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# Cutaneous Disorder Associated Diabetes Mellitus

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**ABSTRACT**

Diabetes mellitus (DM) is a chronic disease that occurs in nearly all countries, with complications related to skin disorders affecting up to 30% of diabetic patients. Skin changes in DM or as a complication of DM represent a complex and multifactorial process. These changes can occur through various pathomechanisms due to pathological glucose levels, resulting in alterations to skin aspects and clinical manifestations. The skin changes arise from diverse factors, including lesions related to Diabetes Mellitus, infection, manifestations of Diabetes Mellitus complications, and lesions resulting from Diabetes Mellitus treatment. This review will examine the clinical manifestations, pathophysiology and general management of several skin manifestations in diabetic patients.

Cutaneous disorder, Diabetes mellitus, and manifestations

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## INTRODUCTION

Diabetes mellitus (DM) is a chronic disease that is prevalent in nearly all countries, and its incidence continues to increase concomitantly with lifestyle changes such as reduced physical activity and rising obesity rates. Skin disorders are observed in diabetes patients, with a prevalence of up to 30%. These manifestations can be categorised into four groups, skin lesions related to DM but not specific, skin changes due to diabetes complications, dermatological complications of diabetes treatment, and dermatoses that are more common in DM.[1] Skin manifestations may occur during the course of DM, serve as an early indicator of metabolic disease, or appear several years prior to DM diagnosis. This paper will examine the clinical presentation, pathophysiology, and general management of select skin manifestations in diabetes patients. Accurate diagnosis presents a greater challenge for clinicians and has a direct impact on the treatment approach, potentially minimising future comorbidities and complications that may affect other organs or systems.[1,2]

## ETIOPATHOGENESIS

Skin changes in DM or as a complication of DM are a complex and multifactorial process. These changes can occur through various pathomechanisms. An in vitro study demonstrated that DM negatively affects every cell parameter, not only directly through pathological glucose levels but also indirectly through the formation of advanced glycation end products (AGEs). Advanced glycation end products affect the biological function of numerous intra- and extracellular proteins, such as type 1 collagen, superoxide dismutase, and epidermal growth factor receptors. AGEs also activate proinflammatory cytokines, namely nuclear factor-KB (NF-KB),

and cause increased intracellular oxidative stress, including the formation of reactive oxygen species (ROS).[3,4]

Hyperglycaemia changes directly not only inhibit proliferation, migration, and protein biosynthesis in keratinocyte and fibroblast functions, but also induce endothelial cell apoptosis and inhibit nitric oxide (NO) synthesis by inhibiting the nitric oxide synthetase enzyme. Furthermore, these changes can impede ROS clearance, leading to vasodilation of blood vessels. Additionally, pathological glucose levels suppress chemotaxis and phagocytosis in various types of natural immune system cells.[4] In addition to the aforementioned pathways, pathological glucose levels also directly cause glycosylation of proteins, lipids, and nucleic acids. Ultimately, hyperglycaemia directly or indirectly induces the formation of advanced glycation end products (AGEs), which constitute the primary pathways.[3]

## CLINICAL MANIFESTATION

Skin manifestations in diabetes are primarily categorised into four groups [1]: (1) Skin lesions associated with Diabetes Mellitus (necrobiosis lipoidica, diabetic dermopathy, acanthosis nigricans, diabetic bullae, scleroderma diabeticorum); (2) Infections (bacterial and fungal); (3) Skin manifestations of Diabetes Mellitus complications (diabetic foot syndrome, Eruptive Xanthoma); (4) Skin lesions related to Diabetes Mellitus treatment (sulfonylureas or insulin).

Common conditions observed in DM patients include dry skin appearance (xerosis) accompanied by an immeasurable itch (pruritus), which is indicative of neuropathy. Certain skin conditions demonstrate a tendency to be associated with either type 1 or type 2 DM (Table 1).[5]

Table 1. Skin disorders are associated with Type 1 and Type 2 DM.

| DM type1 | DM type2 |
|---|---|
| Necrobiosis lipoidica diabeticorum | Generalised granuloma annulare |
| Diabetic bullae | Scleredema diabeticorum |
| Vitiligo vulgaris | Diabetic dermopathy |
| Periungual telangiaecstasia | Acathosis nigricans |
| Liken planus | Acrochordons |
| | Psoriasis |

