Section: Dermatology

Original Research Article

CUTANEOUS MANIFESTATIONS IN DIABETES MELLITUS- A CROSS SECTIONAL STUDY

Vallabha Reddy Umadevi[1], Poola Ramachandra Rao[2], Avula Rajamma[3]

[1]*Assistant Professor, Department of DVL, Government Medical College and General Hospital, Markapuram, Andhra Pradesh, India.*
[2]*Associate Professor, Department of DVL, Government Medical College and General Hospital, Markapuram, Andhra Pradesh, India.*
[3]*Assistant Professor, Department of DVL, Government Medical College, Ongole, Andhra Pradesh, India.*

Received *: 05/10/2025*
Received in revised form *: 15/11/2025*
Accepted *: 02/12/2025*

Corresponding Author:
Dr. Poola Ramachandra Rao,
Associate Professor, Department of DVL, Government Medical College and General Hospital, Markapuram, Andhra Pradesh, India.
Email: poola.ramachandrarao@gmail.com

DOI: 10.70034/ijmedph.2025.4.450

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 2491-2496

ABSTRACT

Background: The skin functions as a portal through which internal organs can be observed, providing important diagnostic information for identifying internal illnesses. Cutaneous signs play a pivotal role in the timely identification and treatment of diseases, with diabetes mellitus being a prevalent endocrine disorder. Cutaneous manifestations typically arise following the onset of diabetes, although they can also serve as the initial indicator or precede the diagnosis by a significant number of years.

Aims and Objectives: Main aim involved in this study to evaluate the prevalence of cutaneous manifestations in patients with diabetes mellitus.

Materials and Methods: The study was included 100 patients of diabetes mellitus with skin manifestations who consecutively attend the OPD of DVL and internal medicine departments of our hospital, in the period of four months July 2025 to October 2025. A detailed clinical history, demographic details, family histories were obtained from all study subjects. Samples collected from each patient, according to inclusion and exclusion criteria; informed consent was taken from study population. Ethical clearance was obtained from the institutional ethical committee. Biochemical and microbial assays were performed from patient's samples to rule out diabetes and cutaneous infections.

Results: Among the 100 diabetic patients with cutaneous manifestations, 19 patients (19%) had moderate control of DM with Hba1c levels in the range of 7.1%-8%, while 59 patients (59%) had a poor control of DM with Hba1c levels >8%. Hypertension was most common systemic association in 48 patients (48%), followed by coronary artery disease in 6 patients (6%), and hypothyroidism in 5 patients (5%). In the present study, among the various dermatological manifestations, infections were the most common dermatoses (51%). Amongst the 51 patients (51%) with cutaneous infections, majority had fungal infections (38%), followed by bacterial infections (11%) and viral infections (2%).

Conclusion: Understanding the high prevalence of cutaneous manifestations in diabetic patients is crucial for the timely and comprehensive management of both diabetes and dermatoses.

Key words: Diabetes, Cutaneous manifestations, HbA1c, Control DM, NDM.

INTRODUCTION

The skin serves as a window that allows visualization of internal organs. Skin manifestations often provide valuable clues for diagnosing internal diseases. Cutaneous manifestations are crucial in the early detection and management of diseases. Diabetes mellitus (DM) is among the most common endocrine disorders.[1] Ninety percent have type II, non– insulin- dependent (NIDDM), whereas 10% have insulin- dependent type I (IDDM). The prevalence of DM is on the rise globally, possibly due to lifestyle changes, dietary habits, and other factors. Cutaneous manifestations of DM can vary based on the duration of the disease and glycemic

control. Almost all patients with DM eventually experience skin changes due to the long-term effects of hyperglycemia on microcirculation and skin collagen. Additionally, anti-diabetic drugs can have associated cutaneous side effects. Furthermore, diabetes-related cutaneous lesions may act as entry points for microorganisms and lead to secondary infections.

