Dermatological Manifestations among Diabetic Patients Attending Diabetes Centers in Mosul City

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ABSTRACT

Background: Skin manifestation is an important issue involving the rising epidemic of diabetes mellitus as it can precede or complicate the disease.
Objectives: To assess the point prevalence and patterns of skin manifestations in patients with diabetes mellitus attending diabetes centers in Mosul City.
Methods: A cross-sectional study that covered 674 diabetic patients taken from two diabetic centers. A special questionnaire form was prepared using simplified and summarized questions. Data collected from the 11th of December 2011 to the 20th of May 2012.
Results: Statistical analysis of data revealed a point prevalence of 100%. Most of patients had non-insulin dependent diabetes mellitus (66.5%), the mean age of 48±13.76 years. About two thirds of patients (64.7%) had uncontrolled diabetes mellitus with HbA1c of > 6.5% and 61.9% had a duration of 5 to 10 years. Infections represented a highest proportion of skin manifestations among diabetic patients (39.9%) of which fungal infections constituted 59%. Skin manifestations of diabetic complication was the second most common type (22.7%) of which diabetic shin spot represented 52.2%. Skin reaction to diabetic treatment is the third in frequency of occurrence (22.1%); with a highest proportion (23.0%) among insulin dependent diabetes mellitus. The lowest proportion of skin manifestations is that due to skin lesions with strong to weak association (16.3%) of which pruritus represented 43.6%.
Conclusions: Skin manifestations in diabetic patients are common, so to be considered by clinical staff and health educational personnel dealing with diabetic patients.
Keywords: Skin; Dermatological manifestations; Diabetes mellitus; Mosul City.

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The term diabetes mellitus (DM) describes a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both[1]. DM affects more than 120 million people, a prevalence that has risen dramatically over the past two decades worldwide and estimated to affect 220 million by 2020[2]. In the Arabian countries prevalence of DM was 20%,10.4%,10%, 9.3%, 6.57% reported in the UAE, Sudan, Oman, Egypt and Yemen, respectively, however, in Mosul the reported prevalence was 10.4%[3-8].
Skin; being the largest organ of the body, is affected by acute metabolic derangements and chronic degenerative complications of diabetes[4].

Documented studies have shown the incidence of cutaneous disorders associated with diabetes to be between 30 to 71%[9,10]. DM is associated with a number of skin manifestations that appear subsequent to the development of DM, but may be the first presenting sign or might even precede the diagnosis by many years[11]. For example, diabetic bullae, and the scleroderma like syndrome of waxy skin with limited joint mobility can alert the physician to the diagnosis of diabetes, and reflect the status of glycemic control[9,10].

Cutaneous manifestations of diabetes are classified into four categories:[11,12] 1. Infections 2. manifestations of diabetic complications (micro and macro angiopathies, and neuropathy) 3. Skin reactions to diabetic treatment 4. Skin lesions with strong-to-weak association with diabetes which are necrobiosis lipiodica, dermopathy, diabetic bullae, yellow skin,

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eruptive xanthomas, perforating disorders, acanthosis nigricans, oral leukoplakia and lichen planus. It is important to recognize these manifestations and treat them suitably. The current study aims to assess the point prevalence and patterns of skin manifestations and the relation between skin manifestations and type of diabetes according to age, sex, socioeconomic status, duration of the disease and its control in patients with DM attending diabetes centers in Mosul City.

Methods

The present study was carried out in Al-Waffa Specialized Center for Diabetes and Endocrinology; established since 1999 and located in the campus of Mosul Medical City at right side of Mosul City, and The Diabetic Clinic in Al-Salam General Teaching Hospital that lies at the left side of Mosul and delivers services since 2001.

