Research Article

Clinical profile and Spectrum of Infections in Type 2 Diabetes Mellitus Patients : A Retrospective Study from Rural Tertiary Care Hospital of South Karnataka, India

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Abstract: Diabetes mellitus predisposes to infection. Clinical data on the infections in diabetes mellitus patients from rural areas of India are lacking. We intended to determine the clinical profile and pattern of infections in patients with type 2 diabetes mellitus from rural area. In this retrospective study case records of 842 patients with diabetes mellitus admitted in last four years were reviewed. Out of these 842 patients 254 had infections. There was effect of age, sex, duration of diabetes, type of treatment on infections in diabetic patients. Maximum number of patients belonged to lower socioeconomic status. The commonest comorbidity was hypertension (62.99%).Common infections encountered were upper respiratory tract infection (29.13%), urinary tract infection (26.77%), Lower respiratory tract infection (15.74%), Tuberculosis (11.81%), Skin and soft tissue infections (11.02%) and Foot infections (8.66%). *Eschericia coli* and *Candida albicans* were the common causative organisms of urinary tract infection. *Staphylococcus aureus* and *Mycobacterium tuberculosis* were the most common microorganisms causing respiratory tract infections. Physicians should be aware of risk factors and type of infections present in patients with diabetes in order to provide proper care. Prospective studies on the management of infections in patients with diabetes mellitus are needed.
Keywords: Diabetes mellitus, Foot infections, Infections, Tuberculosis, Urinary tract infections.

INTRODUCTION

Diabetes mellitus (DM) is a common non communicable disease in India. The prevalence of type 2 DM is 11% in urban areas in comparison to 3-9% in rural areas [1]. Infections play a significant role in morbidity and mortality of diabetic patients [2]. Studies revealed that defect in the function of neutrophils, lymphocytes, and monocytes were the reason for increased infections in diabetics [3, 4]. Other reasons are low levels of leucotriene B_4, thromboxane B_2, and prostaglandin E [5, 6]. Some studies showed decreased lymphocyte function in diabetics, and decreased levels of phagocytosis in monocyte [7, 8]. There is also evidence that improving glycemic status in diabetics, improves cellular immunity [9]. Although DM is very common in south India, studies on type of infections in patients with DM from rural south Indian areas are lacking. Therefore, the aim of this study was to explore this problem in our own setup.

MATERIAL AND METHODS

Following approval from institutional ethical committee, this retrospective study was done. Hospital records of all diabetic patients, who were admitted in the department of medicine, Adichunchanagiri institute of medical sciences, Balagangadharanatha Nagar , Karnataka from January 2010 to January 2014 were reviewed. All available data for each patient was studied in detail to determine the nature and clinical profile of infection in these patients.

Data Analysis

Data obtained were analyzed by using the appropriate statistical tool.

RESULTS

During the time period of January 2010 through January 2014, there were total 842 type 2 diabetes mellitus patients admitted in the medicine department. Out of these 842 patients 254(30.1%) people suffered from various infections. These 254 type 2 diabetes mellitus patients were included in the study.

Age distribution

In our study maximum number of infection (47.24%) occurred in fifth decade (Table 1).

Table 1: Age distribution

Age groups in years	Number of diabetics with infection(n=254)	Percentage
30-40	38	14.9%
41-50	62	24.4%
51-60	120	47.24%
61-70	26	10.23%
>70	8	3.1%

Sex distribution

In our study 164 patients were males and 90 were females (Table 2).

Table 2: Sex distribution

Total diabetic patients with infections	254	Percentage
Males	164	64.56%
Females	90	35.43%

Socioeconomic status

It was classified according to kuppuswamy's classification [10]. The maximum number of cases was seen in upper- lower socioeconomic status (SES) (55.11%) followed by lower (16.53%) (Table3).

Table 3: Socioeconomic status

Socioeconomic status	Number of cases(n=254)	Percentage
Upper	14	5.51%
Upper middle	34	13.38%
Lower middle	24	9.44%
Upper lower	140	55.11%
Lower	42	16.53%

Duration of diabetes

In our study infections were more (40.15%) in patients with 11-15years duration of diabetes, followed by patients with diabetes more than 20years (20.47%).Infections were less (2.36%) in patients with diabetes less than one year (Table 4).

Table 4: Duration of diabetes

Duration of diabetes in years	Number of cases(n=254)	Percentage
< 1	6	2.36%
1-5	14	5.51%
6-10	32	12.59%
11-15	102	40.15%
16-20	48	18.89%
>20	52	20.47%

Type of treatment

In this study infections were more in patients on oral antidiabetic drugs (59%), in comparison to patients on insulin therapy (16.53%) (Table 5).

