

Original Research Article

Study of cutaneous manifestations of type 2 diabetes mellitus

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ABSTRACT

Background: Poorly controlled Type 2 diabetes mellitus (DM) is associated with several disorders and microvascular, macrovascular and neuropathic complications. Multiple factors play a role in the manifestations of cutaneous signs of DM. The prevalence of a cutaneous disorder appears to be similar between Type 1 DM and Type 2 DM patients, but Type 2 DM patients develop more frequent cutaneous infections, and Type 1 DM patients manifest more autoimmune-type cutaneous lesions. The objective of the study was to assess the various cutaneous manifestations of Type 2 DM and the relation of cutaneous manifestations with the duration of Type 2 DM.

Methods: All patients of Type 2 DM, of age group 20 and above, of both sexes, attending OPD or IPD at Dr. D. Y. Patil Hospital, Kolhapur willing to give written informed consent, were included for the study between August 2014 – July 2016. Complete history and examination of all the patients with regards to onset of cutaneous manifestations was taken.

Results: Majority (49%) of respondents were in the age group of 41 to 60 years, and majority (66%) were males. 57.5% were new cases and 42.5% were known cases. Duration of illness- majority 50.58% were <5 years, 27.05% in 6 to 10 years. In present study there were 61% who had infectious skin manifestations and 39% who had non-infectious skin manifestations. Out of infectious manifestations 39.5% had fungal infection.

Conclusions: Therefore on the basis of present study, we conclude that the skin is involved in DM quite often. The manifestations are numerous and varied and many a times they can serve as diagnostic marker for underlying DM. Whenever patients present with multiple skin manifestations, their diabetic status should be checked. The recognition of these skin findings is the key to treatment and prevention.

Keywords: Diabetes mellitus, Cutaneous manifestations, Atherosclerosis, Fungal infection

INTRODUCTION

In India diabetes mellitus (DM) continues to be a major public health problem, and India is having the highest number of diabetics.¹

DM is a disease with target organs being almost all the parts of body. The changes in the skin are comparable to those occurring in the other internal organs of the body. Many skin disorders show high incidence and severity in DM, the biochemical factors responsible for this are yet to be understood. And according to research, about 30%

of diabetic patients will eventually develop cutaneous manifestations during the natural course of this chronic disease. The skin is a temporary reservoir for excess blood glucose which accounts for tendency to develop pruritus and both bacterial and fungal infections.²

As it is known skin is the largest organ of the body, which is affected by both acute metabolic and the chronic derangements that occur in diabetes.³

Multiple factors have a role in the skin manifestations of DM. According to a study, abnormalities in carbohydrates metabolism, vascular involvement leading

to atherosclerosis, alterations in metabolic pathways, microangiopathy and neuronal involvement and impaired host mechanisms, all have a role to play in pathogenesis of DM.⁴

According to a study global presence of Type 2 diabetes in the year 2000 was 171 million which is expected to go up to 366 million by 2030. According to International Diabetes Federation (IDF) the total number of diabetic patients to be approx is 40.9 million in India and this may rise in the future to 70 million by the year 2025. The prevalence of a cutaneous disorder appears to be similar between people affected with Type 1 DM and Type 2 DM, but Type 2 DM patients develop more skin infections, while Type 1 DM patients manifest more as autoimmune-type cutaneous lesions.⁵⁻⁸

Abnormalities of insulin and elevated blood glucose level leads to involvement of multiple organ systems like CVS, CNS, eyes, renal and skin.⁹ According to a study, more than one third of diabetic patients have one or the other type of dermatological manifestations during the course of their disease.¹⁰

Cutaneous manifestations of DM are very important to the clinician as some of them can prompt the physician to the early detection of diabetes and also reflect the glucose level and lipid metabolism over period of time.¹¹

