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Frequency and Association of Cutaneous Manifestations of Diabetes Mellitus with HbA_{1c}

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SUMMARY

Diabetes mellitus is the most common endocrine disorders associated with disturbed metabolism. Glycosylated haemoglobin (HbA_{1c}) is one parameter of checking blood glucose control in diabetics over the past 3 months. We concluded a study to look for skin disorders due to diabetes mellitus and to see correlation between control of blood sugar (HbA_{1c}) and cutaneous manifestations. It was a cross sectional study. The study was carried out from 1st January 2003 to 31st March 2003 in the Department of Medicine and Dermatology, Shaikh Zayed Hospital, Lahore. A total of 200 patients of diabetes mellitus admitted as inpatient and attending Outpatient Department of Medicine were studied. Patient's history, dermatological and systemic examination were recorded. Their blood was collected for estimation of random blood sugar, complete blood count, blood urea, serum creatinine, serum electrolytes, serum lipid profile whereas HbA_{1c} was determined by chromatographic method. Normal range of HbA_{1c} was taken as 5-7%. HbA_{1c} of $\geq$ 7% was taken as high and HbA_{1c} value of <7% was taken as normal. Of 200 patients, 116 (58%) patients were found to have cutaneous abnormalities, 127 (63.5%) patients had high HbA_{1c} value and 73 (36.5%) patients had normal HbA_{1c} value. In patients having high HbA_{1c} value, 90 (70%) patients had cutaneous disorders. Among those patients who had normal HbA_{1c} value 26 (35.6%) patients had skin abnormalities. This correlation was found to be statistically significant (P <0.002). Prevalence of cutaneous disorders in diabetes mellitus is 58%. Cutaneous manifestations are more common in patients who have overall poor glycemic control which in turn is reflected by high HbA_{1c} value (Normal= 5-7%).

Key Words: Diabetes mellitus, Glycosylated haemoglobin (HbA_{1c}), Dermatological manifestations.

INTRODUCTION

Diabetes mellitus is a syndrome with disordered metabolism and inappropriate hyperglycemia due to either deficiency of insulin secretion or a combination of decreased insulin secretion and increased insulin resistance.

Diabetes mellitus is associated with a number of skin diseases. Incidence of cutaneous manifestations varies from 30-71%.[1] Cutaneous manifestations of diabetes mellitus can be categorized on the basis of their most probable origin.[2] Some cutaneous diseases like diabetic dermopathy, diabetic rubiosis, diabetic thick skin, Dupuytren's contractures, eruptive xanthomas, vitiligo, haemochromatosis, acanthosis nigricans, necrobiosis lipoidica, granuloma annulare, lichen planus, periungual talengiectasias and pigmented purpura are strongly associated with diabetes mellitus. Skin manifestations related to infection include fungal and bacterial infections. Microangiopathy associated with diabetes mellitus leads to diabetic foot ulcers and diabetic gangrene. Treatment related complications include insulin lipoatrophy, insulin lipohypertrophy and phototoxic and allergic reactions due to oral hypoglycemic agents. Uncontrolled diabetes mellitus predisposes to cutaneous abnormalities like skin infections and eruptive xanthomas.[3] Skin infections in type-2 diabetes mellitus are associated with poor metabolic control and higher mean HbA_{1c} value.[4] There is no local study about association of cutaneous changes

in diabetes in connection with levels of HbA_{1c}. This study was conducted to determine the prevalence of skin abnormalities and their correlation with variable HbA_{1c}.

PATIENTS AND METHODS

Two hundred patients of diabetes mellitus visiting diabetic clinic or admitted in Medical Wards of Shaikh Zayed Hospital were studied from 1st January 2003 to 31st March 2003.

Patients of type 1 diabetes mellitus were defined as those having age < 40 years and of type 2 diabetes mellitus having their age ≥40 years.

Patient's detailed history, dermatological and systemic examination was recorded on a proforma. Their blood was collected for estimation of random blood sugar, complete blood count, blood urea, serum creatinine, serum electrolytes, serum lipid profile and HbA_{1c} by chromatographic method. Normal range of HbA_{1c} was taken between 5-7%. A value <7% was taken as normal and value ≥7% was taken as high. (Normal = 5-7%)

Student t-test was used for statistical analysis.