Cutaneous manifestations of diabetes mellitus (DM) may appear after the development of the disease, but they can also be the first sign or even precede the diagnosis of diabetes by several years.[2,3] As a result, skin manifestations can play a role in the early detection of diabetes. The measurement of glycated hemoglobin (HbA1c) is considered the standard method for assessing long-term glucose control.[4] The pattern of skin manifestations can vary based on glycemic control, as measured by levels of HbA1c. Additionally, the pattern of cutaneous manifestations may also vary depending on the duration of the disease. Therefore, a study was conducted to determine the prevalence of mucocutaneous manifestations in patients with DM, the clinical pattern of mucocutaneous lesions among them, and the relationship of these manifestations with glycemic control and the duration of diabetes in a hospital setting.[5]

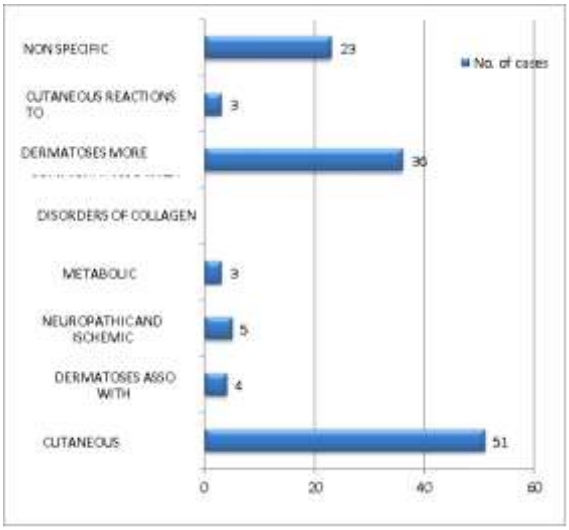
MATERIALS AND METHODS

Before commencing the current study, approval was obtained from the Institutional Ethical Committee, guaranteeing compliance with ethical standards. The study included 100 consecutive diabetic patients who visited the general medicine and dermatology Outpatient Departments (OPD) of our hospital over a 4-month period from July 2025 to October 2025. The inclusion criteria encompassed individuals with diabetes, regardless of the duration of the condition, who expressed willingness to participate in the study. Patients with gestational diabetes, HIV, internal malignancy, other terminal illnesses, and steroid-induced hyperglycemia were excluded from the study. Descriptive statistics like mean, frequency and percentage were calculated.

RESULTS

In the present study peak prevalence was seen in the age group of 50-59 years that is 32%. The youngest patient was 19 years old and eldest was 77 years old. Majority of the patients in present study had type 2 diabetes (96%), while type 1 diabetes was seen in 4% of patients.

The majority of the patients had random blood sugar levels in the range of 210-279mg/dl, accounting for 36% of the total, followed by 30% of patients with levels of 140-209 mg/dl. Additionally, the majority of patients, comprising 59%, had HbA1c levels greater than 8%, while 19% of patients had levels between 7.1-8%. Out of the 100 patients, 55% had associated systemic illness, while the remaining 45% did not have any other systemic illness. Among those with associated systemic illness, hypertension was the most commonly seen, affecting 48% of the patients, followed by coronary artery disease at 6% and hypothyroidism at 5%. It's worth noting that some patients had more than one associated systemic illness. A positive family history of diabetes was reported in 44% of patients, whereas 56% of patients had a negative family history.



Graph 1: Graph represents the pattern of cutaneous manifestations

The data presented above illustrates that cutaneous infections were the most frequently observed dermatoses, accounting for 51% of cases. Following cutaneous infections, dermatoses commonly associated with diabetes mellitus were the next most prevalent at 36%. Additionally, non-specific dermatoses were observed in 23% of the cases, while neuropathic and ischemic diabetic skin disease accounted for 5% of the cases. Microangiopathy-related dermatoses were present in 4% of the cases, and metabolic disorders accounted for 3% of the cases. Furthermore, 3% of the cases exhibited cutaneous reactions to therapy. It is notable that some patients exhibited more than one type of cutaneous manifestation. Fungal infections were the most common among the 51 patients with cutaneous infections, accounting for 38% of cases. Bacterial infections accounted for 11% of cases, while viral infections made up 2% of cases.