Long standing DM leads to permanent and irreversible functional damage in cells of the body which may be a cause for various complications. Skin being the largest organ of the body, is readily available for examination and study in case of cutaneous disorders of diabetes. It is particularly important in diabetic patients because it essentially does get involved in one way or another. It is well known that DM leads to a number of cutaneous manifestations. Skin changes mostly appear later to DM but may be the first clinical presenting sign or even precede the diagnosis by many years. Similar to other complications such as retinal disorders and nephrological disorders, skin manifestations are largely the results of the combined effect of hyperglycemia, neuropathy, impaired host immune mechanisms, microvascular angiopathies. The main mechanism leading to these changes is thought to be non-enzymatic glycosylation. This mechanism occurs to a lesser extent at normal blood sugar level and is apparently accelerated in patients with increased blood glucose levels.¹²

Although the cutaneous manifestations of diabetes are well known and considered common, systemic surveys of the skin findings in young diabetics having IDDM are sparse. However, there is no such difference between prevalence found in patients with IDDM and those with NIDDM. Several reports propose that few skin manifestations in diabetic patients may suggest the degree of long-term control of diabetes and are associated with other diabetic complications.¹³

Cutaneous manifestations are common in Type I diabetes, like acquired ichthyosis and keratosis pilaris which begin early in the course of the diabetes. Diabetic hands and rubeosis faciei are related to the disease duration.¹⁴

DM affects individuals of all age groups and all socio-economic section of the population. While many diabetic complications have been broadly studied, the dermatological complications are relatively unexplored. There is no epidemiologic data that reflects skin manifestations in diabetics from Western Maharashtra. This study was carried out to assess the clinical pattern of cutaneous manifestations among diabetic patients.

The study was conducted with the aim to study the various cutaneous manifestations of Type 2 DM and to study the relation of cutaneous manifestations with the duration of Type 2 DM.

METHODS

Study design: The present study was cross sectional type of study.

Study place: Tertiary care hospital, Dr D Y Patil Hospital and Research Institute, Kadamwadi, Kolhapur.

Study setting: Department of Dermatology, Venereology and Leprology of tertiary care hospital. Registration of patients was from August 2014 to July 2016. They were registered when admitted under Dermatology, Venereology and Leprology department. At the time of registration the patients with exclusion criteria were not enrolled for study. The data thus collected was analyzed to study the various cutaneous manifestations of Type 2 DM.

Sample size: 200 patients.

Study participant: Patients coming to Dermatology, Venereology and Leprology Department and having inclusion criteria were taken in the study.

Ethics: Institute Ethical committee's approval was taken prior to the study.

Inclusion criteria: All clinically diagnosed cases of Type II DM with cutaneous manifestations, of any age, of both sexes, willing to give their consent and participate in the study.

Exclusion criteria: Patients with partially treated cutaneous manifestations of DM with changed morphology attending skin OPD were excluded from this study and patients having Type 1 DM.

Data collection: Written informed consent was taken from the participants. Patients coming to Dermatology, Venereology, and Leprology Department and having inclusion criteria were included in the study. Pre designed

questionnaire schedule consisting of standard questions related to socio demographic factors, environmental conditions, addiction, and so on, were interviewed. In addition, questionnaire also included questions on past and present medical history and health seeking behaviour.

Method of collection of data: A patient diagnosed to have diabetes mellitus (NIDDM).

- Already on treatment or newly detected diabetic patients.
- Symptoms of diabetes + Random plasma sugar >200mg/dl or
- Fasting plasma sugar: >126 mg/dl OR
- HbA1C >6.5% OR
- 2 hr post 75gm oral glucose >200mg/dl.

Statistical analysis

The collected data was compiled in Microsoft Excel 2010 and analyzed using SPSS (Statistical Programme for Social Sciences) software 15 version, Open Epi Software Version 2.3.

RESULTS

Table 1 shows the age distribution among the study population, where it was seen that majority 49.5% of respondents were in the age group of 41 to 60 years, followed by 42.5% were less than 40 years and only 8% were more than 61 years. Mean age was 44.5 + 12.2 years.

