabilis* (7.7%).

Table-1: Distribution of various Infections among patients under study (Diabetic - 100; Non-diabetic - 100)

Clinical Condition	Diabetic (%)	Non-diabetic (%)	P value
Urinary tract infection	32	13	0.001
Lower respiratory tract infection	8	10	0.62
Skin and soft tissue infection	12	19	0.17
Septicemia	3	2	0.65
Acute appendicitis	0	1	0.32
Enteric fever	0	1	0.32
Ascites	1	0	0.32
Total	56	46	0.16

Table-2: UTI isolates among diabetics (n=32) and non-diabetics (n=13)

Isolate	Diabetic, N (%)	Non-diabetic, N (%)
<i>E. coli</i>	19 (57.6)	10 (76.9)
<i>K. pneumoniae</i>	3 (9.1)	2 (15.4)
<i>P.aeruginosa</i>	2 (6.1)	0
<i>A.baumannii</i>	2 (6.1)	0
<i>Enterococci</i>	2 (6.1)	0
<i>P. mirabilis</i>	0	1 (7.7)
<i>C.albicans</i>	1 (3)	0
<i>C.nonalbicans</i>	2 (6.1)	0
<i>E.cloacae</i>	1 (3)	0
<i>P.rettgeri</i>	1 (3)	0
Total	33 (100)	13 (100)

Table-3: *E. coli* antibiotic resistance pattern among Diabetics (n=19) and Non-diabetics (n=10) in UTI

Antibiotics	Diabetic, N (%)	Non-diabetic, N (%)
Amikacin	6 (31.6)	3 (30)
Ampicillin	16 (84.2)	8 (80)
Ampisulbactam	16 (84.2)	7 (70)
Aztreonam	15 (78.9)	6 (60)
Amox-clav	16 (84.2)	7 (70)
Imipenem	0	0
Meropenem	9 (47.4)	4 (40)
Ertapenem	0	2 (20)
Gentamycin	13 (68.4)	5 (50)
Ciprofloxacin	17 (89.5)	5 (50)
Levofloxacin	17 (89.5)	5 (50)
Piperacillin	16 (84.2)	7 (70)
Piptaz	4 (21.1)	3 (30)
Ticarcillin-Clavulanate	13 (68.4)	4 (40)
Cotrimoxazole	10 (52.6)	7 (70)
Tetracycline	14 (73.7)	6 (60)
Cefipime	15 (78.9)	6 (60)
Cefotaxime	15 (78.9)	6 (60)
Ceftazidime	15 (78.9)	6 (60)
Cefuroxime	15 (78.9)	6 (60)
Ceftriaxone	15 (78.9)	6 (60)
Nitrofurantoin	6 (31.6)	3 (30)
Norfloxacin	17 (89.5)	5 (50)
Ofloxacin	17 (89.5)	5 (50)

Discussion

People with diabetes suffer from simple and complicated infections, although the association between diabetes mellitus and increased susceptibility to infection has been questioned.^[2,3] Among various infections, urinary tract infection is of concern in diabetic patients because of their higher incidence and tendency to cause severe complications, such as emphysematous pyelonephritis and abscess formation.^[4,5] In patients with UTI, diabetes has been found to be a risk factor for multi-drug resistant uropathogens.^[6] In present study infections encountered in diabetics were UTI (32%), skin and soft tissue infection (12%), LRTI (8%) and septicemia (3%) compared to the study conducted by Abdul Hamid *et al* (1994) in which common infections encountered in diabetic patients were UTI (28.6%), skin and soft tissue infections (14.3%), tuberculosis (20.1%), bacterial pneumonia (10.4%).^[7] In present study, prevalence of urinary tract

infection was significantly higher in diabetics (32%) than non-diabetics (13%) with p value of 0.001. Geerlings and colleagues found that diabetics were more vulnerable for urinary tract infections and *E. coli* adheres better to uroepithelial cells in these patients.^[5,8,9] In present study *E. coli* was the predominant pathogen in diabetic patients which was comparable with previous studies.^[10-12] Present study also showed *E. coli* as the most common organism causing UTI in both diabetic and non-diabetic patients that correlates with a previous study conducted by Mohammed KH *et al* (2007).^[13] In present study, all the isolates were 100% sensitive to Imipenem in both the group of patients that correlates with the previous study conducted by Mohammed KH *et al* (2007) where Imipenem was found to be highly sensitive antibiotic (94%) in UTI.^[13] In present study, Nitrofurantoin was the more sensitive drug (68%) than cotrimoxazole (47%) and tetracycline (26%) in diabetic patients that also correlates with the previous study carried out by Mohammed KH *et al* (2007).^[13] In a previous study conducted by Shill *et al* (2010)^[14], *E. coli* exhibited 94% resistance to amoxicillin and 79% resistance to ciprofloxacin in diabetic patients that was comparable with present study where amoxicillin resistance was 84.2% and ciprofloxacin resistance was 89.5%. Resistance to cephalosporin was also above 60% in previous study and was comparable with present study that showed 78.9% resistance to cephalosporin.

Quinolones are used widely for the treatment of *E. coli* causing UTIs and may also be used to treat other infections caused by other members of the Enterobacteriaceae family.^[15,16] There has been a significant increase in quinolone-resistant uropathogenic *E. coli* strains isolated from patients with UTI in several countries and therapeutic failures have been reported.^[17-20]

The overall resistance to fluoroquinolones among urinary isolates in present study was 83.3% in diabetic patients and 61.5% in non-diabetic patients. This was comparable to previous study carried out by Horcajada JP, *et al* that demonstrated a resistance rate of 17% in diabetic patients and 3.7% in non-diabetic patients.^[21] The probable reason for such a high resistance to fluoroquinolones among urinary isolates could be a higher prescription rate of fluoroquinolones in suspected UTI as prior receipt of a quinolone has also been shown to be an independent risk factor for quinolone resistance.^[22,23] Moreover insufficient dose, duration, poor patient compliance and uncontrolled abuse of the drug could be responsible for this higher degree of

resistance. In present study, most interesting result found was, resistance to fluoroquinolones among urinary isolates of *E. coli* that was significantly higher (89.5%) in diabetic patients compared to (50%) non-diabetic patients (P value = 0.02). This was comparable with the previous study conducted by Krenke DS *et al* (2007), who demonstrated fluoroquinolones resistance rate in 40% of diabetic patients and in 14% of non-diabetic patients with UTI caused by *E. coli* (p=0.0001).^[24]

Conclusion

The significance of the study lies in the determination of common pathogens in diabetic and non-diabetic patients with various infections and the resistance pattern of antibiotics so that physicians get the proper information for rationalizing the use of antibiotics. Urinary tract infection was the most common infection followed by skin and soft tissue infection in diabetics. *E. coli* was the predominant pathogen causing urinary tract infection in both the group of patients with significantly higher resistance to fluoroquinolones among diabetic patients (P value = 0.02). Thus this study should provoke policy makers to formulate an antibiotic policy for rational use of antibiotics in UTI amongst diabetic patients.

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