RESULTS

Out of 200 patients, 21 (10.5%) patients were suffering from type-I diabetes mellitus and 179 (85.5%) patients were suffering from type-2 diabetes mellitus. Eighty-seven patients (48%) of type-2 diabetes mellitus were male and 92 (51.3%) patients were female. Ten (47.6%) patients of type-1 diabetes mellitus were male and 11 (51.3%) patients were female. Mean duration of diabetes mellitus was 7.1±0.89 years and 6.8±0.84 years in type-1 and type-2 diabetes mellitus respectively. Mean duration of diabetes mellitus was almost same in both groups.

Cutaneous abnormalities were observed in 116 (58%) patients as shown in Table 1. Among these patients, 57 (49%) were male and 49 (50.86%) patients were female. Thirteen patients (11.2%) were suffering from type-1 diabetes mellitus and 103 (87.7%) patients were suffering from type-2 diabetes mellitus.

Most prevalent cutaneous abnormality was cutaneous infections which were observed in 44 (23%) patients. Fungal infections were observed in 25 patients (13.5%) and bacterial infections were observed in 19 patients (9.5%). Xanthomas were observed in 5 patients (2.5%). Granuloma annulare in one (1%) patient and diabetic dermopathy was observed in 12 patients (6%).

Table 1: skin lesion and HbA_{1c} (n=116)

Skin lesions	HbA_{1c}		Total
	> 7%	< 7%	
Granuloma annulare		1	1
Vitiligo	4		4
Xanthelasma	5		5
Lichen planus	1		1
Diabetic thick skin	7		7
Scleroderma of DM	7		7
Seborrhic dermatitis	1		1
Diabetic foot	4		4
Paronychia	1	2	3
Carbuncle	5	1	6
Impetigo	5	1	6
Cellulitis	2	2	4
Tinea pedis	9	1	10
Tinea cruris	2	1	3
Tinea capitis	1	1	2
Oral candidiasis	1		1
Onychomycosis	5	2	7
Rubiosis fascie	3		3
Allergic reaction to metformin	5		5
Insulin lipoatrophy	3	1	4
Pruritis	6		6
Necrobiosis lipoidica	1	1	2
Eruptive xanthomas	1	1	2
Acanthosis nigricans	1	2	3
Callus on foot	1	1	2
Shoe dermatitis		1	1
Finger pebbles		2	2
Diabetic dermopathy	7	5	12
Vaginal candidiasis	2		2
TOTAL	**90**	**26**	**116**

Diabetic thick skin was observed in 7 (3.5%) patients, scleroderma in 7 (3.5%) patients, finger pebbling in 2 (0.5%) patient, diabetic foot in 4 (2%) patients, diabetic rubiosis in 3 (1.5%) patients, lichen planus in one patient (0.5%) vitiligo in 4 patients (2%) and seborrhoeic dermatitis was observed in one (0.5%) patient.

Generalized pruritis in the absence of any obvious skin lesion was observed in 6 (3%) patients. Necrobiosis lipoidica was observed in 2 (1%) patients. Skin complications related to treatment of diabetes mellitus was observed in 9 (4.5%) patients in the form of allergic reactions to metformin (n=5) and insulin lipoatrophy (n=4). Eruptive xanthomas were observed in 2 (1%) patients, acanthosis nigricans in 3 (1.5%) patients, shoe dermatitis in 1 (0.5%) patient and callus on the foot was observed in 2 (1%) patients.

When patients with abnormal levels of HbA_{1c} were studied it was observed that 127 (63.5%) patients had HbA_{1c} value of $\geq$7% (normal = 5-7%). Out of these 127 patients, 90 (70.7%) were suffering from cutaneous abnormalities. Seventy-three patients (36.5%) had normal HbA_{1c} value (<7%) and out of these 26 patients (35.6%) had the skin disease.

