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Spectrum of cutaneous manifestations in patients with type 2 diabetes mellitus

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ABSTRACT

Background: Skin disorders, usually neglected and frequently under diagnosed among diabetic patients. These are common complications and encounter a broad spectrum of disorders in diabetes. **Aims and Objectives:** Present study, aimed to evaluate various cutaneous manifestations among type 2 diabetes mellitus (DM) patients. **Materials and Methods:** The present study was conducted at Dermatology, Diabetic Clinic of tertiary care centre hospital. After approval from the Institutional Ethics Committee and consent from study subjects, 240 subjects were included. All subjects underwent clinical examination-special emphasis on cutaneous manifestations. Blood samples were collected and used for the estimation of blood glucose, liver function tests and renal function tests, complete blood count, bacterial infections-Gram stain and culture, fungal infections-KOH (potassium hydroxide) mount, Gram stain (for *Candida*), and culture. **Results:** Out of 200, 140 (58.4%) were males and 100 (41.6%) were females. The majority of the patients were 5th, 6thand 7th decades. Acrochordons 22 (9.1%) and candidal balanoposthitis 21 (8.7%) were predominantly observed. Fungal, bacterial, and non-infective were 90 (37.5%), 54 (22.5%), and 112 (46.6%), respectively. On bacterial culture, Pyogenic ulcer was observed in 8, furunculosis in 6, etc. KOH mount positive in 22 patients and culture positive was seen in 16 patients. In non-infective dermatoses, Acrochordons were observed in 24 patients. The majority of the patients were on oral hypoglycemic agents. **Conclusion:** This study's results showed demographic, social factors, and the prevalence of various dermatological manifestations in type 2 DM patients.

Key words: Cutaneous manifestations; Diabetes mellitus; Infections

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INTRODUCTION

Skin disorders, usually neglected and frequently under diagnosed among diabetic patients. These are common complications and encounter a broad spectrum of disorders in both type 1 and type 2 diabetes mellitus (DM)-examples are cutaneous infection, dry skin, and pruritus. These cutaneous infections can lead to major complications and are highly associated with hyperglycemia and advanced glycation end products (AGEs).[1]

India has the world's largest diabetic population which is approximately 51.8 million. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.[2] The WHO estimates the global burden of diabetes to be 299 million cases by the year 2025. Diabetes is a heterogeneous group of disorders characterized by abnormally increased levels of glucose in the blood often accompanied by abnormalities in carbohydrate, fat, and protein metabolism. Cutaneous infections are commonly seen in DM.[3]

Insulin affects the utilization of glucose in the skin and is required for the growth and differentiation of keratinocytes and fibroblasts.[4] The association of certain skin diseases with DM has been fairly well recognized with an incidence rate ranging from 11.4% to70.6%.[2,5] It was reported that at least 30% of diabetic patients have some type of cutaneous

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involvement. Skin sugar levels run parallel to the blood sugar levels.[6,7] Dermatological manifestations in DM are mainly due to four causes. First, is directly due to diabetes. Second are lesions of the skin due to infections of the skin. Third due to other complications of diabetes and fourth due to the reaction of the body of the patient to insulin or oral hypoglycemic agents (OHA).[6]

It has been reported that skin changes may be due to the effects of AGEs, oxidative stress, and inflammation, which leads to early skin aging, development of diabetic dermopathy, and scleroderma diabeticorum. Similarly, skin lesions, such as acanthosis nigricans, acrochordons, and inflammatory dermatitis may result from hormonal influences, insulin resistance, imbalance growth factors and cytokines.[8,9]

Cutaneous manifestations of DM usually appear subsequent to the development of the disease, but sometimes it may be the first presenting sign and in some patients, they may even precede the onset of primary disease by many years.[10] Therefore, early recognition of these manifestations will help to achieve good glycemic control and prevent morbidities. A few similar studies have been conducted.[11,12]

Aims and objectives

Therefore, the present study, aimed to evaluate various cutaneous manifestations among type 2 DM patients.

MATERIALS AND METHODS

The present study was conducted at the Dermatology, Diabetic Clinic of the Tertiary Care Center Hospital. The study has been approved from the Institutional Ethics Committee and informed consent was obtained from the study subjects. A total of 240 subjects were included in this study. Out of 240 subjects, 140 were males and 100 were females. The age of the study subjects was from 31 to 80 years.

Inclusion criteria

Patients were selected on the basis of dermatological signs and/or symptoms.