In a study of 100 diabetic patients, 11 were found to have bacterial infections. The most commonly observed bacterial infection was furunculosis, which was seen in 3 patients (3%). This was followed by 2 patients each (2%) with folliculitis and cellulitis, and 1 patient each (1%) with ecthyma, erysipelas, abscess, and carbuncle. Among the same 100 patients, 38 were diagnosed with fungal infections. The most commonly observed fungal infection was tinea corporis, was observed in 14 patients (14%), tinea cruris in 11 patients (11%), candidial balanoposthitis in 4 patients (4%), and candidial

intertrigo, p.versicolor in 3 patients each (3%). Additionally, 2 patients had candidial vulvovaginitis, and 1 patient had chronic paronychia. It's important to note that some patients presented with more than one fungal infection. Moreover, 2 out of the 100 patients had viral infections, 1 patient (1%) had verruca vulgaris and another patient (1%) had herpes zoster. Furthermore, 4 patients (4%) presented with dermatoses due to microangiopathy. Of these, in 3 patients (3%) showed diabetic dermopathy, and 1 patient (1%) had diabetic bull.

Figure 1: Fissure Feet

Figure 2: Diabetic Foot Ulcer

Our study revealed that, six patients presented with neuropathic and ischemic diabetic skin disease. 3 patients (3%) had diabetic foot ulcers and (3%) patients had fissure feet.

Out of the 100 diabetic patients, 3 patients (3%) each had xanthomas, scleredema adultorum of Buschke, and xanthelasma palpebrum. The majority of patients presented with pruritus secondary to xerosis, which accounted for 12 patients (12%), followed by 11 cases (11%) of psoriasis, 4 cases of vitiligo, and 2 patients each (2%) of acrochordons, lichen planus, and macular amyloidosis. Additionally, 1 patient each (1%) had acanthosis nigricans, alopecia universalis, and Kyrle's disease. It is noteworthy that some of the patients experienced more than one type of dermatoses commonly associated with diabetes mellitus.

Out of the 98 patients receiving anti-diabetic treatment, only 3 patients (3%) experienced acute urticaria as a result of insulin therapy. Among the observed non-specific dermatoses, eczema was the most prevalent, affecting 9 patients (9%). Following eczema, there were 2 patients each (2%) with pemphigus, acne vulgaris, and hidradenitis suppurativa. Additionally, there was one case each (1%) of scabies, seborrheic keratosis, senile comedones, papular urticaria, discoid lupus erythematosus, keratolysis exfoliativa, pellagra, and erythema nodosum.

In the current study, a comparison was made between the patterns of cutaneous manifestations in the controlled and uncontrolled groups. The findings revealed that cutaneous infections, neuropathic and ischemic diabetic skin diseases, metabolic diseases, dermatoses commonly associated with DM, and cutaneous reactions to therapy for DM were more prevalent in uncontrolled DM. However, there was no statistically significant difference between the cutaneous manifestations of controlled DM and uncontrolled DM.

DISCUSSION

In the current investigation involving 100 diabetic patients with skin manifestations, the majority were in their 40s and 50s, accounting for 32% and 24% of the total cases, respectively. The occurrence of skin manifestations in diabetic patients varied across different age groups, with frequencies of 1%, 3%, 8%, 19%, and 13% in the first, second, third, sixth, and seventh decades, respectively. Similar frequencies of skin manifestations in diabetic patients have been documented in studies conducted by Mahajan et al,[6] Sawhney et al,[7] and Nigam et al,[8] aligning well with the aforementioned findings. The increase in the prevalence of skin involvement with age in diabetic patients may be linked to the reduced resistance of the body and the prolonged duration of diabetes in these individuals.

In the present study, it was found that male diabetics had a higher tendency for cutaneous manifestations compared to females, with a distribution of 56% for males and 44% for females. Similar observations were made by Sawhney et al,[7] Rao et al,[9] and Al-Mutairi et al,[10] in their respective studies. On the other hand, Mahajan et al,[6] Bhat et al,[11] and Nigam et al,[8] reported a significantly higher incidence of cutaneous manifestations in female diabetic patients.

Duration of diabetes

In the present study 48% of the patients had diabetes for duration of 1–5 years and 27% patients for 6–10 years. According to Bhat et al,[11] majority of diabetic patients with cutaneous manifestations had

1–5 years of duration of diabetes (37.37%), followed by 6–10 years (24.24%).