A cross-sectional design was implemented that included diabetic patients (of both types, old and new, all age and both sexes) who attended the clinics during the study period. Diagnosis of DM was according to the standard of American Diabetic Association (ADA): A person is considered diabetic if had fasting plasma glucose ≥126 mg/dl, or two-hour plasma glucose ≥200 mg/dl during an oral glucose tolerance test, or Hba1C ≥ 6.5%; or a patient with classic symptoms of hyperglycemia or hyperglycemic crisis with a random plasma glucose ≥ 200 mg/dl[13]. Dermatological examination was performed by a dermatologist at the outpatient clinic of Al Salam hospital. Data were collected from 11th of December 2011 to 20th of May 2012. Regarding sample size determination, the following equation was entrusted

$$n = [\{Z (1-\alpha)^2 \ p\ q / d^2\} \times 2] + 5\% \ [14]$$

Where: n is the estimated sample size, Z=1.96, p= is the proportion of the population possessing the characteristics of interest (30%). That is the prevalence of skin manifestations among diabetic patients[9,10]. q= is (1-p), d= is the desired level of precision= 0.05, 2= is the design effect and 5%= is contingency error.

Hence, the final calculated sample size was 672. Oral consent was taken from each participants and study aim and procedure were explained. Data collection was carried out by using a specially designed questionnaire. Depending on the pilot-study results that involved 50 diabetic patients interviewed from the two centers, the questionnaire was adjusted and the reliability index was calculated using test and retest approach three hours apart by two different interviewers depending on the equation stated by Gordis[15]. It was proved to be a good reliability (88%). The questionnaire was also reviewed by a committee consisted of experts in the field of community and family medicine and medical statistics. Approval of the present study proposal has been obtained by the Department of Community Medicine in Mosul, after that essential official permission was obtained from both centers. All data were processed and analyzed by Statistical Package for the Social Sciences version 18. The four types of skin lesions were compared with the different socio-demographic and clinical characteristics. The predictor of socio-demographic character (age, sex, educational state, etc.) and that of clinical characteristics (type of DM, duration of the disease, etc.) were compared with outcome (skin lesions) in order to identify the predictor which contributed significantly with the outcome, P value of (< 0.05) was considered statistically significant.

Results

Out of the 674 interviewed diabetic patients, 226 were IDDM (33.5%) and the rest (66.5%) were NIDDM. Surprisingly, all study sample have at least one skin manifestation. The basic characteristics of study population are presented in Table 1. Type 2 DM was more prevalent among study sample than type 1 (66.5% versus 33.5%). Two thirds of cases (65.3%) were females; the male to female ratio was 0.6:1.

Table 2 exhibits that 88.1% of patients had positive family history for DM. Just more than one-tenth (14.2%) their FBS was < 110 mg/dl, and one-third (35.3%) their HBa1c was< 6.5%. The skin manifestations according to DM types showed a highest figure for infection (269(39.9%)) followed by skin manifestations of diabetic complications (153(22.7%)), skin reaction to diabetic treatment (142(21.1%)) and finally skin lesions with strong to weak association (110(16.3%)).

The proportion of patients with skin manifestations due to diabetic complications were higher among IDDM than that of NIDDM (26.1% versus 21.0%), the same picture is true concerning skin reaction to diabetic treatment (23.0% and 20% respectively). Figure (1) depicts the types of infection present among the study sample. Fungal infections were highly prevalent (59.0%) among all patients with skin infections. This type of infection was significantly more common among NIDDM than IDDM (63.4% versus 50.8%, P=0.018).

Bacterial infection is the second most common infection (28.2%), followed by viral infection (12.8%). Similar picture to fungal infections was reported concerning bacterial infection and type of DM (29.2% in NIDDM versus 26.5% in IDDM), however, the difference was not significant. Viral infections showed a reverse picture where the fraction of viral infection was significantly higher among cases with IDDM than NIDDM (22.7% versus 7.4%; p=0.018).

In table 3, one-fourth (24.6%) of NIDDM cases with infection were in the age group 50 - <60 years, this fraction is significantly higher than that found among IDDM of same age group (12.2%); (P=0.01). No significant differences were found among all categories of socio-demographic characteristics except for the age group 20-<30 years where the fraction of such condition is significantly higher among cases with NIDDM than IDDM (12.8% versus 1.7%; p =0.004). NIDDM (43(45.7%)) cases who have secondary educational level also have the highest proportion which is significantly higher than their mates with IDDM (17(28.8%)) (P=0.03). Regarding skin reaction to diabetic treatment, 17 (18.9%) of NIDDM had reactions to diabetic treatments, their age was 20-30 years. This figure is significantly higher than that of IDDM group of the same age range (3.8%); (p = 0.002).