Table 1: Age distribution among the study population (n=200).

Age distribution (in years)	Frequency	Percentage (%)
<40	85	42.5
41 to 60	99	49.5
>61	16	8
Total	200	100

Table 2 shows the gender distribution among the study population, where it was seen that majority 66% were males and 34% were females.

Table 3 shows DM known case or new case, which shows that majority 57.5% were new cases and 42.5% were known cases.

Table 2: Gender distribution among the study population (n=200).

Gender distribution	Frequency	Percentage (%)
Male	132	66
Female	68	34
Total	100	100

Table 3: DM known case or new case (n=200).

DM	Frequency	Percentage (%)
New case	115	57.5
Known case	85	42.5
Total	200	100

Table 4 shows the duration of DM among the study population; majority 50.58% were <5 years, 27.05% in 6 to 10 years, 11.76% in 16 to 20 years and 10.85% in 11 to 15 years.

Table 4: Duration of DM among the study population (n=85).

Duration in years	Frequency	Percentage (%)
<5	43	50.58
6 to 10	23	27.05
11 to 15	9	10.85
16 to 20	10	11.76
Total	85	100

Table 5 shows skin manifestations among the study population, where 61% had infectious skin manifestations and 39% had non-infectious skin manifestation. Out of infectious manifestations 39.5% had fungal infection, 20.5% had bacterial and 1% had viral.

Table 6 shows the duration of skin manifestation among the study population; majority 77.5% had for less than 1 month and 22.5% >1 month.

Table 7 shows association between duration of DM and bacterial skin manifestation among the study population (n=85) shows statistical significance.

Table 5: Skin manifestations among the study population (n=200).

Skin manifestations	Infectious			Non infectious	Total
	Fungal	Bacterial	Viral		
Frequency	79	41	2	78	200
Percentage (%)	39.5	20.5	1%	39	100

Table 6: Duration of skin infection among the study population (n=200).

Duration	Frequency	Percentage (%)
<1month	155	77.5%
>1 month	45	22.5%
Total	200	100%

Table 7: Association between duration of DM and bacterial skin manifestation among the study population (n=85).

Duration of DM/bacterial	Present	Absent	Total
<5	4	39	43
6 to 10	2	21	23
11 to15	0	9	9
16 to 20	5	5	10
Total	11	74	85

Applying chi square test=14.4, df=3, p value=0.002. As p value was <0.05, which shows statistical significance.

Table 8 shows association between duration of DM and fungal skin manifestation among the study population (n=85), where there was no statistical significance seen.

Table 8: Association between duration of DM and fungal skin manifestation among the study population (n=85).

Duration of DM/fungal	Present	Absent	Total
<5	12	31	43
6 to 10	7	16	23
11 to15	2	7	9
16 to 20	1	9	10
Total	22	63	85

Applying chi square test=1.7, df=3, p value=0.63. As p value was >0.05, which shows no significance.

Table 9: Association between duration of DM and viral skin manifestation among the study population (n=85).

Duration of DM/viral	Present	Absent	Total
<5	2	41	43
6 to 10	0	23	23
11 to15	0	9	9
16 to 20	0	10	10
Total	2	83	85

Applying chi square test=2.0, df=3, p value=0.572. as p value was >0.05, which shows no significance.

Table 9 shows Association between duration of DM and viral skin manifestation among the study population (n=85), there was no significance seen.

Table 10 shows duration of DM and non infectious skin manifestation among the study population (n=85), there was no significance seen.

Table 10: Association between duration of DM and non infectious skin manifestation among the study population (n=85).

Duration of DM/ non infectious	Present	Absent	Total
<5	25	18	43
6 to 10	14	9	23
11 to15	7	2	9
16 to 20	4	6	10
Total	50	35	85

Applying chi square test=2.8, df=3, p value=0.41. As p value was >0.05, which shows no significance.

