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Original Article

Frequency of Cutaneous Skin Manifestations Among Patients with Diabetes Mellitus at a Tertiary Care Hospital: A Cross-Sectional Survey

Sadaf Yousaf,[1] Muhammad Riaz,[2] Muhammad Irfan,[2] Naila Atif,[2] Qurat ul Ain Javaid,[2] Shiza Ghazal Javed[2]

[1]Central Park Medical College, Lahore, Pakistan, [2]Rashid Latif Medical College, Lahore

Abstract

Objective: To identify various types of skin-mediated complications of diabetes mellitus and their frequency of presentations in a tertiary care hospital.

Methods: It was a cross-sectional study carried out at Arif Memorial Teaching Hospital, Lahore. During the study, 200 diabetic patients were enrolled. Patients were assessed in detail on the basis of history taking and detailed dermatological examination. Data was analyzed for frequency of different types of skin manifestations and their correlation with diabetic control (as evidenced by HbA1c and BSR charting of patients).

Results: Out of 200 patients, 122 had poor control as indicated by a high HbA1c of above 7% and 78 patients had a good control of blood sugar as seen by HbA1c value of less than or equal to 7%. Among these patients, 162 patients had infectious cutaneous complications (81%), 67 patients had vascular mediated cutaneous manifestations (33.5%) and 141 patients had mixed vascular and infectious complications (70.4%).

Conclusion: Study concluded that majority of patients with diabetes mellitus presented with infectious cutaneous complications, followed by, mixed (vascular and infectious) complications and the least common mode of presentation was vascular complications of skin.

Keywords: Frequency, skin manifestation, diabetes mellitus, patients.

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Corresponding Author: Dr. Sadaf Yousaf **Email:** drsadafyousaf@yahoo.com

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Introduction

Diabetes mellitus is a common endocrine disorder, which affects the all ages as well as socioeconomic groups.[1] The disease is recognized through hyperglycemia due to either relative or absolute insulin insufficiency. Diabetes Mellitus is divided in two types: Type-1 is IDDM (insulin-dependent diabetes mellitus) while Type-2 is called NIDDM (non-insulin dependent diabetes mellitus).[2] Worldwide, about 463 million adult population has DM and among them, 90% suffer from T2DM (Type-2 diabetes mellitus). As reported by International Diabetes Federation, 26.7% Pakistani adults were affected due to diabetes in 2022 and the total cases were almost 33,000,000.[3]

DM is recognized to be a persistent disorder that affects several systems of the body. World Health Organization described that DM is one of the metabolic disorders of several etiologies characterized by persistent hyperglycemia with disorders of the fat protein and carbohydrate metabolism that occur caused by disturbance in insulin secretion and insulin action or both.[4] Persistent diabetes can cause irreversible and permanent modifications as well as damage to body cells, thus leading to several complications that mostly occur due to functional, structural and biochemical abnormalities.[5]

This disease can affect all systems of the body, including skin.[6] The skin manifestations incidence

related to DM differs from 11.3 percent to 70.6 percent.[7] Cutaneous manifestations associated with diabetes mellitus are categorized as follows: i) skin diseases with a weak to strong relationship with diabetes mellitus; ii) skin infections; iii) skin manifestations caused by diabetes mellitus complications; and iv) skin reactions to diabetes mellitus treatments.[8]

The diabetic cutaneous manifestations may differ depending upon the disease duration as well as glycemic control. Virtually, all individuals with diabetes mellitus eventually manifest skin changes caused by hyperglycemia long-term effects on the microcirculation as well as skin collagen. Also, anti-diabetic medication can be linked to cutaneous adverse effects.[9] Skin manifestations resulting from diabetes mellitus have a wide-ranging impact on patient health, spanning from cosmetic alterations to potentially life-threatening conditions.[10] Skin problems due to diabetes can offer evidence regarding past and current metabolic status of individual. Sometimes, skin disorder assessment helps in diagnosing the underlying diabetes. Among known individuals with diabetes mellitus, skin manifestations may also offer warning signs about probable systemic involvement. Furthermore, certain skin conditions might occur at a specific level of diabetes severity.[11]

Several factors play an important part in manifestations of diabetes mellitus cutaneous signs. Abnormalities in carbohydrates metabolism, metabolic pathways modification and vascular participation in the shape of microangiopathy, atherosclerosis as well as neuronal engagement in the shape of motor, sensory, autonomic neuropathies and host impaired mechanisms, all play an important part in diabetic dermopathy pathogenesis.[12] Early identification of cutaneous symptoms in individuals with DM is significant because it can help in adequate metabolic assessment, timely referral, prompt treatment and improving the diagnosis of diabetic individuals as well as decreasing the long-term effect of complications caused by diabetes.[13]

Although numerous international studies have explored skin manifestations in DM, region-specific data from Pakistan remains limited. Most published data originate from metropolitan hospitals or foreign settings, with varied patient demographics and clinical environments. However, local factors—including climate, healthcare access, glycemic control awareness, and treatment adherence—can significantly influence the prevalence and pattern of diabetic skin complications.

