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Spectrum of Cutaneous Manifestations of Diabetes Mellitus: An Observational Study from a Tertiary Care Hospital

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Abstract:

Background: Diabetes mellitus (DM) is the most common endocrine disorder. It exhibits a variety of multisystem complications involving the blood vessels, skin, eye, kidney, and the nervous system during the course of the disease process. The skin shares both the effects of acute gross metabolic derangement and chronic degenerative changes of diabetes, as it is an actively metabolizing tissue.

Materials and Methods: This is prospective and observational study conducted in the Department of Dermatology, Narayana Medical College, Nellore. Patients diagnosed to have DM after the age of 30 years, including known cases of type 2 DM already on treatment or newly detected diabetic patients, based on the American Diabetic Association criteria. The cutaneous features in diabetics were compared with that of normal controls. An attempt was made to find out any association between cutaneous features of DM and internal organ involvement due to diabetes.

Results: This study showed that in specific cutaneous disorders, Dermatophytosis was present in 12(17.1%) patients in controlled group and 23(32.9%) patients in uncontrolled group. Candidiasis was present in 11(15.7%) patients in controlled group and 22(31.4%) patients in uncontrolled group. Bacterial Infection was present in 13(18.5%) patients in controlled group and 26(37.1%) patients in uncontrolled group. Acanthosis Nigricans was present in 8(11.4%) patients in controlled group and 24(34.3%) patients in uncontrolled group. Acrochordon was present in 18(25.7%) patients in controlled group and 32(45.7%) patients in uncontrolled group. Onychomycosis was present in 7(10.0%) patients in controlled and 1 1 (15.7%) patients in uncontrolled group.

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Conclusion: This study shows the prevalence and variety of DM skin and nail manifestations in an effort to further acquaint dermatologists and other clinicians with diabetic dermatologic manifestations. This study provides an overview that may facilitate earlier detection and treatment of the disorder. Also, this matter can help physicians and endocrinologists to have a visualized idea of DM control and situation.

Keywords: Cutaneous Manifestations, Diabetes mellitus, Diabetic dermopathy.

Introduction

Diabetes mellitus (DM) is the most common endocrine disorder. It exhibits a variety of multisystem complications involving the blood vessels, skin, eye, kidney, and the nervous system during the course of the disease process. Abnormal carbohydrate metabolism, other altered metabolic pathways, atherosclerosis, microangiopathy, neurone degeneration, and impaired host mechanisms all play roles. Although some cutaneous reactions are secondary to treatment, simple skin manifestation may be the first clue to an underlying deadly disease not less than diabetes. This has stimulated interest to all diabetic care providers, inclusive of dermatologists for development of an early detection system for markers of DM, of which skin is a vital organ and which demands due honor in the work up list in connection with diabetes mellitus. [1]

The condition of skin has long provided clues to the presence of diabetes. This includes frequent infections, dryness, nonspecific pruritus etc. In the last few years many new associations between diabetes mellitus and the skin have been noted and we have a better understanding now of the pathophysiology of some diabetic complications. Microcirculatory alteration, glycosylation of different proteins with production of advanced glycosylated end product and their subsequent deposition in the basement membrane and alterations in the lipid profile results in changes of the skin condition of diabetic patients. [2]

Diabetes and/or hypercholesterolemia alter the skin structure as well as the function, and fish oil-supplementation scavenges the free radicals and changes the skin structure and function of rats subjected to diabetes and or hypercholesterolemia. Insulin affects the utilization of glucose in skin and is required for growth and differentiation of keratinocytes and fibroblasts. In animal studies, it was shown that maternal diabetes and/or hypercholesterolemia increased the average deformation of hair follicles, vacuolation, and degeneration of epidermal cell layers. Ultra-structure and size of human coenocytes in the upper stratum corneum layer of skin are changed in diabetic subjects. [3]

A significant number of diabetic patients in skin out door and diabetic clinics are presenting different types of dermatological manifestations. This study was conducted to learn about demographic characteristics of subjects with diabetes having cutaneous manifestations and to note the clinical patterns of dermatological manifestations of DM.

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Materials and Methods

This is prospective and observational study conducted in the Department of Dermatology, Narayana Medical College, Nellore.