Table 11 shows association between duration of DM and infectious skin manifestation among the study population (n=85), only bacterial was found to be statistically significant.

Table 11: Association between duration of DM and infectious skin manifestation among the study population (n=85).

Infection/ duration of DM	<5	6 to 10	11 to 15	16 to 20	P value
Fungal	12	7	2	1	0.63
Bacterial	4	2	0	5	0.002
Viral	2	0	0	0	0.57

DISCUSSION

In our study, majority 49.5% of respondents were in the age group of 41 to 60 years, followed by 42.5% who were less than 40 years and only 8% were more than 61 years. Mean age was 44.5±12.2 years. Galdeano et al in their study showed that of the 125 diabetic patients hospitalized in the Department of Medical Clinic of the Hospital Luis Lagomaggiore, it was observed that mean age was 58.9±15.43 years, with a maximum of 85 years and a minimum of 16 years old, 55% of patients (n=69) were older than 60 years.¹⁵ An observational study by Goyal et al comprised of 100 consecutive patients of DM. The youngest patient was 28 years and oldest was 80 years with a mean age of 57.44±10.37 years.¹⁶

Chatterjee et al showed that among 680 patients, the age varied from 14 to 80 years, mean age being 46.3±6.7 years.¹⁷ Sanad et al in their study showed that age range was from 17 to 80 years, with a mean of 51.42±14.66 years.¹⁸ In a study by Timshina et al the age of the patients ranged from 10-75 years, with a mean age of 49.38±12.78.¹⁹

In our study, majority 66% were males and 34% were females. Galdeano et al in their study showed that females predominated slightly, representing 57% of the patients.¹⁵

The study by Kumar et al comprised of 50 consecutive patients of DM with skin lesions.²⁰ There were 27 males and 23 females. Similarly a study by Goyal et al also showed the same results that males were 54% more than females 46%.¹⁶

Chatterjee et al showed that four forty one (64.8%) were male and two thirty nine (35.1%) were female.¹⁷ But no similar results were found in study by Timshina et al, the majority was females (54.95%) who were diabetic as compared to males (45.1%).¹⁹

In our study, majority 57.5% were new cases and 42.5% were known cases. Study by Kumar et al showed that 5 were newly diagnosed.²⁰ Study by Goyal et al also showed that 10% were newly diagnosed.¹⁶ Chatterjee et al showed that among 680 diabetic patients 12 patients were newly diagnosed.¹⁷

In our study, majority 50.58% were <5 years, 27.05% in 6 to 10 years, 11.76% in 16 to 20 years and 10.85% in 11 to 15 years. Study by Kumar et al showed that the duration of diabetes was <10 years in 30 patients, 17 had 11-20 years and 3 had > 20 years of diabetes.²⁰ Study by Goyal et al also showed that the duration of diabetes was <10 years in 60 patients.¹⁶ Thirty four patients had 11-20 years of diabetes, and six had >20 years of diabetes. The duration of diabetes was 1-10 years in 290 patients. Two hundred and one (201) had >10 years of diabetes in a study by Chatterjee et al.¹⁷

The duration of the disease ranged from 3 months to 30 years with a mean of 10.57±7.63 years. The duration of DM was more than 5 years in 65 patients and 5 years or less in 35 patients in a study by Sanad et al.¹⁸

In the present study 61% had infectious skin manifestations and 39% had non-infectious skin manifestation. Out of infectious manifestations 39.5% had fungal infection, 20.5% had bacterial and 1% had viral. Galdeano et al showed that the skin infection was present in 35 patients (28%).¹⁵ Skin lesions were observed in 113 patients, 90.4% of cases. The most frequently observed were: xeroderma, dermatophytosis, peripheral hypotrichosis, etc.