This study was conducted at Arif Memorial Teaching Hospital, Lahore, which caters to a diverse population, including underserved groups. It aims to identify the most common cutaneous manifestations among diabetic patients and analyze their association with glycemic control, thereby contributing valuable local evidence to support early detection and better clinical management.

Methods

It was a cross-sectional study conducted at Arif Memorial Teaching Hospital, Lahore, over three months, from July to September 2024. A total of 200 patients with confirmed Type-II diabetes mellitus were consecutively enrolled from the outpatient departments of endocrinology and dermatology during routine clinical visits. Patients were included if they were adults aged 18 or older, had been previously diagnosed with Type-II diabetes mellitus by a registered medical practitioner, and presented with visible cutaneous manifestations. Non-probability consecutive sampling included patients who met the inclusion criteria until the required sample size was achieved. The sample size (n = 200) was based on precedent from similar published studies and logistical feasibility within the study timeframe. Ethical approval was obtained from the Hospital Ethical Review Committee, and informed written consent was taken from all patients. To ensure that the cutaneous manifestations were diabetes-related, a detailed history was obtained to rule out other causes (e.g., medication reactions, autoimmune skin diseases, pregnancy-related changes, or systemic illnesses). Only skin conditions commonly associated with diabetes (e.g., diabetic dermopathy, fungal infections, necrobiosis lipoidica) were included. Each patient underwent a thorough dermatological examination conducted by a consultant dermatologist, and only those findings with a plausible pathophysiological link to diabetes, supported by published dermatological criteria, were considered. Patients with skin changes caused by pregnancy, iatrogenic factors and other systemic illnesses were excluded.

Informed written consent was obtained from each patient before participation. A detailed history was taken, followed by a comprehensive general, systemic, and dermatological examination. The clinical diagnosis of skin manifestations was established by a consultant dermatologist based on recognized dermatological criteria.

To assess glycaemic status, patients underwent HbA1c testing, and results were used to categorize

glycaemic control as either good (HbA1c ≤7%) or poor (HbA1c >7%), under the American Diabetes Association (ADA) guidelines. Although fasting blood sugar (FBS) and random blood sugar (RBS) were also recorded, they were used primarily for clinical validation and in immediate glycaemic context, and were not utilized in statistical analysis or subgrouping, hence not reported in the results section.

Based on clinical evaluation, skin manifestations were categorized into three types:

- Infectious (e.g., fungal, bacterial, viral infections),
- Vascular-mediated (e.g., diabetic dermopathy, necrobiosis lipoidica),
- Mixed (patients exhibiting both infectious and vascular features).

All clinical and laboratory data were documented on a structured proforma, designed specifically for the study.

The collected data were entered into SPSS version 25.0 and analyzed using the same software. Mean and standard deviation were used to represent quantitative variables like age. Descriptive variables like gender, diabetic control and type of skin manifestations were presented as frequencies and percentages. The chi-square test was used to determine the association of types of skin manifestations with diabetic control. P value ≤ 0.05 was considered significant.

Results

Table-1 depicts that among 200 patients, 74 (37.0%) were up to 40 years old and 126 (63.0%) were more than 40 years old while the mean age was 42.91±9.654 years.

Out of 200 patients, 69 (34.5%) were males and 131 (65.5%) were females.

Among 200 patients, 78 (39.0%) had good diabetic control (HbA1c ≤7%) and majority 122 (61.0%) had poor (HbA1c >7%) diabetic control while the mean HbA1c was 7.377±0.561%.

Table 2 demonstrates that among the 200 diabetic patients, 162 (81.0%) had infectious cutaneous complications, 67 (33.5%) had vascular-mediated manifestations, and 141 (70.5%) exhibited mixed features, i.e., overlapping infectious and vascular complications. These categories are not mutually exclusive, as some patients presented with more than one type of skin manifestation.