## NECROBIOSIS LIPOIDICA

Necrobiosis Lipoidica (NL) typically manifests as erythematous papules, which gradually evolve into non-scaly yellow-brown plaques with atrophic centres and telangiectasias. NL is characterised as a chronic non-pruritic inflammatory granulomatous disease with collagen degeneration. This condition affects 0.3-1.6% of all diabetes patients, with a higher prevalence in females compared to males, and is predominantly localised in the tibial region of the foot, exhibiting symmetrical distribution.[5] Histopathological examination reveals collagen degeneration surrounded by granuloma reaction, thickening of the blood vessel walls and fat deposition.[4] In 35% of patients, lesions may ulcerate if accompanied by secondary bacterial infection. Topical steroids or intralesional injections are the primary treatment modalities; in cases resistant to steroids, chloroquine and cyclosporine may be administered.[6]

## DIABETIC DERMOPATHY

Diabetic Dermopathy (DD) occurs in approximately 9% – 55% of patients with Diabetes, predominantly in males, and may result from minor trauma.[6] It frequently manifests on the lower extremities and in older males. Clinical findings demonstrate erythematous, multiple, bilaterally asymmetric macules or papules with rapid growth. Lesions exhibit a recurrent course but resolve spontaneously. The healing process involves the formation of brown atrophic scars.[7] Research suggests that DD has a microangiopathic aetiology, necessitating investigation of other Diabetes-associated complications involving the microvasculature, including retinopathy and peripheral neuropathy. Furthermore, neuropathy may be an aetiological factor, and it is postulated that patients with peripheral neuropathy are more susceptible to trauma, leading to the

development of DD lesions. Reduced pain sensation may elucidate why individuals with these lesions tend to disregard their presence.[8,9]

## ACANTHOSIS NIGRICANS

Intertriginous hyperpigmented plaques in individuals with Diabetes are termed Acanthosis Nigricans (AN). This condition is frequently observed on the neck, axillae and hirsute regions. Hyperinsulinism induces keratinocyte hyperproliferation, as the binding of insulin to its receptor promotes the synthesis of insulin growth factor type 1 (IGF1), resulting in epidermal acanthosis. Elevated fasting insulin is characterised by increased HbA1c; however, it may occur in prediabetes with normal HbA1c values. Histopathological examination confirms hyperkeratosis with papillomatosis and acanthosis accompanied by hyperpigmentation. Moreover, AN may manifest in association with skin tags (achrocordon) and acral papillosis, potentially facilitating the screening for insulin resistance among the general population.[8]

## DIABETIC BULLAE

Diabetic Bullae (BD) may present as an early clinical manifestation of Diabetes. Throughout the course of the disease, approximately 0.5% of individuals with Diabetes develop blisters. BD blisters emerge rapidly and resolve within a few weeks. In patients with a history of chronic Diabetes, tense serous blisters can be observed without signs of cutaneous inflammation. These bullae are painless and are predominantly found on the lower extremities, particularly on the feet and plantar surfaces.[6]

## SCLERODERMA DIABETICORUM

Scleroderma diabeticorum (SD) affects 2.5%-14% of DM patients, predominantly those with type 2 DM. SD cases have not been reported in paediatric populations. The condition is clinically characterised by pronounced thickening and rigidity of the subcutaneous tissue, manifesting as symmetrical induration that originates in the upper back and neck region without associated pain. Lesions may extend to the face, shoulders, chest and abdomen. The affected area exhibits decreased sensation to pain and fine touch, accompanied by limited mobility of the upper extremities and neck. Scleroderma Adultorum of Buschke is frequently associated with type 1 DM, characterised by extensive scleroderma-like induration of the skin on the back, neck, shoulders, and face. This manifestation is attributed to the deposition of collagen and mucopolysaccharides in the skin, resulting in cutaneous thickening, rigidity, and impaired motility, particularly in the shoulder region.[9]

## GRANULOMA ANNULARE

The clinical presentation of granuloma annulare (GA) is characterised by erythematous papules that coalesce into circular formations on the dorsal surfaces of the feet and hands or joints. Although the pathogenesis linking GA and diabetes remains elusive, this condition frequently occurs in individuals with DM. GA is also commonly associated with infectious diseases, such as hepatitis and HIV, as well as neoplasms including lymphoma and carcinoma. The disease course is often asymptomatic, with lesions healing through central involution accompanied by hypo- or hyperpigmentation.[10,11]

## VITILIGO

Vitiligo is characterised by skin depigmentation that presents with a prevalence of 2-10% in patients with type 1 DM. The mechanism of this depigmentation remains unknown; however, it is hypothesised that polyglandular autoimmune syndrome (PAS) and endocrinopathy are potential mechanisms underlying type 1 DM itself. Lesions affect the extremities, face, and neck as well as the trunk, in a symmetrical distribution. Vitiligo is readily diagnosed and manifests spontaneously with a progressive course.[9]

