

A Tertiary Care Hospital-based Study of Various Skin Manifestations in Diabetes Mellitus Patients: Skin as a Clinical Marker of Diabetes Mellitus

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ABSTRACT

Introduction: Incidence of skin manifestations in diabetes mellitus (DM) varies from 11.3 to 70.6% and may manifest once the primary disease has already developed, but may also occur coincidentally with its onset or may even precede DM in some of the cases. Our study is an attempt to analyze the pattern of various types of skin manifestations seen in DM.

Aims and objectives: To study and analyze the various skin manifestations in patients of DM.

Materials and methods: Two hundred patients of DM were enrolled. A detailed history was taken, investigations like preprandial and postprandial capillary plasma glucose and HbA1c were done. Diabetes was considered controlled when preprandial capillary plasma glucose 3.9–7.2 mmol/L (70–130 mg/dL), postprandial capillary plasma glucose <180 mg/dL, and HbA1c <7.0%.

Results: Infections were the commonest skin manifestation present in a total of 81% of patients (56% fungal, 19% bacterial, and 6% viral) followed by conditions associated with DM present in 67% of patients (skin tag 33% was the commonest). Miscellaneous skin conditions were present in 62% of patients (discoloration of nails was the commonest 11%).

Conclusion: Various skin manifestations may appear early and remain undetected till DM is diagnosed. The majority of patients do not take regular treatment and follow dietary restrictions in early diabetes leading to a persistent hyperglycemic state which predisposes to infections and other skin manifestations. The presence of easily visible skin manifestations can heighten the suspicion for early diagnosis of DM and thus, may very well be taken as a clinical marker of DM.

Keywords: Diabetes mellitus, Skin as clinical marker of DM, Skin manifestations.

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INTRODUCTION

The World Health Organization (WHO) describes diabetes mellitus (DM) as a chronic, multisystem disorder with chronic hyperglycemia, disturbances of fat, protein, and carbohydrate metabolism because of disturbance in either insulin action or secretion or both.

Common symptoms in DM are polyuria, weight loss and blurring of vision, coma, and even death can occur due to acute complications like ketoacidosis¹ and a non-ketotic hyperosmolar state.² India has the world's largest diabetic population which is approximately 51.8 million.^{3,4}

Classification of DM:¹

- Diabetes mellitus type-1
- Diabetes mellitus type-2
- Other specific types of diabetes
- Gestational diabetes mellitus (GDM).

Cutaneous Manifestations

Acute metabolic disturbances and chronic degenerative complications of DM also affect the skin. The incidence of skin manifestations associated with DM varies from 11.3 to 70.6%.⁵ The skin manifestations seen in DM mostly appear either once the primary disease has already developed, or it may also occur coincidentally with its onset or may even precede DM by many years in many of the cases.

Classification of cutaneous manifestations of DM:⁶

- Cutaneous infections in DM
- Cutaneous associations of DM

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- Cutaneous manifestations of complication of DM
- Cutaneous reactions to the treatment of DM.

At times, the skin manifestations can be the first presenting sign of DM; hence, our study is an attempt to analyze the pattern of various types of skin manifestations seen in DM.

AIMS AND OBJECTIVES

To study and analyze the skin manifestations in patients of DM.

MATERIALS AND METHODS

The present study was carried out in the outpatient Departments of NIMS Medical College; a tertiary care hospital in Jaipur. A total

of 200 consecutive patients of DM (type 1 and 2) attending the Department of Medicine and Dermatology were enrolled.

Ethics

Patients' confidentiality was maintained and informed consent was taken.

Inclusion Criteria

- Diagnosed cases of DM willing to participate in the study.

Exclusion Criteria

- Patients <15 years of age.
- Patients with GDM.
- Unwilling patients.

Detailed history with special reference to age, sex, rural/urban background, BP, smoking, alcohol intake, duration of diabetes, type of diabetes, type of treatment taken, complications, and family history was taken. A complete general, physical, systemic, and dermatological examination was carried on each patient.