Rao et al,[9] reported that majority of skin manifestations occurred within five years of diagnosis of diabetes. As duration of diabetes increases there is non- enzymatic glycosylation of dermal collagen and mucopolysaccharides, leading to various cutaneous manifestations.[11]

In the present study, 48% of the patients had been diagnosed with diabetes for a duration of 1–5 years, while 27% of the patients had been diagnosed for 6–10 years. According to Bhat et al,[11] the majority of diabetic patients with cutaneous manifestations had a diabetes duration of 1–5 years (37.37%), followed by 6–10 years (24.24%). Rao et al,[9] reported that the majority of skin manifestations occurred within five years of the diagnosis of diabetes. As the duration of diabetes increases, there is non-enzymatic glycosylation of dermal collagen and mucopolysaccharides, leading to various cutaneous manifestations. Infections are more common in the early stages of diabetes. This is likely due to a decrease in the body's defence mechanisms and reduced phagocytic activity. These changes are particularly noticeable in cases of uncontrolled diabetes.

Type 2 diabetes mellitus (DM), also known as non-insulin dependent diabetes mellitus, was found to be the most commonly observed type, accounting for 96% of cases, while type 1 diabetes mellitus (insulin dependent) accounted for 4% of cases. This distribution pattern reflects the general prevalence of type 1 and type 2 DM cases in the world population. There was no noted difference in the prevalence of cutaneous disorders between type 1 and type 2 DM. Similar observations of type 2 diabetes being more common were reported in studies conducted by Mahajan et al,[6] (98%), Sawhney et al,[7] (80%), Bhat et al,[11] (97.7%), Nigam et al,[8] (82.1%), and Al-Mutari et al,[10] (93%). The findings of the present study align well with the results of these mentioned studies.

In 44% of the patients, a positive family history of diabetes was found, while 56% of the patients had a negative family history. The majority of the patients had random blood sugar levels ranging from 210-279 mg/dL (36%), followed by 30% of patients with levels between 140-209 mg/dL. Out of the 100 diabetic patients with cutaneous manifestations, 19% had moderate control of diabetes mellitus with HbA1c levels between 7.1% and 8%, while 59% had poor control with HbA1c levels exceeding 8%. According to a study by Nigam et al,[8] uncontrolled diabetes was observed in 52% of cases. The incidence of cutaneous diseases in patients with uncontrolled diabetes mellitus was 70.2%, compared to 51% in patients with controlled diabetes.

Several studies, including those by Bhat et al,[11] Sawhney et al,[7] and Yosipovitch et al,[12] have found that a majority of diabetic patients with skin lesions also have uncontrolled diabetes. Uncontrolled diabetes significantly increases the risk of developing microangiopathy, related complications, or sequelae, as indicated by Sawhney et al,[7] and predisposes the skin to various infections, as noted by Yosipovitch et al.[12] Contrastingly, a study conducted by Raghunatha et al,[13] demonstrated that a majority of the patients had well-controlled diabetes. Out of 100 patients, 55 patients (55%) had associated systemic co-morbidities, with 48 patients (48%) having hypertension, 6 patients (6%) having coronary artery disease, and 5 patients (5%) having hypothyroidism. According to Mahajan et al,[6] 53.1% of the patients were found to be hypertensive, a finding consistent with the frequencies reported by Bhat et al,[11] (46.46%), Al-Mutairi et al,[10] (44%), and Nigam et al.[8] The studies by Al-Mutairi et al,[10] and Nigam et al,[8] also highlighted hypertension as the most common associated systemic disease in diabetic patients, and it has been suggested to accelerate the process of microangiopathy in diabetics, as hypothesized by Al-Mutairi et al.[10]

Pattern of cutaneous manifestations:

The present study found that infections were the most common dermatological manifestations, accounting for 51% of cases. Dermatoses commonly associated with diabetes mellitus followed closely, representing 36% of cases. Non-specific dermatoses accounted for 23% of cases, while neuropathic and ischemic diabetic skin disease accounted for 5% of cases. Other less common manifestations included those due to microangiopathy (4%), metabolic disorders (3%), and cutaneous reactions to therapy for diabetes (3%). It was also noted that some patients had more than one type of cutaneous manifestation. Similar findings have been reported in other studies by Mahajan et al,[6] Rao et al,[9] Bhat et al,[11] Nigam et al,[8] and Al-Mutairi et al.[10]