Concerning educational background; half (52.3%) of NIDDM cases who have skin reaction to diabetic treatment were secondary school graduates; this fraction is significantly higher than that of IDDM of the same educational level (34.6%, P=0.037). Contrary, 42.3% of IDDM cases who have this manifestation were university graduates which was significantly higher than that of NIDDM group falling at the same educational level, (18.9%, P=0.003).

In general skin manifestations with strong to weak association with DM showed no significant difference in the frequency of this disorder among both types of diabetes except that less than one tenth (6.5%) of NIDDM cases have this manifestation emerging from class V. This figure is significantly lower than that of IDDM cases in the same socio-occupational class (9.0%, p=0.004). Pertaining to educational level; one quarter (24.7%) of NIDDM with this skin manifestation having primary education certificate. This fraction is significantly higher than their pears of IDDM (9.0%, p=0.02).

Table 4 shows the clinical characteristics and skin manifestations with DM among study population. Apart from duration of DM no significant differences were found in the distribution of cases of skin infections and characteristics of interest. Among those who had diabetes 5 to less than 10 years, two thirds (63.7%) of NIDDM cases had skin infection while half (50.0%) of IDDM group showed skin infections (P=0.037). A reverse picture was shown among patients with shorter duration (P=0.011). Concerning skin reactions to diabetic treatment and related clinical characteristics; 60% of NIDDM cases who have this manifestation have a duration of DM of 5-<10 years. This figure is

significantly lower than that of IDDM cases having the same duration of DM (33; (63.5%); (P=0.002).

In respect to FBG level; more than half (51.9%) of IDDM cases have skin reactions to diabetic treatment their FBG level ranged between 110-126 mg/dl compared to 49.2% of NIDDM group (p=0.041). Contradictory finding was registered concerning patients with FBG >126mg/dl, (P=0.015). (11 (14.3%)) of NIDDM patients with absent family history of DM have a significantly higher frequency of skin lesions with strong to weak association with DM than IDDM (14.3% versus 12.1%, P =0.001).

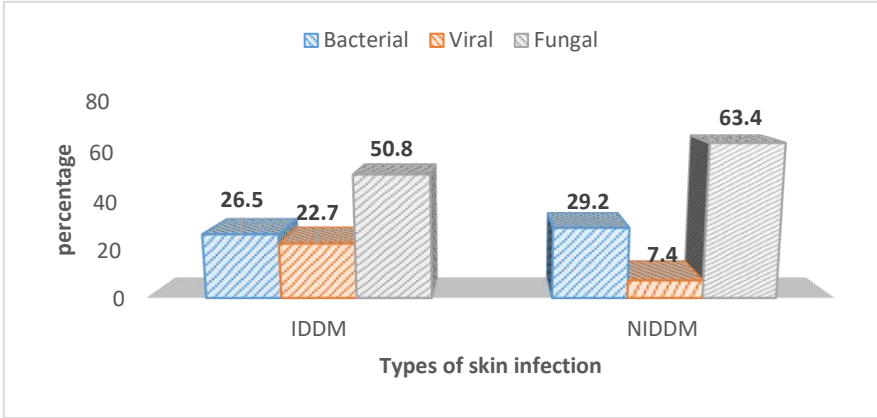

Figure 1: The distribution of the types of infection present by types of DM among the study sample.