Table 1: *Characteristics of diabetic patients*

	Frequency	Percentage
Age		
≤40 years	74	37
>40 years	126	63
Total	200	100
Mean±SD	42.91±9.654	
Gender		
Male	69	34.5
Female	131	65.5
Total	200	100
Diabetic control		
Good control (HbA1c ≤7%)	78	39
Poor control (HbA1c >7%)	122	61
Total	200	100
Mean±SD	7.377±0.561	

Table 2: *Types of skin manifestations in diabetic patients*

	Yes		No	
	Freq.	%age	Freq.	%age
Infectious cutaneous complications	162	81	38	19
Vascular mediated cutaneous manifestations	67	33.5	133	66.5
Mixed vascular and infectious complications	141	70.5	59	29.5

Table-3 presents the correlation between skin manifestations and glycaemic control. Infectious Cutaneous Complications: Among the 162 patients with infectious complications, 84 (51.9%) had poor glycaemic control (HbA1c >7%), while 78 (48.1%) had good control (HbA1c ≤7%). Conversely, all 38 patients without infectious complications had poor glycaemic control, indicating a significant association ($p < 0.001$). Vascular-Mediated Cutaneous Manifestations: All 67 patients with vascular skin lesions had poor glycaemic control (100%). Among the 133 patients without vascular lesions, 78 (58.6%) had good control, and 55 (41.4%)

had poor control, again showing a statistically significant correlation ($p < 0.001$). Mixed (Infectious + Vascular) Complications: Of the 141 patients with mixed lesions, 92 (65.2%) had poor glycaemic control and 49 (34.8%) had good control. Among the 59 patients without mixed manifestations, 30 (50.8%) had poor control and 29 (49.2%) had good control. This association was not statistically significant ($p = 0.057$).

Table 3: *Correlation of skin manifestations with diabetic control*

Skin Manifestations	Diabetic Control		Total	P-value
	Good	Poor		
Infectious cutaneous complications				
Yes	78 (39.0%)	84 (42.0%)	162 (81.0%)	
No	0 (0.0%)	38 (19.0%)	38 (19.0%)	0
Total	78 (39.0%)	122 (61.0%)	200 (100.0%)	
Vascular mediated cutaneous manifestations				
Yes	0 (0.0%)	67 (33.5%)	67 (33.5%)	
No	78 (39.0%)	55 (27.5%)	133 (66.5%)	0
Total	78 (39.0%)	122 (61.0%)	200 (100.0%)	
Mixed vascular and infectious complications				
Yes	49 (24.5%)	92 (46.0%)	141 (70.5%)	
No	29 (14.5%)	30 (15.0%)	59 (29.5%)	0.057
Total	78 (39.0%)	122 (61.0%)	200 (100.0%)	

Discussion

Skin manifestations are common among patients with diabetes mellitus. The current study was carried out to assess the frequency of skin manifestation among diabetic patients. To acquire appropriate outcomes, a group of 200 patients with diabetic mellitus was included in the study and found that majority of the patients were more than 40 years old and the mean age was 42.91±9.654 years. However, the results of a similar study conducted by Sarwar and teammates highlighted that mean age of the patients was 52.4±9.96 years.[14] Another study undertaken by Kebria and fellows also confirmed that diabetic patients belonged to elderly age group as the mean age was 55±12 years.[6] However, Mandal and comrades confirmed in their study that mean age of patients with diabetes mellitus was 48.97±17.50 years.[11] A study done by Fahad and companions highlighted that patients mean age was 49.62± 10 years.[13] The differences observed in our study population compared to previously published literature may be attributed to several contextual factors. Firstly, our hospital is a tertiary care center located in an urban area, which may influence the type of patients referred, especially those with complications such as skin infections. Secondly, the higher proportion of female participants (65.5%) in our study contrasts with some studies reporting male predominance. This could be due to increased health-seeking behaviour among females in our region or gender-specific referral trends within dermatology clinics.

Additionally, the relatively younger mean age (42.9 years) of patients with skin manifestations may reflect earlier onset of Type-II diabetes mellitus in the South Asian population, as reported in local epidemiological data. Differences in climatic conditions, personal hygiene practices, and access to healthcare may also contribute to the higher prevalence of infectious skin complications observed in our population. Lastly, cultural and dietary factors, along with variations in disease awareness and glycaemic control strategies, can influence the pattern of skin manifestations and explain observed discrepancies with international studies.