Cutaneous infections

Out of the 51 patients included in the study, 51% were found to have cutaneous infections. The majority of these infections were identified as fungal (38%), followed by bacterial (11%) and viral (2%) infections. This observation aligns with findings from other studies, where fungal infections were also reported to be more common. For example, Mahajan et al,[6] found fungal infections in 54.68% of cases, Bhat et al,[11] reported 34.34%, and Al-Mutairi et al,[10] observed 68%. The incidence of cutaneous infections is higher in individuals with uncontrolled diabetes. It is well known that diabetic patients are more susceptible to infections, likely due to hyperglycemia and defects in polymorphonuclear leukocyte function. The incidence of cutaneous infections varies across different studies, but it is consistently found to be more common in uncontrolled diabetics compared to controlled ones. In a study by Paron et al,[16] skin infections were found in 20% to 50% of cases of poorly controlled diabetes, with type 2 diabetics being the most commonly affected. Similarly, a

study by Wahid et al,[17] demonstrated cutaneous infections in 49% of all diabetic patients. Naheed et al,[18] from Lahore reported cutaneous infections in 62.2% of diabetics, while Mahajan et al [6]. found skin infections in 54.69% of diabetics. Baloch et al. [19] observed a prevalence of skin infection in 72% of diabetics, and Nawaf et al,[20] reported skin infection as the most common manifestation in their study.

Bacterial infections

Out of the 100 diabetic patients, 11 were found to have bacterial infections. The most commonly observed bacterial infection was furunculosis, which was seen in 3 patients (3%). This was followed by 2 patients each (2%) with folliculitis and cellulitis, and 1 patient each (1%) with ecthyma, erysipelas, abscess, and carbuncle. Similar findings were reported by Nigam et al. where out of 32 patients with bacterial infections, furunculosis was the most common (15 cases), followed by folliculitis (8 cases), cellulitis (3 cases), and two cases each of carbuncle, bacterial impetigo, and multiple abscesses.

Fungal infections

In a study of 100 patients, 38 were found to have fungal infections. The most commonly observed fungal infection was tinea corporis, which was seen in 14 patients (14%). This was followed by tinea cruris in 11 patients (11%), 4 cases (4%) of candidial balanoposthitis, and 3 cases each (3%) of candidial intertrigo and p. versicolor. Additionally, there were 2 cases (2%) of candidial vulvovaginitis and 1 case (1%) of chronic paronychia. Some patients presented with more than one fungal infection. According to reports by Mahajan et al,[6] Rao et al,[9] and Bhat et al,[11] fungal infections were the most common type of infection in diabetics. Mahajan et al,[6] reported 21 cases, Rao et al93 reported 59.42%, and Bhat et al,[11] reported 28.18% prevalence of fungal infections in diabetics. Mahajan et al,[6] study found a higher prevalence of dermatophytes, while Bhat et al,[11] study found a higher prevalence of candidial infections. A recent study by Gupta et al,[21] revealed that the rate of dermatophyte infections, particularly toe nail onychomycosis, was 2.77 times greater for patients with diabetes mellitus compared to controls. Several authors have suggested that mucocutaneous candida infections are more common among patients with diabetes mellitus, particularly those with poorly controlled disease. Vazquez et al,[22] and Stone et al. observed that 9.3% of diabetics showed candidiasis, in contrast to only 3.4% of nondiabetics.[23]

Viral infections

In the study, out of the 2 patients with viral infections, 1% had verruca vulgaris and 1% had herpes zoster. Similar frequencies were observed by Bhat et al,[11] and Al-Mutairi et al.[10] Interestingly, previous studies have not reported viral infections in diabetic patients. Out of the hundred patients studied, 4 presented with dermatoses due to microangiopathy, with 3% having diabetic dermopathy and 1% having diabetic bullae.

Most western studies report a high frequency of diabetic dermopathy at 50%, compared to 17.8% in Indian patients. Nigam et al,[8] reported 6 cases (3.5%) of diabetic dermopathy and 2 cases (1%) of diabetic bullae. Similarly, in their study of 100 diabetics, Mahajan et al,[6] found diabetic dermopathy in 6 patients and 2 cases of diabetic bullae.

CONCLUSION

Cutaneous manifestations of diabetes mellitus serve as external markers for impaired glycemic control. Thus dermatologists can play an important role in reducing dermatologic morbidity, improvement of quality of life and management strategy of diabetic patients.