Table 1: Socio-demographic characteristics of study population

Characteristics	IDDM n=226(33.5%)	NIDDM n=448(66.5%)	Total n=674(100%)
Age group (years)			
<20	3(21.4)	11(78.6)	14(2.1)
20-	12(16.4)	61(83.6)	73(10.8)
30-	34(35.4)	62(64.6)	96(14.2)
40-	39(30.5)	89(69.5)	128(19.0)
50-	50(31.5)	109(68.6)	159(23.6)
≥60	88(43.1)	116(56.9)	204(30.3)
Sex			
Male	86(36.8)	148(63.3)	234(34.7)
Female	140(31.9)	300(68.2)	440(65.3)
Socio-occupational class			
Class I	0(0.0)	1(100.0)	1(0.2)
Class II	1(25.0)	3(75.0)	4(0.6)
Class III	172(34.2)	331(65.9)	503(74.7)
Class IV	38(30.4)	87(69.6)	125(18.6)
Class V	15(36.6)	26(63.4)	41(6.1)
Educational level			
Illiterate	15(40.5)	22(59.5)	37(5.5)
Primary	40(29.4)	96(70.6)	136(20.2)
Secondary	83(29.0)	204(71.1)	287(42.6)
University	77(41.4)	109(58.6)	186(27.6)
Post university	11(39.3)	17(60.8)	28(4.2)
Residence			
Urban	174(33.3)	348(66.7)	522(77.5)
Rural	52(34.2)	100(65.8)	152(22.6)

Table 2: Clinical characteristics of study population.

Characteristics	IDDM n=226(33.5%)	NIDDM n=448(66.5%)	Total n=674(100%)
Family history of DM			
Present	202(34.0)	392(66.0)	594(88.1)
Absent	24(30.0)	56(70.0)	80(11.9)
Duration of DM (years)			
1-	84(40.0)	126(60.0)	210(31.2)
5-	130(31.2)	287(68.8)	417(61.9)
≥10	12(25.5)	35(74.5)	47(7.0)
Types of treatment			
OHAs	0(0.0)	442(100.0)	442(65.6)
Insulin	218(99.1)	2(0.9)	220(32.6)
Both	8(66.7)	4(33.3)	12(1.8)
FBG (mg/dl)			
<110	27(28.2)	69(71.9)	96(14.3)
110-	120(39.0)	188(61.0)	308(45.7)
≥126	79(29.3)	191(70.7)	270(40.1)
Hba1c%			
<6.5%	83(34.9)	155(65.2)	238(35.3)
>6.5%	143(32.8)	293(67.2)	436(64.7)

Table 3: Socio-demographic characteristics and skin manifestations according to DM types among study population.

Characteristics	DM cases with skin											
	infections n=269			manifestations of diabetic complication n=153			reactions to diabetic treatment n=142			lesions with strong to weak association n=110		
	IDDM n=82 (30.5%)	NIDDM n=187 (69.5%)	P-value	IDDM n=59 (38.6%)	NIDDM n=94 (61.4%)	P-value	IDDM n=52 (36.6%)	NIDDM n=90 (63.4%)	P-value	IDDM n=33 (30.0%)	NIDDM n=77 (70.0%)	P-value
Age (years)												
<20	3(3.6)	2(1.1)	0.240	0(0.0)	2(2.0)	0.153	0(0.0)	2(2.2)	*	0(0.0)	5(6.5)	*
20-	8(9.8)	24(12.9)	0.452	1(1.7)	12(12.8)	0.004	2(3.8)	17(18.9)	0.002	1(3.2)	8(10.4)	0.108
30-	12(14.6)	27(14.4)	0.967	8(13.5)	12(12.8)	0.888	4(7.7)	7(7.8)	0.958	10(30.2)	16(20.8)	0.303
40-	20(24.4)	44(23.5)	0.879	7(11.8)	10(10.6)	0.816	7(13.5)	17(18.9)	0.387	5(15.2)	18(23.4)	0.297
50-	10(12.2)	46(24.6)	0.010	14(23.8)	29(30.9)	0.330	20(38.5)	20(22.2)	0.150	6(18.2)	14(18.2)	1.000
≥60	29(35.4)	44(23.5)	0.053	29(49.2)	29(30.9)	0.218	19(36.5)	27(30.0)	0.428	11(33.2)	16(20.8)	0.183
Sex												
Male	27(32.9)	57(30.5)	0.693	19(32.2)	36(38.3)	0.439	23(44.2)	29(32.2)	0.156	17(51.6)	26(33.8)	0.083
Female	55(67.1)	130(69.5)	0.693	40(67.8)	58(61.7)	0.439	29(55.8)	61(67.8)	0.156	16(48.4)	51(66.2)	0.083
Socio-occupational class												
Class I	0(0.0)	0(0.0)	*	0(0.0)	0(0.0)	*	0(0.0)	0(0.0)	*	0(0.0)	1(1.2)	*
Class II	0(0.0)	2(1.0)	*	0(0.0)	0(0.0)	*	0(0.0)	0(0.0)	*	1(3.2)	1(51.2)	0.544
Class III	64(78.0)	137(73.3)	0.393	42(71.2)	73(77.7)	0.375	42(80.7)	68(75.6)	0.463	24(72.6)	53(68.9)	0.821
Class IV	13(15.9)	36(19.3)	0.493	12(20.3)	14(14.9)	0.395	8(15.3)	20(22.2)	0.304	5(15.2)	17(22.2)	0.376
Class V	5(6.1)	12(6.4)	0.920	5(8.5)	7(7.4)	0.820	2(40.0)	2(2.2)	0.599	3(9.0)	5(6.5)	0.004
Educational level												
Illiterate	5(6.1)	7(3.7)	0.430	4(6.8)	7(7.4)	0.875	2(3.8)	2(2.2)	0.599	4(12.2)	6(7.7)	0.502
Primary	16(19.5)	42(22.5)	0.581	12(20.3)	15(1.1)	0.519	9(17.2)	20(22.2)	0.472	3(9.0)	19(24.7)	0.020
Secondary	35(42.7)	83(44.4)	0.795	17(28.8)	43(45.7)	0.030	18(34.6)	47(52.3)	0.037	13(39.4)	31(40.3)	0.932
University	23(28.0)	47(25.1)	0.621	21(35.6)	27(8.7)	0.378	22(42.3)	17(18.9)	0.003	11(33.2)	18(23.4)	0.296
Post univ.	3(3.7)	8(4.3)	0.808	5(8.5)	2(2.1)	0.105	1(1.9)	4(4.4)	0.862	2(6.2)	3(3.9)	0.645
Residence												
Urban	63(76.8)	145(77.5)	0.898	40(76.8)	71(75.5)	0.304	43(82.7)	68(75.5)	0.303	28(84.9)	64(83.1)	0.819
Rural	19(23.2)	42(22.5)	0.898	19(32.2)	23(24.5)	0.304	9(17.3)	22(24.5)	0.303	5(15.1)	13(16.9)	0.819