Inclusion criteria

Patients diagnosed to have DM after the age of 30 years, including known cases of type 2 DM already on treatment or newly detected diabetic patients, based on the American Diabetic Association criteria (symptoms of diabetes and random plasma sugar >200 mg/dl or fasting plasma sugar >126 mg/dl or >200 mg/dl 2 h after 75 g oral glucose or hemoglobin A1c >6.5%) were included in this study. [1]

Exclusion criteria

Patients with known comorbid conditions requiring long-term steroid therapy and patients suffering from immunocompromised conditions, type 1 DM, pulmonary tuberculosis, collagen vascular diseases, thyroid disorders, and primary dermatological conditions were excluded from the study.

Controls (who do not have diabetes confirmed by blood investigations) were selected from the bystanders of patients attending the dermatology OPD of our Institute.

Using a preset preformat, information on demography and evolution of skin manifestations were collected from each subject, including the treatment received. A thorough clinical examination was carried out to document the mucocutaneous lesions in natural light with special reference to infections, xanthoma, acanthosis nigricans, necrobiosis lipoidica, rubeosis, dermopathy, diabetic bulla, gangrene, trophic ulcer, sensory neuropathy, lipodystrophy, finger pebbles, skin tag, scleredema diabeticorum, granuloma annulare, perforating disorder, earlobe crease, and limited joint mobility in cases and controls.

Blood sugar level was determined on venous samples. Urine microscopy, renal function tests, fasting lipid profile, electrocardiogram, 24 h urine protein estimation, and fundoscopy were performed wherever indicated. Histopathology and microbiology analyses were carried out wherever necessary to confirm the diagnosis.

Statistical Analysis

The data were entered in Microsoft Excel and comparison between cases and controls was done using Pearson Chi-square test ($P < 0.03$ was considered as significant).

Results

Out of 70 patients, 37 (52.8%) patients were males and 33 (47.1%) were females in table 1.

Table 1: Distribution of Gender of Diabetic patients

Gender	Frequency	Percentage
Male	37	52.8
Female	33	47.1

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Total	**70**	**100**

Table 2: Distribution of Age of Diabetic patients

Age Group	Frequency	Percentage
30-40	13	18.5
41-50	17	24.2
51-60	19	27.1
61-70	21	30
Total	**70**	**100**

Table 3: Duration of DM Type - 2

Duration of DM Type - 2	Frequency	Percentage
<3 years	28	40.0
3-5 years	19	27.1
5-7 years	14	20.0
>7	9	12.8
Total	**70**	**100**

In table 3, 28 (40%) patients had DM Type-2 since the last 3 years, 19 (27.1%) patients since last 3-5 years and 9 (12.8%) patients since more than 7 years in table 3.

Table 4: Characteristic of diabetic patients in controlled and uncontrolled group of Specific disorder

Specific disorder	Controlled Group	Uncontrolled Group	P value
Dermatophytosis	12(17.1%)	23(32.9%)	<0.05
Candidiasis	11(15.7%)	22(31.4%)	<0.05
Bacterial Infection	13(18.5%)	26(37.1%)	<0.05
Acanthosis Nigricans	8(11.4%)	24(34.3%)	<0.05
Acrochordon	18(25.7%)	32(45.7%)	<0.05
Onychomycosis	7(10.0%)	11(15.7%)	<0.05

In table 4, Among the specific disorders, Dermatophytosis was present in 12(17.1%) patients in controlled group and 23(32.9%) patients in uncontrolled group. Candidiasis was present in 11(15.7%) patients in controlled group and 22(31.4%) patients in uncontrolled group. Bacterial Infection was present in 13(18.5%) patients in controlled group and 26(37.1%) patients in uncontrolled group. Acanthosis Nigricans was present in 8(11.4%) patients in controlled group and 24(34.3%) patients in uncontrolled group. Acrochordon was present in 18(25.7%) patients in controlled group and 32(45.7%) patients in uncontrolled group. Onychomycosis was present in 7(10.0%) patients in controlled and 1 1 (15.7%) patients in

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uncontrolled group.

Table 5: Characteristic of diabetic patients in controlled and uncontrolled group of Non-Specific disorder

Non-Specific disorder	Controlled Group	Uncontrolled Group	P value
Generalized Pruritus	12 (17.1%)	24(34.3%)	<0.05
Xerosis	18 (25.7%)	32 (45.7%)	<0.05

In table 5, Among the non-specific disorders, Generalized Pruritus was present in 12 (17.1%) patients in controlled group and 24(34.3%) patients in uncontrolled group. Xerosis was present in 18 (25.7%) patients in controlled group and 32 (45.7%) patients in uncontrolled group.