Exclusion criteria

Subjects below 30 years of age, those with impaired glucose tolerance but not DM, gestational diabetic subjects, and type 1 DM were excluded from the study.

A detailed history was collected from the study subjects. All subjects underwent clinical examination-special emphasis on cutaneous manifestations. 5 mL of venous blood samples were collected and used for the estimation of blood glucose, liver function tests and renal function tests, complete blood count, bacterial infections-Gram stain and isolation of organism by culture, fungal infections-KOH (potassium hydroxide) mount, Gram stain (for *Candida*) and culture.

RESULTS

This study aimed to evaluate various cutaneous manifestations among type 2 DM patients. A total of 240 subjects were involved, out of this 140 (58.4%) were males and 100 (41.6%) were females. In this, 24 (10%) were in 31–40 years of age, 58 (24.1%) were in 41–50 years of age, 78 (32.5%) were in 51–60 years of age, 60 (25%) 61–70 years of age and 20 (8.3%) were in 71–80 years of age group. The majority of the patients were 5th, 6th, and 7th decade i.e., 58 (24.1%), 78 (32.5%), and 60 (25%), respectively.

In the current study, the majority of the patients in males were self-employed 42 (30%) and agriculture workers and office workers 24 (17.6%) each, retired and unemployed 16 (11.4%) each, etc. were observed. In females, the majority of the patients were housewives 62 (62%), followed by agriculture, Domestic Help, and Self-employed 12 (12%) each, etc. were observed.

In this study, diabetic patients with duration of ≤5 years were 160 (66.6%) and ≥5 years were 80 (33.3%).

The predominant symptoms observed were pruritus 98 (38.8%), cosmetic concern 60 (23.8%), pain 42 (16.6%), soreness 40 (15.8%), asymptomatic were 4 (1.5%), and others 8 (3.1%) were recorded. 12 (4.7%) patients had 2 predominant symptoms each.

In the present study, acrochordons 22 (9.1%), candidal balanoposthitis 21 (8.7%), furunculosis 20 (8.3%), Tinea corporis 19 (7.9%) were predominantly seen in study subjects. However, 14 (5.8%) patients had two dermatoses each as mentioned in Table 1 and Figures 1-3.

Fungal infections were observed in 90 (37.5%) patients and bacterial infections were observed in 54 (22.5%) patients. Non-infective were 112 (46.6%). However, 16 (6.7%) patients had two dermatoses.

On bacterial culture, Pyogenic ulcer was observed in 8, furunculosis in 6, ecythema in 4, pyogenic abscess in 4, and folliculitis and carbuncle 2 in each as represented in Table 2.

To study the cutaneous fungal infections, a KOH test and culture were done. KOH mount positive was reported in 22 patients and culture positive was seen in 16 patients as reported in Table 3.

Table 1: Distribution of dermatoses in the study subjects

Dermatoses	No. of patients (%)
Acanthosis Nigricans	10 (4.1)
Acrochordons	24 (10)
Candidal balanoposthitis	21 (8.7)
Candidal intertrigo	3 (1.2)
Candidal paraonychia	7 (2.9)
Candidal vulvovaginitis	9 (3.7)
Carbuncle	3 (1.2)
Cellulitis	11 (4.5)
Diabetic dermopathy	5 (2.0)
Diabetic neuropathy	6 (2.5)
Necrobiosis lipoidica diabeticorum	4 (3.3)
Ecthyma	5 (2.0)
Erysipelas	5 (2.0)
Erythrasma	2 (0.8)
Folliculitis	9 (3.7)
Furunculosis	20 (8.3)
Bullosis diabeticorum	5 (2.0)
Generalized pruritus	15 (6.2)
Lichen planus	13 (5.4)
Onychomycosis	7 (2.9)
Perforating dermatoses	6 (2.5)
Pyogenic abscess	5 (2.0)
Pyogenic ulcer	9 (3.7)
Tinea corporis	19 (7.9)
Tines manum	3 (1.2)
Tinea pedis	10 (4.1)
Vitiligo	13 (5.4)
Xanthelasma	11 (4.5)
Total	254*

*14 (5.8%) Patients had two dermatoses each

Among non-infective dermatoses, Acrochordons was observed in 24 (10%) patients, generalized pruritus in 15 (6.2%) patients, lichen planus and vitiligo in 13 (5.4%) each, xanthelasma in 11 (4.5%), Acanthosis Nigricansin 10 (4.1%), Diabetic Neuropathy and Perforating Dermatoses in 6 (2.5%) each, Diabetic Dermopathy and Bullosis diabeticorum in 5 (2.0%) each, and Necrobiosis lipoidica diabeticorum in 4 (1.6%) patients.