Table 4: Clinical characteristics and skin manifestations with DM among study population.

Characteristics	DM cases with skin											
	infections n=269			manifestations of diabetic complication n=153			reactions to diabetic treatment n=142			lesion with strong to weak association n=110		
	IDDM n=82 (30.5%)	NIDDM n=187 (69.5%)	P-value	IDDM n=59 (38.6%)	NIDDM n=94 (61.4%)	P-value	IDDM n=52 (36.7%)	NIDDM n=90 (63.4%)	P-value	IDDM n=33 (30.0%)	NIDDM n=77 (70.0%)	P-value
Family history of DM												
Present	74(90.2)	159(85.0)	0.213	53(89.8)	83(88.3)	0.766	46(88.5)	84(93.3)	0.344	29(87.9)	66(85.7)	0.755
Absent	8(9.8)	28(15.0)	0.213	6(10.2)	11(11.7)	0.766	6(11.5)	6(6.7)	0.344	4(12.1)	11(14.3)	0.001
Duration of DM (years)												
1-	37(45.1)	54(28.9)	0.011	21(35.6)	22(23.4)	0.109	19(36.5)	31(34.5)	0.984	8(24.3)	19(24.6)	0.961
5-	41(50.0)	119(63.7)	0.037	43(72.9)	61(64.9)	0.293	33(63.5)	54(60.0)	0.002	21(63.6)	53(68.9)	0.600
≥10	4(4.9)	14(7.4)	0.394	5(8.5)	11(11.7)	0.511	0(0.0)	5(5.5)	*	4(12.1)	5(6.5)	0.375
Type of Treatment												
OHAs	0(0.0)	185(98.9)	*	0(0.0)	93(98.9)	*	0(0.0)	88(97.8)	*	0(0.0)	76(98.7)	*
Insulin	80(97.6)	0(0.0)	*	59(100.0)	0(0.0)	*	51(98.1)	1(1.1)	*	28(84.8)	1(1.3)	*
both	2(2.4)	2(1.1)	0.462	0(0.0)	1(1.1)	*	1(1.9)	1(1.1)	0.712	5(15.2)	0(0.0)	*
FBG(mg/dl)												
<110	7(8.5)	22(11.7)	0.406	7(11.9)	17(18.1)	0.282	10(19.2)	15(23.9)	0.703	3(9.0)	15(19.4)	0.123
110-126	46(65.1)	88(47.1)	0.170	32(54.2)	37(39.4)	0.070	27(51.9)	31(49.2)	0.041	15(45.5)	32(41.6)	0.706
>126	29(35.4)	77(41.2)	0.363	20(33.9)	40(42.5)	0.279	15(28.8)	44(48.9)	0.015	15(45.5)	30(39.5)	0.525
Hba1c %												
<6.5%	28(34.1)	72(38.5)	0.491	27(45.8)	37(39.4)	0.436	17(32.7)	22(24.5)	0.298	11(33.3)	24(31.2)	0.824
>6.5%	54(65.9)	115(61.5)	0.491	32(54.2)	57(60.6)	0.436	35(67.3)	68(75.5)	0.298	22(66.7)	53(68.8)	0.824

