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Original Research Article

Prevalence of Cutaneous Infections among Diabetic Patients Attending a Tertiary Care Centre

Dr. Padmaja Saikia[1], Dr. Mehak Singh[2]
[1]Associate Professor, Department Of Dermatology, Gauhati Medical College, Assam.
[2]Postgraduate Student, Department Of Dermatology, Gauhati Medical College, Assam.

***Corresponding author**
Dr. Padmaja Saikia
Email: padmajasaikia4@gmail.com

Abstract: Diabetes mellitus (DM) is the most common of the endocrine disorders. Mucocutaneous manifestations of diabetes mellitus are many and vary from trivial to life-threatening. Sometimes, mucocutaneous disorders may herald the onset of diabetes. The objective is to study the pattern of cutanous infections in diabetics and role of it in diagnosing diabetes mellitus and its complications. It was a longitudinal observational study of patients having diabetes with skin complaints attending dermatology outdoor department in a tertiary care hospital. Total 780 patients were included in the study. Detailed history, clinical examination, and relevant investigations were done to diagnose the different pattern of cutaneous infections. Results were drawn after comparing study results with previous similar study and available literature.
Keywords: cutaneous infections, diabetes mellitus.

INTRODUCTION

Diabetes mellitus (DM) has been associated with increased rates of infections [1-3] which may be partially explained by a decreased T cell–mediated immune response [2, 3]. The International Diabetes Federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India, and this is further set to rise to 69.9 million by the year 2025 Impaired neutrophil function associated with diabetes has also been documented [4], although this is currently being debated [5]. Evidence from clinical studies for a causal relation between diabetes and common infections is, however, limited and not consistent [1, 6].

According to Frank Parker, classification of mucocutanous infections of diabetes is as follows-

Bacterial

- Pyodermas
- Malignant otitis externa
- Necrotizing fasciitis
- Erythrasma

Mycotic

- Superficial-dermatophytosis or candidiasis
- Deep-mucormycosis

Only a few epidemiologic studies have been done on the prevalence of skin infections in patients with diabetes mellitus. There are no large scales epidemiologic data related to skin disorders in diabetics reported from this part of country and even from whole North East part of India; hence this study is an attempt to fill this lacunae. Disease control, early-stage treatment (e.g. skin hydration, orthotic devices) and awareness can reduce morbidity of DM patients. Thus, better understanding of the burden of skin infections in DM patients may raise awareness on prevention and management. This study was designed to know the pattern of mucocutaneous manifestations in diabetics and role of it in diagnosing diabetes mellitus and its complications.

Aims and Objectives

The aims and objective of the present study is to know the prevalence of cutaneous infections among diabetic patients attending outpatients department of a tertiary care centre.

MATERIALS AND METHODS

The study consists of 780 cases of type 1 and type 2 diabetes mellitus with cutaneous manifestations attending Dermatology and Venereology opd of Gauhati Medical College and Hospital for a period of

12 months from June 2015 to July 2016, with prior ethical committee approval.

Inclusion Criteria

All confirmed cases (old and new) of diabetes mellitus with cutaneous manifestations irrespective of age, sex, duration of illness and associated diseases.

Exclusion Criteria

- patients not willing to participate in the study
- patients with gestational diabetes mellitus

Study Procedure

All patients underwent detailed history taking, clinical examination, systemic examinations and laboratory tests. Findings were noted on a standard proforma. Physical examination included general, systemic and cutaneous examination.

Investigations-

- TLC, DLC, ESR, HB%
- HbA1c levels
- Routine urine examination
- Fasting and Postprandial blood sugar
- Routine stool examination
- Blood urea, serum creatinine, lipid profile

SPECIAL LABORATORY TESTS-

- Potasium hydroxide preparation (KOH)-to demonstrate fungal infections.
- Pus culture and sensitivity-in selected cases.
- Histopathological examination of skin lesions-in selected cases.

Statistical Analysis

The results and observations of the study were analysed according to chi square(x^2) test.

RESULTS AND OBSERVATIONS

Prevalence of Skin Disorders in the Study Group

Table-1: Prevalence of skin disorder in diabetics

Total no. of diabetic patients enrolled in the study at diabetic clinic	No. Of patients with skin manifestations	Percentage
925	780	84.324%

Table-1 shows that, out of 925 patients examined, 780(84.324%) were found to have skin disorders.

Sex Distribution

Table-2: Sex distribution

Sex	No. Of patients	Out of 780 cases (%)	Out of total 925 cases (%)
Male	462	59.2	49.94
Female	318	41.8	34.37
Total	780	100	100

Table-2 shows that out of 780 cases with skin disorders in diabetes mellitus, 462(59.2%) were male and 318(41.8%) were female.