In this, 174 patients had <5 years of diabetic history compared to 66 patients with >5 years. A significant association was observed between <5 years of diabetic history and infective dermatoses ($P<0.05$) as shown in Table 4.

In this, 36 patients had a family history of DM and 22 had no family history. In 58 patients, the dermatosis preceded detection of diabetes and was significant as shown in Table 5.

In this, 200 patients were on OHA, 16 were on both OHA and insulin, 14 (5.8%) were on insulin, and 10 (4.1%) were not on any treatment. None of the patients presented with any known cutaneous adverse reaction to any of the above antidiabetic medications.

Figure 1: Acanthosis nigricans

Figure 2: Candidal balanoposthitis

Figure 3: Vitiligo

DISCUSSION

The present study was undertaken to evaluate various cutaneous manifestations among type 2 DM patients. Skin manifestations are commonly seen in DM patients as a

Table 2: Distribution of cutaneous bacterial infections and their microbiological aspects in the study subjects

Clinical entity	No. of patients	Sampled for microscopy and culture	Gram stain			No. of cases with growth on culture
			+ Organism	- Organism	No results	
Furunculosis	16	10	6	-	4	6
Pyogenic ulcer	8	8	6	-	2	8
Ecthyma	6	4	4	-	-	4
Folliculitis	6	4	4	-	-	2
Pyogenic abscess	6	4	4	-	-	4
Erysipelas	4	-	-	-	-	-
Carbuncle	2	2	2	-	-	2
Cellulitis	2	-	-	-	-	-
Erythrasma	2	-	-	-	-	-
Total	52	32	26	-	6	26

Table 3: Distribution of cutaneous fungal infection and their mycological aspects in the study subjects

Clinical entity	No. of patients	Sample for microscopy and culture	KOH mount positive	Positive for culture
Candidal infections				
Balanoposthitits	24	16	10	6
Vulvovaginitis	10	4	2	2
Paronychia	8	6	-	2
Intertrigo	2	2	-	-
Total	44	28	12	10
Dermatophyte infection				
Tinea corporis	24	16	12	8
Tinea pedis	10	8	4	4
Tinea manum	2	2	2	2
Tinea unguium	6	8	4	2
Total	48	34	22	16

Table 4: Correlation between duration of Diabetes and pattern of dermatoses observed in study subjects

Pattern of dermatoses	Duration of diabetes mellitus		Total
	<5 Years	>5 Years	
Pattern of dermatoses			
Infective	108	26	134
Non-infective	66	40	106
Total	174	66	240

Statistically significant association (P<0.05)

Table 5: Correlation between dermatoses and detection of DM and family history of DM

History of DM	Dermatoses preceded the detection of DM	Dermatosis did not precede the detection of DM	Total
Family history of DM	36	70	106
No. family history of DM	22	112	134
Total	58	182	240

Statistically significant association (P<0.05), DM: Diabetes mellitus

result of changes in the metabolism such as hyperglycemia, or damage to vascular, neurological, or immune system.[10] Infections as well as increase the possibility of developing neurovascular and other systemic complications which can give rise to various dermatological manifestations.[13] In this study, the majority of the patients were 5th, 6th, and 7th decades. Studies by Bhat et al., Naheed et al., were in accordance with our study findings.[13,14]

Pruritus, the most common symptom with 98 (38.8%) patients. 60 (23.8%) patients sought dermatological advice primarily for cosmetic concerns of their skin lesions. In a study by Rao and Pai reported pruritus was the predominant symptom and accounts for 60.2% of patients.[15] Similarly, Al-Mutairi et al., reported pruritus (40%) was shown to be the common cutaneous manifestation.[16]

Acrochordons (10%), candidal balanoposthitis (8.7%), furunculosis (8.3%), tinea corporis (7.9%), lichen planus (5.4%), vitiligo (5.4%) xanthelasma (4.5%), cellulitis (4.5%), acanthosis nigricans (4.1%), tinea pedis (4.1%), candidal vulvovaginitis (3.7%), folliculitis (3.7%), pyogenic ulcer (3.7%) were the common dermatoses. Sasmaz et al., and Galdeano et al., also reported similar findings.[17,18]