Discussion

The purpose of this study was assessing the prevalence and variety of DM skin and nail manifestations to further acquaint dermatologists and other clinicians with diabetic dermatologic manifestations. The results of this study con-firmed our hypothesis that identifiable skin conditions have a very high prevalence amongst diabetic patients.

In our sample of diabetic patients, DM type 2 was more prevalent like most of the random diabetic patients' samples. Our study subjects were about male predominant. The older age and longer DM duration had a meaningful relationship with diabetic retinopathy, nephropathy, and neuropathy. The average age and disease duration in patients with these disorders were significantly higher than in non-affected patients. Literature has shown the effect of obesity on DM and even on diabetic cutaneous manifestations but this effect does not become significant under the BMI of 30 kg/m2 such as our study sample. [4] Cutaneous manifestations were generally observed in 88.4%; there is thus a relative consistency between our study and previous studies in this domain. [5] In the study of Chatterjee et al. 67% of subjects showed more than one cutaneous manifestation.

In our study 76% of patients had more than one cutaneous manifestation. A review of different researches indicates a wide variety of reported prevalence for different types of cutaneous manifestations in diabetic patients. Xerosis and Androgenic Alopecia were two main common cutaneous disorders detected among our patients. Skin tag, facial erythema, shin spot, and lentigo were, respectively, the most prevalent cases afterwards. Ridging nail (7.6%) was the most common nail manifestation detected. In a research conducted by Goyal et al. on 100 diabetic patients, Xerosis was reported as the most common cutaneous manifestation with a prevalence of 44% and was followed by skin dermopathy and diabetic tags. [6]

Cutaneous infections and diabetic dermopathy were the most common cutaneous manifestations in the study of Furqan et al. in 2014 on 100 diabetic patients with DM types 1 and 2. [7] Infections, Xerosis, below knee hair loss, and diabetic dermopathy were the most common cutaneous manifestations in the study of Chatterjee et al. and in the study of Vahora

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et al. [8] on 300 diabetic patients; infections and acanthosis nigricans were reported as the most common cutaneous manifestations. Ragunatha et al. [9] showed signs of insulin resistance, and fungal and bacterial infections are the most common manifestations. [10]

Among cutaneous manifestations, acanthosis nigricans, acral erythema, and onychoschizia showed a significant relationship with age and disease duration; and knuckle pebbles, eczema, facial erythema, and koilonychias had a meaningful relationship with fasting blood sugar level and hemoglobin HbA1c. Chatterjee et al. [11] conducted a study to investigate the prevalence and pattern of skin disorders on 680 diabetic patients; they did not find a statistically significant relationship between the occurrence of cutaneous diseases and metabolic glucose control. [12] In our study, only cutaneous manifestations of acral erythema, acanthosis nigricans, and onychoschizia showed a significant relationship with the age and disease duration; this fact may also indicate that most DM cutaneous manifestations are not associated with the age and disease duration. In the descriptive study by Ragunatha et al. in 2011 with the purpose of investigating the effect of DM control on the occurrence of cutaneous manifestations in 500 diabetic patients, there was no statistically significant difference in patients in terms of age, gender, DM duration, and fasting plasma glucose. [13]

However, in the study of Chatterjee et al., a statistically significant relationship was reported between cutaneous manifestations and DM duration. [14] Also, according to the results of a study conducted by Al-Mutairi et al. [15] on 320 diabetic patients, in patients with less than 5-year DM duration, the prevalence of cutaneous manifestations was 80%, whereas in patients with more than 5-year duration, the prevalence of cutaneous manifestations was 98%, and this difference was statistically significant ($p<0.001$). [16]

Conclusion

DM is a common endocrine disorder that frequently accompanies skin manifestations—up to 80% of patients with DM are affected. Recognition of the clinical features of DM is critical, as delayed detection and untreated disease may result in a significantly reduced quality of life. Dermatologists are poised for the early detection of skin manifestations of DM, as diabetic ulcers predate its development in many of patients. Until recent decades diabetic foot ulcer was the only diabetic skin manifestation that attracted authors' notification. This study shows the prevalence and variety of DM skin and nail manifestations in an effort to further acquaint dermatologists and other clinicians with diabetic dermatologic manifestations.

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