Study by Kumar et al showed that various types of skin lesions were found in the patients of diabetes.²⁰ Around 17 types of skin lesions were found in 50 diabetic patients, but most of the patients suffered from more than one type of skin lesions (n=130) like bacterial, boils and fungal infections. Majority were fungal which was seen among the present study population also. Study by Goyal et al also showed that the skin lesions were in majority fungal and in that candida and dermatophytoses,

followed by bacterial and in that impetigo contagiosa, boils, erythrasma and folliculitis.¹⁶

In Sanad et al study, cutaneous infections included fungal (22%), bacterial (16%), and viral (2%) infections.¹⁸ The most common skin disorders were cutaneous infections (40%), followed by pruritus (11%), local reactions at the site of insulin injection (8%), vitiligo (8%), diabetic dermopathy (7%), periungual telangiectasia (6%), and xanthelasma (5%). Diabetic bullae, reactions of oral hypoglycemic drugs, skin tags, and neuropathic ulcers occurred in 4% of the patients, whereas acanthosis nigricans, angular cheilitis, and xerosis in 3% and diabetic rubeosis, stiff joints, necrobiosis lipoidica diabetorum, psoriasis, and eczema were observed in 2% of the patients. Yellow nail, pigmented purpura, keratosis pilaris, acquired ichthyosis, and pemphigus vulgaris were each observed in 1% of the patients.

In our study, majority 77.5% had for less than 1 month and 22.5% >1 month. Association between duration of DM and bacterial skin manifestation, p value is 0.002 which shows statistical significance. Galdeano et al in their study showed that there was statistical significance (p=0.009).¹⁵ Similar results were in present study. In study by Sanad et al it showed that the bacterial association with duration of disease was not significant. Findings were not similar to present study.¹⁸

Association between duration of DM and fungal skin manifestation, p value is 0.63, which shows no significance. In study by Sanad et al it showed that the bacterial association with duration of disease was significantly seen. Findings were not similar to present study.¹⁸

Association between duration of DM and viral skin manifestation, p value is 0.572, which shows no significance. Association between duration of DM and non-infectious skin manifestation, p value is 0.41, which shows no significance.

In present study it was seen that only bacterial infection showed statistical significance. According to a study from Saudi Arabia, for those patients having diabetes of less than 5 years' duration, the incidence of skin manifestations was 80.6%; for those having diabetes for more than 5 years, the incidence was 98%. This difference was statistically significant (P<0.001).²¹

Study by Sanad et al showed that the number of patients suffering from skin manifestations increased with a longer duration of DM, but there was no statistically significant relation between skin manifestations of DM and the duration of DM, except for diabetic bullae (P=0.04), diabetic dermopathy (P=0.003), and tinea pedis (P=0.001), which were significantly present in DM of more than 5 years' duration. The prevalence of skin manifestations was higher as the duration of diabetes increased.¹⁸

CONCLUSION

Therefore on the basis of present study, we conclude that the skin is involved in diabetes quite often. The manifestations are numerous and varied and many a times they can serve as diagnostic marker for underlying diabetes. Whenever patients present with multiple skin manifestations, their diabetic status should be checked. The recognition of these skin findings is the key to treatment and prevention. Dermatologic manifestation is a highly prevalent complication of DM which affects quality of life and adds to the heavy burden of therapeutic costs. It is found more frequently among Type 2 diabetics and increasing duration of diabetes increases the possibility of skin involvement. Impaired diabetic control as evidenced by higher HbA1C levels among patients with infections can be used as a good measurement tool. However, prospective long term studies with larger number of subjects are needed to explore these issues further.

As the duration of diabetes increased, the likelihood of developing skin manifestations also increases. Early referral to the dermatologist may help to detect complications of the skin in diabetes at an early stage and may prevent disability caused by these complications.