In our study, the infective dermatoses were more common than the non-infective dermatoses. A total of 144 (60%)

patients suffered from either a cutaneous bacterial or fungal infection, of which 90 (37.5%) had cutaneous fungal infections. Cutaneous bacterial infections were seen in 54 (22.5%) of the study subjects. 112 (46.6%) patients presented with non-infective dermatoses. In a study conducted by Mahajan et al., reported 54.7% of infective dermatoses in diabetic patients.[19] Gulati et al., reported cutaneous infections in 49% of their study population of diabetics.[20]

Among the 144 cutaneous infections, the majority were fungal infections (90 patients), followed by bacterial infections (54 patients). These findings were common in diabetics. In a study conducted by Avula et al., reported that the prevalence of fungal infections among type 2 diabetes mellitus patients was 37%.[21] Similarly, Kataria et al., also reported the prevalence of fungal infections as 26%.[22] Similarly, Netha et al., reported cutaneous fungal infections prevalence of 55%.[23] Yasso et al., the study also reported 44% cutaneous infections prevalence in diabetics Irani patients.[24]

Among 52 patients with cutaneous bacterial infections in our study, the most frequently encountered clinical entity was furunculosis with 16 patients, followed by pyogenic ulcers with 8, ecthyma and folliculitis, and pyogenic abscess in 6 each. In the study by Nigam and Pande reported the prevalence of 26.2% for cutaneous bacterial infections and the most common entity is furunculosis (15 patients).[25]

In our study, 112 patients were presented with non-infective dermatoses. Acrochordons was the most common, seen in 24 (10%), generalized pruritus in 15 (6.2%), lichen planus in 13 (5.4%) and vitiligo in 13 (5.4%), xanthelasma in 11 (4.5%), Acanthosis nigricans in 10 (4.1%), diabetic neuropathy and perforating dermatoses in 6 (2.5%) each and necrobiosis lipoidica diabeticorum in 4 (1.6%). In the study by Mahajan et al., reported neuropathy as the most common clinical entity, observed in 8 (12.5%) patients.[19] In a study by Nigam and Pande reported 9 (7.3%) patients had generalized pruritus without any demonstrable skin lesion, and the authors attributed it to the hyperglycemic status of their patients.[25]

Hyperglycemic state in DM is associated with a greater frequency of cutaneous infections, which favors immune dysfunction, microangiopathies, and neuropathy. The impairment of skin barrier function, hypohydrosis, and reduced epidermal antimicrobial peptide expression in the skin due to hyperglycemia are other factors of cutaneous infections in diabetes. This difference may be due to variations in climate and humidity and health/hygiene practices.[3]

In this study, 200 (83.3%) patients were on OHA and 16 (6.6%) were on both OHA and insulin to control blood sugar levels. Studies by Mahajan et al., and Nigam and Pande also reported similar findings.[19,25]

Limitations of the study

The study has limitation with small sample size.

CONCLUSION

This study results may conclude that the majority of the patients were 5th, 6th, and 7th decades. The predominant symptoms observed were Pruritus, Cosmetic Concern, Pain, Soreness, etc. Acrochordons, candidial balanoposthitis, furunculosis, and Tinea corporis were predominantly seen in study subjects. Fungal infections were observed in 90 (37.5%) patients and bacterial infections were observed in 54 (22.5%) patients. Non-infective were 112 (46.6%). On bacterial culture, Pyogenic Ulcer was observed in 8, Furunculosis in 6, Ecythema in 4, Pyogenic Abscess in 4, and Folliculitis and Carbuncle 2 in each. Out of 56 non-infective dermatoses, Acrochordons were observed in 24 patients, generalized pruritus in 15 patients, lichen planus in 13, and vitiligo in 13 patients. The majority of patients were with diabetic history of <5 years. A significant association was observed between <5 years of diabetic history and infective dermatoses. None of the patients presented with any known cutaneous adverse reaction to any of the above antidiabetic medications. These dermatological manifestations in diabetic patients reflect the metabolic status of these patients. Therefore, it is very essential to identify these signs and symptoms of diabetes at an early stage to reduce dermatological morbidities. Further, studies with large sample sizes are recommended.

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RB- Concept, study design, data collection, data analysis, manuscript preparation and submission of article; **SK**- Manuscript preparation, editing, manuscript revision and submission.

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