Age Distribution

Table-3: Age distribution

Age in years	male	female	Total	Out of 780(%)	Out of 925(%)
1-20	42	23	65	8.33	7.02
20-40	21	16	37	4.74	4.74
41-60	157	176	333	42.69	36
61-80	144	70	214	27.43	27.43
>80	91	40	131	16.81	16.79
Total	462	318	780	100	100

Above table shows that in the present study, peak prevalence was seen in the age group of 41-60 years that is 42.60%.

Various Skin Infections in Diabetes Mellitus

Table-4: Various skin infections

	Out of 780 (type 1+type 2)	%	Out of 705 (Type 2)	%	Out of 75 patients (type 1)	%
Cutanous infections associated with diabetes mellitus	467	59.9	435	61.70	32	42.66
Bacterial	94	12.1	78	11.06	16	21.33
Fungal	351	45	338	47.94	13	17.33
Viral	15	1.92	12	1.70	3	4
Parasitic	6	0.76	6	0.85	0	0

Stastical Analysis

There is a highly significant difference between the prevalence of fungal versus bacterial infections when correlated with HbA1C i.e. fungal infections may serve as a marker for poorly controlled diabetes.

Table-5: Statistical analysis

RESULTS	
Difference	36.67%
95% CI	30.0195 to 42.9505
Chi squared	111.626
DF	1
Significance level	P<0.0001

Bacterial Infections (Types)

Table-6: Various bacterial infections

Types of infection	number	% out of 94
Furunclosis	44	46.80
Folliculitis	16	17.02
Impetigo	6	6.38
Carbuncle	4	4.25
Cellulitis	8	8.51
Abscess	4	4.25
Ecthyma	2	2.12
Sycosis barbae	6	6.38
erythrasma	4	4.25
Total	94	100

Above table shows that most common bacterial infection, was furunclosis consisting of 46.80% of cases.

Fig-1: Image showing FURUNCLOSIS

Fungal Infections (Types)

Table-7: Various fungal infections

Types of fungal infections	No. Of patients	Out of 351 cases(%)
Dermatophytosis	**200**	**56.98**
Tinea corporis	46	13.10
T.ungum	69	19.65
T.pedis	71	9.10
T.cruris	16	2.05
T.barbae	7	1.99
P.versicolor	**56**	**15.95**
Candidial infections	**86**	**11.02**
Vulvovaginitis	24	6.83
Balanitis	25	7.12
Intertrigo	28	3.58
Paronychia	6	1.70
Oral candidiasis	3	0.85
Total	351	100

From above table it can be observed that most common fungal infections were Dermatophytosis (56.98%), P.versicolor (15.95%) and candidial infections (11.02%).

Fig-2: Image showing onychomycosis

Fig-3: Image showing tinea corporis

Statistical Analysis

Comparision between the prevalence of Dermatophytosis vs candidiasis in diabetes, revealed a statistically significant difference between the two, indicating dermatophytosis as a major fungal pathogens in diabetic patients.

Table-7: Statistical analysis

RESULTS	
Difference	18.465
95% CI	14.8045-22.1036
Chi squared	96.825
DF	1
Significance level	P<0.0001

Viral Infections

Table-8: various viral infections

Type of infection	number	% out of 15
Herpes zoster	11	73.33
Verruca vulgaris	3	20
Extensive molluscum contagiosum	1	6.67
Total	15	100

Above table shows that most common viral infection was herpes zoster (73.33%).

Fig-4: Image showing scabies infection

DISCUSSION

In our study infections were the most common skin manifestations associated with diabetes mellitus. Out of cutaneous infections i.e.467(59.9%), fungal infections were most prevalent 351(45%), followed by bacterial infections 94(12.1%) and viral infections15(1.9%).The prevalence is high as compared to other studies but the pattern remains the same with fungal infections forming the major chunk. Fungal agents formed largest group of cutaneous lesions and it may be because most of our patients belonged to lower socioeconomic group residing in slum areas.

Our findings are similar to as reported by Swahney *et al*. [7] who reported overall prevalence of 14.63% skin infections in diabetes. White has observed 55% of juvenile onset diabetes. Greenwood also reported high prevalence of skin infections in his series of 500 patients [8].

Timishina *et al*. [9] in their study reported cutaneous infections to be the most common cutanous manifestations seen in 41.9% of the cases, whereas, cutaneous infections were observed in only 18.8% of the controls. The difference in prevalence of cutaneous infections was found to be statistically significant ($p<0.05$).

There is no convincing evidence that patients with well controlled diabetes are more prone to skin infection. Also it is doubtful that host resistance to infection is significantly decreased in diabetes whose disease is well controlled. In our studies we have noted that majority of skin infections were poorly controlled diabetes. Rayfield [15] found no significant difference in the distribution of infections by organ system in a one year follow up study of 241 diabetic patients. They however, found striking direct correlation between prevalence of infections and the mean level of plasma glucose. They found a significant decrease in intracellular bacterial activity of leucocytes against staphylococcus aureus. They concluded that their study result suggested good control of blood glucose is a desirable goal.