As far as gender of the patients is concerned, this study showed that 65.5% were females and 34.5% were male patients. But the findings of a study carried out by Bose and Kumar exhibited different scenario and reported that majority (58.4%) of patients were males and 41.6% patients were females.[15] In their study Furqan and companions indicated that among patients, 58.0% were males and 42.0% were females.[16] However, the results of a study performed by Kameti and coworkers are comparable with our study results who also confirmed that most of the patients (58.5%) were females and 41.5% were male patients.[17] The observed differences in our study—particularly the higher proportion of infectious cutaneous manifestations and the greater number of female patients—may be attributed to several regional and contextual factors. The setting of our study, a tertiary care hospital in an urban area of Pakistan, likely receives more patients with advanced or complicated diabetic presentations, including skin infections. Additionally, the warm and humid climate, combined with limited access to early

dermatological care, may predispose diabetic patients to cutaneous infections.

The female predominance observed in our cohort may reflect greater healthcare-seeking behaviour among women, or local sociocultural patterns that influence clinic attendance. Furthermore, the younger mean age could be due to the early onset and increasing prevalence of Type-II diabetes mellitus among younger adults in South Asia, as documented in national epidemiological studies. These contextual differences may explain the variation from previously reported data in other regional and international studies.

In comparison to previous studies, the overall glycemic control among our participants appears slightly better, as 61.0% of patients had poor control (HbA1c >7%) compared to 68.0% reported by Niaz et al. Furthermore, the mean HbA1c in our cohort was 7.38%, which is lower than the 8.6% reported in their study. This difference may be attributed to improved disease awareness, earlier diagnosis, or more accessible diabetes management services in our urban tertiary care setting.[18] Another study performed by Kebria and fellows highlighted that mean HbA1c of patients was 8.0±1.7%.[6] The results of a study conducted by Hailat and collaborators also confirmed that HbA1c level of patients was 8.4±1.8 which was more than our patients who participated in the study.[2]

The findings of our study revealed that 81.0% patients had infectious cutaneous complications and 33.5% had vascular mediated cutaneous manifestations while 70.5% patients had mixed vascular and infectious complications. A study undertaken by Durgavathi et al. reported that cutaneous infections took place among 70.5% patients.[19] In a study Phulari and colleagues highlighted that infectious skin manifestations occurred among 61% patients while non-infectious skin manifestation among 39% patients.[20] The results of a study performed by Kavana and Kumar (2021) showed that 35.0% patients had cutaneous manifestation while 11.0% patients had pruritus.[21] Although pruritus is recognized as a common cutaneous symptom in diabetes mellitus, in this study, it was considered part of the clinical presentation of specific dermatological diagnoses (e.g., fungal infections or xerosis) rather than as an independent manifestation. Henry and Singh (2020) reported in their study that 53.0%, 10.0% and 0.8% patients had fungal, bacterial and viral infections, respectively.[5]

During study correlation of skin manifestations with diabetic control was assessed, significant association ($P<0.05$) was seen between cutaneous, vascular mediated and mixed cutaneous manifestations and glycemic control. A study done by Chaurasia and partners (2020) showed significant association ($P<0.05$) of poor diabetic control with bacterial, fungal and viral infections.[12] The findings of a study carried out by Mandal and comrades (2023) showed significant association between diabetic dermopathy and HbA1c ($P=0.012$).[11]

Conclusion

This study highlights that a significant proportion of patients with diabetes mellitus experience cutaneous manifestations, with infectious lesions being the most prevalent, particularly among those with poor glycemic control. These findings underscore the importance of early dermatological screening in diabetic patients as an integral part of comprehensive diabetes management.

Given the burden of skin-related complications, especially in poorly controlled diabetics, clinicians should be encouraged to incorporate routine skin examinations into outpatient diabetic care. Additionally, public health awareness campaigns and training of primary care providers can help in early identification and management of these conditions, reducing complications and improving quality of life.

Policy-level interventions such as integrating dermatological assessment into diabetes care protocols at the primary and secondary care levels may significantly enhance the early detection of complications and reduce hospital burden. Future multicenter studies are recommended to generalize these findings and to support the development of national guidelines for managing cutaneous manifestations in diabetic patients.

Ethical Approval: The IRB/EC approved this study via letter no. RLKUMC/IRB/0061, June 24, 2025.

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Authors' Contribution

SY: Conception

MR,MI: Design of the work

NA,QAJ,SGJ: Data acquisition, analysis, or interpretation

MI,NA,QAJ,SGJ: Draft the work

SY,MR: Review critically for important intellectual content

All authors approve the version to be published

All authors agree to be accountable for all aspects of the work

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