Investigations like hemoglobin, total leukocyte count, differential cell count, preprandial capillary plasma glucose, postprandial capillary plasma glucose, complete urine examination, and HbA1c were done in each patient. Assessment of glycemic control (DM) was done by measuring preprandial capillary plasma glucose, postprandial capillary plasma glucose, and HbA1c and DM was considered to be controlled when preprandial capillary plasma glucose 3.9–7.2 mmol/L (70–130 mg/dL), postprandial capillary plasma glucose <180 mg/dL, and HbA1c <7.0% were measured.

RESULTS

The study group included 200 patients with DM with skin manifestations. The age group varied from 20 to 79 years with a mean age of 52 years and SD of 10.52 years. The minimum age was 25 years and the maximum was 75 years. The maximum number of patients was in 50–59 years (32%) of age group, followed by age group 40–49 years (27%). Fifty-five percent of the patients were male and 45% were females with male to female ratio of 1.2:1.

Out of 200 patients, 73% of the patients belonged to a rural background while 27% were from an urban background.

The maximum no. of patients (48%) were from lower socioeconomic status, followed by 38% from middle socioeconomic and 14% were from upper socioeconomic status.

The maximum no. of patients were housewives (51%), followed by retired persons (19%) and businessman (16%). Miscellaneous group (14%) constituted of priest, tailor, policeman, astrologer, Anganwadi worker, etc.

Fifty percent of patients were overweight, 26% were of normal weight, 21% patients were obese, and the remaining 3% were underweight (Table 1).

Ninety-two percent of the patients had type 2 DM while only 8% of the patient was that of type 1 DM.

Twenty-one percent of the patients were smokers, 13% were alcoholics, and 30% were hypertensive.

The maximum no. of patients (50%) had a duration of diabetes between 1 years and 5 years, 21% between 6 years and 10 years duration, while 19% had duration <1 year, and only 10% patients were having diabetes \geq 16 years of duration.

The maximum no. of patients (60) were on oral hypoglycemic drugs, while 33% of the patients were on combination therapy, i.e., insulin and oral hypoglycemic. Seven percent of the patients were not on any treatment for DM.

Fifty-three percent of the patients were on regular treatment, while 40% were irregular treatment and 7% were on no treatment. Out of 53% patients on regular treatment, 52.8% patients had controlled diabetes ($\text{HbA1c} \leq 7$) whereas among patients on irregular treatment (40%) only 19.5% of patients had controlled diabetes. Seven percent of patients who did not take any treatment had uncontrolled diabetes ($\text{HbA1c} \geq 8$) (Table 2).

Skin infections were the commonest manifestations present in 81% of patients, followed by the conditions associated with DM, which were present in 67% of patients, miscellaneous skin conditions were present in 62% of patients, and none of the patients had complications due to treatment of DM.

Most of the patients in the infection group had more than one manifestation. Out of 200 patients, 56% had a fungal infection, 19% had bacterial infections, and 6% had viral infections. None of the patients had parasitic infestation (Table 3). Out of 162 patients, 25 patients had a single infection of 137 patients had more than one infection.

The skin conditions associated with DM were present in 67% of patients. Among the skin conditions, skin tag was the most common (33%), followed by cherry angioma in 6%, xerosis in 5%, etc. (Table 4).

Miscellaneous cutaneous findings were present in 62% of total cases. Discoloration of the nail was the commonest (11%), followed by decrease hair over lower legs and foot in 10%, eczemas in 10%, psoriasis in 5%, etc. (Table 5).

Skin infections were the commonest complications (46%) in inadequate and poorly controlled diabetes (i.e., $\text{HbA1c} \geq 7$). Fungal infections were the commonest (56%) among infections followed by bacterial (19%) and viral (6%) in all these groups. Diabetes-associated complications and miscellaneous skin conditions were also more frequent among inadequate and poorly controlled diabetes, i.e., 72.4 and 51.7%, respectively.