Bacterial Infections

In our series bacterial infections were present in 94(12.1%) out of 780 diabetic patients with skin manifestations. Out of total 94 cases, Furunclosis was the commonest bacterial infection in our series.

Greenwood [8] found carbuncles, furuncles, cellulitis and erysipelas in 2.4% of 500 diabetic patients. Williams [16], however, did not find carbuncles and furuncles to be more common in diabetics than nondiabetics. Shafi *et al*. [17], found bacterial infections in 16.4% of 140 diabetic patients. In their series furunclosis was present in 11.4%, carbuncle in 2.8% and cellulitis in 2.14%.Swahney *et al*. [7], found bacterial infections in 11.4% of patients which is similar to the findings in our study. The lower prevalence of bacterial infections in our study as compared to that of Shafi *et al*. [17] may reflect the lack of awareness about skin problems in this part of country.

Mahajan *et al.* [10] observed the prevalence of bacterial infections to be 11% in a cross sectional observational study of 100 diabetic patients, thereby forming the majority [10]. Out of the 100 patients, 22 had pyoderma and 1 case was of erythrasma. Among the pyodermas which were seen in 11 cases, folliculitis was seen in 7, and 1 case each had bullous impetigo, carbuncle, ecthyma and infected eczematoid dermatitis.

Foss *et al*. [11] reported an prevalence rate of 4.7% in a study of 403 patients frpm brazil;making bacterial infections the 4th most common dermatoses in contrast to their counterpart studies in india.

Fungal Infections

In our study, fungal infection was present in 351(45%) patients out of 780 Diabetic cases with cutaneous manifestations. Dermatophytes were the commonest fungal infections and were present in 200(25.64%) patients out of 780 patients. Candidiasis was present in 86(11.02%). Comparision between the prevalence of Dermatophyrtosis vs candidiasis in diabetic revealed statistically significant difference between the two, indicating dermatophytosis as major fungal pathogen in diabetic patients.

Shafi *et al*. [17], reported fungal infection in 4.28% patients out of 140 diabetic patients. Swahney *et al*. [7], found fungal infection in 2.4% of 123 diabetic patients. Greenwood [8] reported 40% prevalence of fungal infection in his series of 500 patients and most patients had dermatophytosis of interdigital spaces of

the feet. Behrman and Levin [18] found dermatophytosis to be most common skin disease in diabetics and found the prevalence in diabetes to be much more than nondiabetic.

Sawhney *et al*. [7] found dermatophyte infection of skin in only 2.4% of one hundred and twenty three patients. Although fungal infections were observed as the majority, there was a variation in the pattern of fungal agents delineated. Mahajan *et al*. [10] found a higher prevalence of dermatophytoses in their study,while Bhat *et al*.[12] found a higher prevalence of candidal infections [12]. In the study by Ragunath *et al*. (2011), among skin lesions identified, noted 82.6% dermatophytoses and 42.6% fungal onychomycoses [13]. Among the fungal infections, Tinea cruris was most common (37.68%), followed by Tinea corporis(18.84%).Pityriasis versicolor(15.94%), candidal intertrigo (13.04%) Ttinea unguium (11.59%), candidal balanoposthitis (8.69%), candidal vulvovaginitis (4.34%), Tinea pedis (1.4%) and Tinea barbae (1.4%).Our findings are in accordance with the aforementioned studies.

Viral Infections

15 patients out of 780 patients studied had viral infections of which 11(1.4%) had herpes zoster and 3 patients had (0.38%) verruca vulgaris, 1(0.13%) patient had extensive molluscum contagiosum.

In a study conducted by Mahajan *et al*. [10], two cases of herpes zoster were reported. Similar frequencies were observed by Bhat *et al*. [12], Foss *et al*. [11], Timshina *et al*. [9] who reported the prevalence to be 2.2%, 4.9% and 0.4%, respectively.

Parasitic Infections

6 patients (0.76%) of the 780 patients studied had scabies with 1 case of Norwegian scabies. The prevalence was found to be similar to the findings of other studies as shown below:

parameters	Present study	Nigam *et al*. (2003) [14]	Mahajan *et al*. (2003)[10]	Foss *et al*. (2005) [11]	Bhat *et al*. (2006) [12]	Raghunath *et al*. (2011) [13]	Timshina *et al*. (2012) [9]
	0.76	0.5	NDA	1.2	NDA	0.6	0,4

CONCLUSION

This study was undertaken to know the spectrum of cutaneous infections in diabetic patients. Infections were the most common cutanous manifestations in diabetes, followed by other dermatoses .Cutaneous infections were more common in patients who have overall poor glycemic control which in turn is reflected by high HbA1c value. Cutaneous infections can heighten the suspicion of a physician regarding the diagnosis of diabetes .Cutaneous infections can be the first clue to underlying diabetic condition. This further helps to prevent systemic derangements by early institution of appropriate treatment. Thus dermatologists can play an important role in reducing dermatologic morbidity, improvement of quality of life and management strategy of diabetic patients.

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