Table 5: Type of treatment

Type of treatment	Number of cases(n=254)	Percentage
Diabetes controlled with diet only	4	1.57%
Oral antidiabetic drugs	150	59%
Insulin treatment	42	16.53%
Oral antidiabetic drugs and insulin treatment	58	22.83%

Co morbidities

Hypertension (62.99%) was the most frequent comorbidity in this study, followed by cardiovascular disease (59.84%) (Table 6).

Table 6: Co morbidities

Comorbidity	Number of cases	Percentage (n=254)
Hypertension	160	62.99%
Cardiovascular disease	152	59.84%
Pulmonary disease	68	26.77%
Psychiatric disease	4	1.57%
Thyroid disease	26	10.23%
Urinary incontinence	32	12.59%
Neurologic disease	20	7.87%
Renal disease	24	9.44%
Hepatic disease	18	7.08%
Malignancy	8	3.14%

Type of infection

Common infections encountered in this study were upper respiratory tract infections (29.13%), urinary tract infection (26.17%), lower respiratory tract infection (15.74%), and tuberculosis (11.81%).The miscellaneous infections recorded were balanoposthitis, amoebic liver abscess, vaginitis, infective endocarditis, periodontitis (Table7).

Table 7: Type of infection

Type of infection	Number of cases	Percentage (n=254)
Upper respiratory tract infections	74	29.13%
Urinary tract infection	68	26.77%
Lower respiratory tract infection	40	15.74%
Tuberculosis	30	11.81%
Skin and soft tissue infections	28	11.02%
Foot infections	22	8.66%
Pyrexia of unknown origin	20	7.87%
Acute gastroenteritis	14	5.5%
Cholecystitis	10	3.93%
Miscellaneous	8	3.14%

Upper respiratory tract infection

Commonest upper respiratory tract infection was acute rhinolaryngitis(32.43%), followed by acute sinusitis(21.62%). Chronic otitis media was present (5.40%) patients (Table 7A).

Table 7 A: Type of upper respiratory tract infection

Type of upper respiratory tract infection	Number of cases (n=74)
Acute rhinolaryngitis	24
Acute sinusitis	16
Acute tonsillitis	14
Acute otitis media	10
Chronic sinusitis	6
Chronic otitis media	4

Lower respiratory tract infection

Pneumonia was present in 11 (27.5%) patients. Lung abscess was the cause of lower respiratory tract infection in two (5%) patients (Table 7 B).

Table 7 B: Type of lower respiratory tract infection

Type of lower respiratory tract infection	Number of cases(n=40)
Pneumonia	11
Acute bronchitis	9
Exacerbation of COPD or asthma	8
Pleural effusion	6
Pleuritis	4
Lung abscess	2

Urinary tract infection

Among patients with urinary tract infection majority were asymptomatic (39.7%). Cystitis was present in 16 (23.52%) patients. Emphysematous pyelonephritis was present in two patients (Table 7 C).

Table 7 C: Type of urinary tract infection

Type of urinary tract infection	Number of cases(n=68)
Asymptomatic	27
Cystitis	16
Prostatitis	10
Acute pyelonephritis	6
Nonspecific urethritis	4
Chronic pyelonephritis	3
Emphysematous pyelonephritis	2

Skin infection

Among skin infection fungal infections were present in 18 (64.28%) patients (Table 7 D).

Table 7 D: Type of skin infection

Type of skin infection	Number of cases(n=28)
Tinea pedis	9
Tinea corporis	7
Furuncle/abscess	6
Cellulitis	4
Tinea unguium	2

Tuberculosis

Among tuberculosis, pulmonary tuberculosis was present in 12 (40%) patients. Tubercular meningitis was present in four (13.33%) patients (Table 7 E).

Table 7 E: Type of tuberculosis

Type of tuberculosis	Number of cases(n=30)
Pulmonary tuberculosis	12
Tubercular lymphadenitis	8
Abdominal tuberculosis	6
Tubercular meningitis	4

Organisms causing infection

Eschericia coli(29.41%) and *Candida albicans* (23.52%)were the common causative organisms of urinary tract infection(Table 8 A). *Staphylococcus aureus* (20%) and *Mycobacterium tuberculosis* (17.14%) were the most common microorganisms causing respiratory tract infections (Table 8 B).