The majority of patients had 3 (26%), 4 (25%), and 2 (21%) skin manifestations followed by 1 (12%), 5 (9%), and ≥ 6 (7%) skin manifestations per patients.

DISCUSSION

Diabetes mellitus is the most common endocrine disorder which involves the skin. Many skin disorders are associated with DM. Dermatological signs of DM mostly appear once the primary disease has already developed but may also appear coincidentally with its onset or even precede DM by years.

In the present study, the majority of patients were in the age group of 50–60 years (32%). This is in agreement with various studies done by Sawhney et al.,⁷ Mahajan et al.,⁸ Nigam and Pande,⁹ and Nawaf et al.¹⁰ The skin manifestations increase with age, duration, as well as the level of blood sugar control and severity of DM.

Males (55%) outnumbered females (45%) in our study, which is in agreement with studies done by Sawhney et al.⁷ and Rao and Pai.¹¹ However, Romano et al.,¹² Nigam and Pande,⁹ Al Mutairi,¹³ Mahajan et al.,⁸ and Bhat et al.¹⁴ reported a higher incidence of dermatological manifestations in female diabetic patients. This may be due to the fewer number of females in our study.

Table 1: BMI (kg/m²)

S. no.	BMI	Number of patients (n = 100)			Percentage
		Male	Female	Total	
1	≤18.50 (underweight)	2	4	6	3
2	18.50 to 24.99 (normal)	26	26	52	26
3	25 to 29.99 (overweight)	62	38	100	50
4	≥30 (obese)	28	14	42	21

Table 2: Control and compliance of treatment of diabetes mellitus

		Diabetic control		
		Controlled	Uncontrolled	Total
Compliance of treatment of DM	Regular	56 (52.8%)	50 (47.2%)	106
	Irregular	14 (19.5%)	66 (82.5%)	80
	No treatment	2 (19.5%)	14 (100%)	14
Total		72 (36%)	128 (64%)	200

It could also be because of lack of awareness, illiteracy, and negligence on the part of female patients as well as socioeconomic backwardness.

In the index study, the majority of the patients had uncontrolled diabetes (64%) which is comparable with studies by Sawhney et al.⁷ (97%), Yosipovitch et al.¹⁵ (71%), Nigam and Pande⁹ (52%), Bhat et al.¹⁴ (55%), and Ahmed et al.¹⁶ (94%). Poorly controlled DM, the severity of disease, and the duration of illness increase the chances of complications.

In the present study, among the various dermatological manifestations, infections were the most frequent dermatological manifestations (81%) followed by other dermatological conditions associated with DM (67%) and miscellaneous skin findings (62%). Almost similar findings were reported. Studies by Mahajan et al.⁸ (54%), Nigam and Pande⁹ (26%), Bhat et al.¹⁴ (34%), and Al Mutairi et al.¹³ (68%).

Fungal infections (56%) were the commonest infections followed by bacterial (19%) and viral (6%). However, in similar studies by Yosipovitch et al.¹⁵ and Bhat et al.,¹⁴ the incidences of fungal infections reported were 32 and 34.34%, respectively.

Among the skin conditions associated with DM, skin tags were the commonest and were present in 33% of patients in our study. Various similar studies by Kahana et al.¹⁷ and Thappa¹⁸ observed that skin tags present in 26.3 and 62.85% of the cases, respectively.

Acanthosis nigricans was present in 4% of the patients in our study, Mahajan et al.,⁸ Bhat et al.,¹⁴ Al Mutairi et al.,¹³ and Ahmed et al.¹⁶ reported an almost similar incidence of acanthosis nigricans in their study 3, 5.3, 4.7, and 2.8%, respectively. Acanthosis nigricans and skin tags are dermatological manifestations of DM that may precede the occurrence of DM. A high level of insulin acts on insulin-like growth factor receptors (IGF) which resulted in the development of acanthosis nigricans.