DISCUSSION

Diabetes mellitus is an endocrine disorder with multisystem involvement. Skin involvement is quite common and it has approached to 30-100% in some studies.[1,3,5] In this study an incidence of 58% is recorded. Sex and duration of diabetes mellitus has no effect on frequency of skin lesions.

Common observation in this study was that cutaneous infections were observed in 23% patients. An incidence of 20-50% is reported.[3,6] Uncontrolled diabetes mellitus produces infections that are generally resistant to treatment.[4,6] Fungal infections were more common observation than the bacterial infections.

In studies done previously, diabetic dermopathy was reported as most common cutaneous abnormality with an incidence of 12.5-70%.[3,5] In this study it was observed in 6% patients. No definite reason was found for that. Diabetics have high incidence of skin thickness which is reported in the range of 8-50%.[8] In our study 8% of patients presented with this problem.

Xanthelasmas are generally associated with dyslipidemias, however these patients may have normal serum lipid levels.[9] In this study, 2.5% patients had xanthelamas. All these patients were suffering from type-2 diabetes mellitus and these patients had high mean serum cholesterol value.

Granuloma annulare was observed in 1 (0.5%) patient who had type-2 diabetes where none of the type-1 diabetics had this. In a previous study done its association was described with type-I diabetes mellitus.[10]

Vitiligo is an autoimmune disorder appearing with increased frequency ofabout 9% in type-1 diabetics.[11] In type-2 diabetes mellitus 4-5% cases are reported.[12] In this study, vitiligo was observed in 2% patients and they were all suffering from type-2 diabetes mellitus.

Diabetic foot lesion causes diabetic foot ulcer and gangrene. Twenty percent of diabetic patients were hospitalized only because of diabetic foot.[13] In this study diabetic foot ulcers were observed in 2 (1%) patients and 2 (1%) patients had amputation of toes, all having type-2 diabetes mellitus.

Incidence of diabetic rubiosis is reported as 3-59%.[14] In this study it was observed in 1.5% patients of type-2 diabetes mellitus.

Lichen planus was observed in 1 (.5%) patient on flexor aspect of both legs. Previously an incidence of 1.6 - 3.8% is reported.[4, 13]

Eruptive xanthomas are the common presentation of disorders of lipid metabolism.[15] In this study they were recorded in 2 (1%) patients of type-2 diabetes mellitus. In studies done previously an incidence of 60% is reported for acanthosis nigricans. In this study it was observed in 1% of patients.[16] Similarly necrobiosis lipoidica was observed in 1.5% of patients while an incidence of 0.3-1.5% is reported in previous studies.[17] Diabetics have high incidence of skin thickness reported in the range from 8-50%.[7] In this study 8% of patients presented with these problems.

Diabetics are prone to develop a reddish complexion secondary to engorgement of superficial vessels of face. An incidence of 3-59% has been reported.[2] In this study it was observed in 3 (1.5%) patients of type-2 diabetes mellitus. Generalized pruritis was recorded in 6 patients (3%) in the absence of any other skin pathology. Other skin disorders related to diabetes mellitus like dupuytren's contracture, haemochromatosis, periungual talengiectasias, pigmented purpura perforating dermatoses etc. were not observed in this study.

If we compare this study with two other studies done in Pakistan, it was found that cutaneous infections are more prevalent in our population. They show no difference from our study.[3,18] All confirming that cutaneous infections are more prevalent in diabetics.

In this study HbA_{1c} was used as a parameter for checking overall control of blood glucose over the last three months. It was observed that patients having high HbA_{1c} had significantly high prevalence of cutaneous disorders ($P < 0.002$).

CONCLUSIONS

As regards complications of diabetes mellitus, skin diseases constitute an important aspect of dermatological manifestation. It's frequency in patients with diabetes mellitus is 58%. The commonest skin lesion observed in our population is cutaneous infection. Cutaneous manifestations are strongly associated with poor glycemic control which inturn is reflected by high mean HbA_{1c} value. To minimize these manifestation and complication, a strict control of diabetes mellitus is mandatory.

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