## ACHROCORDON (SKINTAG)

Skintag is a small, pedunculated, soft protrusion characterised by hyperpigmentation or skin-coloured fibroma, typically localised on the eyelids, neck, axilla, or groin. Approximately 25% of DM patients were found to

exhibit skintag manifestations. The majority of fibromas are asymptomatic and do not necessitate therapy. Skintags have also been associated with glucose metabolism disorders, including type 2 DM, hyperinsulinaemia, and insulin resistance.[8]

## LICHEN PLANUS

Lichen planus is an uncommon skin disorder, affecting less than 1% of the general population. The prevalence of lichen planus in patients with type 1 and type 2 DM is approximately 2-4%. Clinical findings demonstrate polygonal erythematous papules, pruritus, with white striae (Wickham striae), typically located on the ankles and wrists, and mucosal involvement is observed. Lichen planus is a dermatological condition that can be triggered mechanically, one manifestation of which is known as the Koebner phenomenon, which can also be observed in psoriasis. Other systemic diseases are also associated with lichen planus, such as liver and bowel malignancies and thymoma.[10]

## CONCLUSION

Cutaneous manifestations in patients with Diabetes Mellitus (DM), although frequently observed, often remain undiagnosed. These manifestations represent common complications and disorders that occur extensively in both type 1 and 2 DM, ranging from xerosis and pruritus to cutaneous infections that may lead to complications. Dermatological changes are evident in approximately 30% of individuals with diabetes. These changes may serve as precursors to diabetes and thus warrant recognition. Patients with diabetes should undergo regular examinations not only by an internist but also by a multidisciplinary team including a dermatologist. Furthermore, the diagnosis of DM should be considered in previously undiagnosed patients presenting with characteristic cutaneous conditions, such as recurrent candidiasis.

## DECLARATIONS

None

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## AUTHORS' CONTRIBUTIONS

All authors are contributed in the entire process of the study, including the preparation, data collection, analysis, as well as conceptualized the study and for the publication of this original article.

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## REFERENCE

1. Macedo GMC, Nunes S, Barreto T. Skin disorders in diabetes mellitus: an epidemiology and physiopathology review. Diabetology & Metabolic Syndrome. 2016 Aug 30; 8(1): 1-9.
2. Salari N, Hosseinian-Far A, Hosseinian-Far M, Kavoussi H, Jalali R, Vaisi-Raygani A, et al. Evaluation of skin lesions in diabetic patients: a systematic review and meta-analysis. Journal of Diabetes & Metabolic Disorders. 2020; 19(1): 1-10.

3. Azizian Z, Behrangi E, Hasheminasabzavareh R, et al. Prevalence Study of Dermatologic Manifestations among Diabetic Patients. Advances in Preventive Medicine. 2019; 2019: 1-5.
4. Fatima K, Naheed A, Khan SA. Skin Manifestations of Diabetes Mellitus. Journal of Rawalpindi Medical College. 2018; 22(3): 252-255.
5. Sugimoto K, Murakami H, Deguchi T, et al. Cutaneous microangiopathy in patients with type 2 diabetes: Impaired vascular endothelial growth factor expression and its correlation with neuropathy, retinopathy and nephropathy. J Diabetes Investig. 2019; 10(6): 1318-1331.
6. Hines A, Alavi A, Davis MDP. Cutaneous Manifestations of Diabetes. Med Clin North Am. 2021; 105(4): 681-697.
7. Van Hattem S, Bootsma AH, Thio HB. Skin manifestations of diabetes. Cleveland Clinic Journal of Medicine. 2008 Nov 1; 75(11): 772-787.
8. Duff M, Demidova O, Blackburn S, Shubrook J. Cutaneous Manifestations of Diabetes Mellitus. Clinical Diabetes. 2015 Jan; 33(1): 40-48.
9. Pal RS, Wal P, Pal Y, Wal A. Recent Insights On Diabetic Dermopathy. The Open Dermatology Journal. 2019 Feb 28; 13(1): 8-12.
10. Sanches MM, Roda Â, Pimenta R, et al. Cutaneous Manifestations of Diabetes Mellitus and Prediabetes. Acta Med Port. 2019; 32(6): 459-465.
11. Zhang S, Cai Y, Meng C, et al. The role of the microbiome in diabetes mellitus. Diabetes Res Clin Pract. 2021; 172: 108645.