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REFERENCES

- Sahay BK. Diabetes mellitus-basic considerations. In: Saha SN, editor. API Text of Medicine, 8 th ed. Mumbai: The Association Of Physicians of India. 2008: 1042-1043.
- Amany Ali Sayed Abd El Nasser. Cutaneous Manifestations Among Diabetic Children. Egyptian Paediatric Association Gazette. 2012;2:12-5.
- Bhat YJ, Gupta V, Kudyar RP. Cutaneous manifestations of diabetes mellitus. Int J Diab Dev Ctries. 2006;26:152-5.
- Goyal A, Raina S, Kaushal SS, Mahajan V, Sharma NL. Pattern of cutaneous manifestations in diabetes mellitus. Indian J Dermatol. 2010;55(1):39-41.
- Sasmaz S, Buyukbese MA, Cetinkaya A, Celik M, Arican O. The prevalence of skin disorders in type-2 diabetic patients. Int J Dermatol. 2005;3:1.
- Nawaf Al-Mutairi. Skin diseases seen in diabetes mellitus. Bull Kuwait Inst Med spec. 2006;5:30-9.
- Goyal A, Raina S, Kaushal SS, Mahajan V, Sharma NL. Pattern of cutaneous manifestations in diabetes mellitus. Indian J Dermatol. 2010;55(1):39-41.
- Ahmed K, Muhammad Z, Qayum I. Prevalence of cutaneous manifestations of diabetes mellitus. J Ayub Med Coll Abbottabad. 2009;21:76-9.
- Giligor RS, Lazarus GS. In: Diabetes Mellitus. Rifkin H, Raskin P, Bradyco Louna, eds. 1981: 313-321.
- Greenwood AM. A study of skin in 500 diabetics. JAMA. 1927;89:774-9.
- Urbach K, Lentz JW. Carbohydrate metabolism and skin. Arch Dermatol Syphilol. 1965;52:301-4.
- Khurshid S, Govada L, EL-Sharif HF, Reddy SM, Chayen NE. Automating the application of smart materials for protein crystallization, Acta Crystallogr D Biol Crystallogr. 2015;71(3):534-40.
- Perez MI, Kohn SR. Cutaneous manifestations of diabetes mellitus. J Am Acad Dermatol. 1994;30(4):519-31.
- Kozjak-Pavlovic V, Ross K, Benlasfer N, Kimmig S, Karlas A, Rudel T. Conserved roles of Sam50 and metaxins in VDAC biogenesis. EMBO Rep. 2007;8(6):576-82.
- Galdeano F, Zaccaria S, Parra V, Giannini ME, Salomón S. Cutaneous manifestations of diabetes mellitus: clinical meaning. Dermatol Argent. 2010;16(2):117-21.
- Goyal A, Raina S, Kaushal SS, Mahajan V, Sharma NL. Pattern Of Cutaneous Manifestations In Diabetes Mellitus. Indian J Dermatol. 2010;55(1):39-41.
- Chatterjee N, Chattopadhyay C, Sengupta N, Das C, Sarma N, Salil K Pa. An observational study of cutaneous manifestations in diabetes mellitus in a tertiary care Hospital of Eastern India. Indian J Endocrinol Metab. 2014;18(2):217-20.
- Sanad EM, ElFangary MM, Sorour NE, ElNemisy NM. Skin manifestations in Egyptian diabetic patients: a case series study. Egypt J Dermatol Venerol. 2013;33:56-62.
- Timshina DK, Thappa DM, Agrawal A. A clinical study of dermatoses in diabetes to establish its markers. Indian J Dermatol. 2012;57:20-5.
- Anuragi Arun Kumar, Shamshad Husain Ansari, Vijay Gupta. A Study on Cutaneous Manifestations in Patients of Type 2 Diabetes Mellitus in a Tertiary Care Hospital. Int J Med Res Prof. 2016;2(1):125-7.
- Shahzad M, Al Robae A, Al Shobaili HA, Alzolibani AA, Al Marshood AA, Al Moteri B. Skin manifestations in diabetic patients attending a diabetic clinic in the Qassim region, Saudi Arabia. Med Princ Pract. 2011;20:137-41.

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