REFERENCES

1. Perez MI, Kohn SR. Cutaneous manifestations of diabetes mellitus. J Am Acad Dermatol 1994;30:519–31.
2. Paron NG, Lambert PW. Cutaneous manifestations ofdiabetes mellitus. Prim Care 2000; 27:371–83.
3. Romano G, Moretti G, Di Benedetto A, et al. Skin lesions in diabetes mellitus: Prevalence and clinical correlations. Diabetes Res ClinPract 1998;39:101–6.
4. Shaikh BA, Shaikh WM, Solangi GA, Sangi SA, Abro HA Shaikh AM et al.
5. Diabetes Mellitus (Diagnosed & Undiagnosed) in acute myocardial infarction. Med Channel 2006;12(2):36–9.
6. Rafique G, Khuwaja AK. Diabetes and Hypertension: Public awareness and life style-Findings of a health mela. J Coll Physicians Surg Pak 2003; 13 (12): 679–83.
7. Mahajan S, Koranne RV , Sharma SK. Cutaneous manifestation of diabetes mellitus. Indian J Dermatol Venereol Leprol 2003;69: 105-8.
8. Sawhney M, Talwar OP, Tutakne MA, Rajpathak SD, diabetic dermoangiopathy : A clinico-pathological correlation. Indian J Dermatol Venereol Leprol.1992; 58:172-178.
9. Nigam PK, Pande S. Pattern of dermatoses in diabetics. Indian J Dermatol Venereol Leprol 2003; 69: 83-5.
10. Rao S, Pai G, Cutaneous manifestations of diabetes mellitus, Indian J Dermatol Venerol Leprol; 1997;63;4:232-34.
11. Al-Mutari N, Zaki A, Sharma KA , Al-Sheltawi M, Cutaneous manifestations in Diabetes Mellitus, Med Prince Pract, 2006;15:427-30.
12. Bhat JY, Gupta V, Kudyar PR, Cutaneous manifestations of diabetes mellitus, Int J Diab Dev Ctries, 2006;26:(4) 152-54.
13. Yosipovitch G, Hodak E, Vardi P, Shraga I, Karp M, Sprecher E et al. The prevalence of cutaneous manifestations in IDDM patients and their association with diabetes risk factors and microvascular complications. Diabetes care 1998: 21:506-9.
14. Raghunatha S, Anitha B, Inamdar AC, Palit A, Devarmani SS. Cutaneous disorders in 500 diabetic patients attending diabetic clinic.Indian J Dermatol, 2011:56(2):160-64.
15. Raghu TY, Vinayak V , Kanthraj GR, Girisha BS, Study of cutaneous manifestations of diabetes mellitus. Indian J Dermatol, 2004:49(2):73-75.
16. Kemmerly SA: Dermatologic manifestations of infections in diabetics. Infect Dis Clin North Am 1994; 8: 523–532.
17. Paron NG, Lambert PW (2000) Cutaneous manifestations of diabetes mellitus. Prim Care 27: 371-383.
18. Wahid Z, Kanjee A (1989) Cutaneous manifestation of diabetes mellitus. The J Pak Med Assoc 48: 304-305.
19. Naheed T, Akber N, Akber N, Shahzad M, Jamil S, Ali T. Skin manifestations among diabetic patients admitted in a

general medical ward for various other medical problems. Pak J Med Sci 2002;18(4):291–6.
20. Baloch GH, Memon NM, Devrajani BR, Iqbal P, Thebo NK. Cuatneous manifestations of Type-II diabetes mellitus. J Liaquat Uni Med Health Sci 2008;7(2):67–70.
21. Nawaf A, Amr Z, Ashok KS and Mazen A. Cuatneous manifestations of diabetes mellitus. Med Princ Pract 2006;15:427–30.
22. Gupta AK, Konnikov N, Macdonala P, Rich P, Rodger NW, et al. (1998) Prevalence and epidemiology of toenail onychomycosis in diabetic subject: A multicentic survey. Br J Dermatol 139: 665.
23. Vazquez JA, Sobel JD (1995) Fungal infections in diabetes. Infect Dis Clin North Am 9: 97-116.
24. Stone OJ, Mullins JF (1963) Incidence of chronic paronychia. JAMA 186: 71.