Table 8 A: Isolation pattern of microorganisms in urine samples

Organisms	Number of cases	Percentage (n=68)
Eschericia coli	20	29.41%
Candida albicans	16	23.52%
Klebsiella species	10	14.70%
Proteus species	6	8.82%
Staphylococcus aureus	4	5.88%
Pseudomonas species	3	4.41%
No growth	9	13.23%

Table 8 B: Isolation pattern of microorganisms from sputum samples

Organisms	Number of cases	Percentage (n=70)
Staphylococcus aureus	14	20%
Mycobacterium tuberculosis	12	17.14%
Klebsiella pneumoniae	8	11.42%
Streptococcus pneumoniae	8	11.42%
No growth	28	40%

DISCUSSION

Patients with DM have been associated with increased rates of infections compared with patients without DM. [11-13]. Early diagnosis and aggressive treatment of infections in this vulnerable population is a clinical priority. Several parts of immune system are altered in diabetic patients. Multiple functions of leukocyte like adherence, chemotaxis, and phagocytosis are affected [3, 4, 14]. Rate of infection in diabetics is

low in developed countries compared to developing countries like India [15].

Out of 842 DM patients 254 (30.1%) had evidence of infections. In our study maximum number of cases was seen in fifth decade. This increase in incidence of infection with age is observed in Gillani *et al.* study [16]. In this study maximum number of patients (71.44%) were from lower socioeconomic status. Some studies showed that low economic status was associated with worse diabetic outcomes, due to low access to health care. Limited access to health care elevates the risk of a decline in health [17, 18].

In this study 164(64.56%) patients were males. Gender differences between men and women in the development of foot infections have been observed in other studies [19, 20]. In a study significant statistical association was found between longer duration of diabetes and increased rate of infection in diabetics [21]. Prevalence of urinary tract infection in diabetics increased 1.9-fold with each 10-year increase in diabetes duration [22]. We observed similar finding in our study. Intensive insulin therapy and tight glycaemic control were associated with a lower risk of infection [23]. In our study rate of infection was more in patients (59%) without insulin therapy. Hypertension and cardiovascular diseases were the most prevalent co morbidities in our study. However, from our data it cannot be concluded that these conditions predispose to infection, since a control population was not included.

Among the diabetics who had infection, upper respiratory tract infection was found in highest number of patients (29.13%).Infections caused by certain microorganisms (*staphylococcus aureus*, gram negative organisms) occur with increased frequency in diabetics with respiratory tract infections [24]. Pneumococcal pneumonia is associated with increased mortality in DM patients [25]. *Staphylococcus aureus* and *Mycobacterium tuberculosis* were the most common microorganisms causing respiratory tract infections in our patients.

In our study 68(26.77%) patients had urinary tract infection, majority (39.7%) of them were asymptomatic. *Eschericia coli* and *Candida albicans* were the common causative organisms.

Several studies have showed a higher incidence of bacteriuria in DM patients than non diabetics [26-28]. DM is a common risk factor for urinary tract infection caused by fungi, particularly candida species [29]. DM patients are more prone for severe infections of the upper urinary tract [30]. Complications also occur more frequently in DM patients than in non DM patients with urinary tract infections [31]. In one study *Eschericia coli* was the commonest cause of urinary tract infection [32]. Our study showed similar finding. Emphysematous

pyelonephritis cases occur more frequently in diabetic patients [33].

Two of our patients suffered from Emphysematous pyelonephritis.

In this study 28(11.02%) DM patients had skin infections. Among the diabetics who had skin lesion fungal infection was more common. Rest of skin infections were due to bacterial invasions. Same results are found by Foss NT, *et al.* [34].

In this study foot infections were found in 22 (8.66%) patients. Foot infections are most common soft tissue infection in diabetics [35]. Several factors play role in causing these infections. First, presence of peripheral neuropathy in patients with long standing DM; these patients are prone for undetected injury and foot ulcers. Second, fungal infections of nail and skin facilitate the entry of invasive pathogens [36]. Thirdly, inadequate blood supply due to peripheral vascular disease resulting in poor wound healing. Finally, there is poor neutrophil function due to hyperglycemia [37].

In our study 30 (11.81%) patients had tuberculosis.Several studies showed that tuberculosis was more common in DM patients. [38- 41]Multiple factors like hyperglycaemia, glycosylation, long term oxidative stress, cell medicated immune dysfunctions and genetic determinants contribute to the susceptibility of severe tuberculosis in diabetes [38, 40].
Other infections were pyrexia of unknown origin, acute gastroenteritis, cholecystitis, balanoposthitis, amoebic liver abscess, vaginitis, infective endocarditis, periodontitis.
The main limitation of our study is its retrospective design. Details about obesity, smoking, alcohol consumption, antibiotic sensitivity, neuropathy, nephropathy, and retinopathy are not included because of missing clinical documentation.

CONCLUSION
Our study showed that patient with type 2DM are at increased risk for common infections. Poor glycemic control increases the susceptibility of infections. Therefore the challenges will be to provide health education and promotion to control glycemia, long term care, and maintenance of normal health to prevent complications arising from these infections. More prospective case control studies on the management of infections in DM patients are needed.

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