In the present study, diabetic foot ulcer was present in 3% of the patients. Almost similar findings were reported by Puri et al., 2012¹⁹ in their study in 2% of patients of DM.

In the present study, 12, 21, 26, 25, 9, and 7% of patients had 1, 2, 3, 4, 5, and ≥ 6 cutaneous manifestations, respectively. While almost similar observations were made by Goyal et al.²⁰ in their study 20, 20, 12, 16, 14, and 2% of patients had 1, 2, 3, 4, 5, 6, and 7 cutaneous manifestations, respectively.

Table 3: Skin infections/infestations

	Number of patients (n = 162)			
	Male	Female	Total	Percentage
(1) Fungal	52	60	112	56
(A) Dermatophytosis	37	35	72	36
T. corporis	18	16	34	17
T. cruris	14	14	28	14
Onychomycosis	1	3	4	2
T. pedis	2	2	4	2
T. unguium	2	0	2	1
(B) Candidiasis	15	25	40	20
Candidal balanoposthitis	12	0	12	6
Vaginal candidiasis	0	12	12	6
Cutaneous candidiasis	0	8	8	4
Candial paronychia	3	2	5	4
(2) Bacterial	18	20	38	19
Folliculitis	8	8	16	8
Furunculosis	6	10	16	8
Carbuncle	2	2	4	2
Foot ulcer	2	0	2	1
(3) Viral	4	8	12	6
Herpes simplex	2	4	6	3
Herpes zoster	3	3	6	3

The number of skin manifestations in our study was comparatively higher because a large percentage (64%) of our patients had uncontrolled diabetes. Poor dietary control, food habits, illiteracy, poor hygiene, climatic conditions, rural background, and socioeconomic backwardness may be the additional factors.

CONCLUSION

Diabetes mellitus is a multisystem disease and skin, is also not spared by its complications. These may either appear early or remain undetected till DM is diagnosed. The majority of patients do not take regular treatment and follow dietary restrictions in early diabetes leading to a persistent hyperglycemic state which predisposes to infections. The advanced glycosylation end product (AGE) may lead to other complications like microangiopathy, neuropathy, etc., which appear late. The presence of skin manifestations (which are easily visible) can heighten the suspicion for DM enabling early diagnosis of DM and thus be very well taken as a clinical marker for DM.



Table 4: Skin conditions associated with diabetes mellitus

S. no.		Number of patients (n = 134)			Percentage
		Male	Female	Total	
1	Skin tag	32	34	66	33
2	Cherry angioma	4	8	12	6
3	Xerosis	8	2	10	5
4	Acanthosis nigricans	6	2	8	4
5	Generalized pruritus	4	4	8	4
6	Xanthelasma palpebrarum	2	6	8	4
7	Diabetic dermopathy	2	6	8	4
8	Yellow discoloration of skin	3	3	6	3
9	Diabetic thick skin	2	2	4	2
10	Rubeosis faciei	1	1	2	1
11	Granuloma annulare	1	1	2	1

Table 5: Miscellaneous skin conditions

S. no.		Number of patients (n = 124)			Percentage
		Male	Female	Total	
1	Discoloration of nail	11	11	22	11
2	Decreased hair on lower leg and foot	12	8	20	10
3	Eczemas	8	12	20	10
4	Psoriasis	6	4	10	5
5	Pigmented purpuric dermatoses	6	4	10	5
6	Lichen planus	3	5	8	4
7	Seborrheic keratosis	4	4	8	4
8	Alopecia	2	4	6	3
9	Macular amyloidosis	2	2	4	2
10	Vitiligo	2	2	4	2
11	Prurigo nodularis	2	2	4	2
12	Perforating dermatosis	1	1	2	1
13	Syringoma	1	1	2	1
14	Urticaria	1	1	2	1
15	Acne keloidalis nuchae	1	1	2	1

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