Discussion

Diabetes mellitus is a devastatingly chronic disease that affects many organs in the body including the skin[16]. This study provides database about types of skin manifestations between both types of DM patients and its link with socio-demographic and clinical characteristics in a study population. With a mean age of 48.66± 13.76 years, the study results reflected the fact that DM are more frequent in adults over the age of 40 years. This is close to that reported by studies from Iran[17] and Pakistan[18] (54.0±11.0 years and 52.0±11.0 years) respectively.

Sex distribution in this study showed that 65.3% of study sample were females. Almost similar finding was reported from studies in Belgrade-sebia and Egypt where 70% and 75% of the sample were females respectively[19, 20] which might be due to the high prevalence of obesity among females adding to that females were more interested and obsessive about their health compared to male patients. Family history of DM was recorded among 88.1% of diabetic patients although a previous study during 2003 in Mosul found that 63% had a family history of DM[21]. This high fraction could be due to the fact that marriage among relatives is more common in Mosul locality.

In the present work 61.9% of patients presented with a duration of illness of five to ten years and only 7% had a duration of more than ten years, this result is comparative with the results of Pakistanian study[18], where only 10% of the sample had a duration of more than ten years. Patients directly after diagnoses suffered from psychological shock and they were not able to adapt themselves with a new situation leading to bad compliance regarding regular visit. After that (5 to ten years later) patients started to accept their disease and manage it correctly. Later on when the disease extends for more than10 years they start to develop complication and/or

morbidities and their compliance significantly decrease.

Less than half of patients presented with a glucose level of 110-126 mg/dl and only 14.3% had a level of <110, while 64.7% had uncontrolled diabetes (Hba1c of >6.5%). Similar results were reported in Iran and Egypt where 68% and 63% of the sample had uncontrolled DM, respectively[17,20]. This perhaps is the result of bad compliance and adherence of patients to management protocol. Amazingly, in the present study every single patient showed one or more cutaneous manifestation (a point prevalence of 100%). Almost 40% of study sample have skin manifestation related to infection. The prevalence of infection is higher among NIDDM than IDDM. This result is akin with the result of Hosseini et al[17]. The proportion of NIDDM was higher than IDDM; In the current study, two thirds of patients (66.5%) versus 33.5%, a higher figure (99% versus 1%) was reported in Egypt[20]. A figure of 98% versus 2% was reported by in New Delhi[22]. All the results go with the fact that NIDDM, worldwide, is more prevalent than IDDM due to increase in the problem of sedentary life style and obesity. Concerning types of infection; more than half were fungal, 28.2% were bacterial and only 12.8% were viral. While in Jordon[23] bacterial infections were the commonest (62.5%) followed by fungal (48.0%), and the least common was viral (14.5%). Probably because in our locality, females spend a lot of time in washing and cleaning their houses with water which may account for a high proportion of fungal infections. Skin reaction to diabetic treatment was more among IDDM; this may be due to poor education of patients about right method of insulin injection. Patients who have skin lesions of strong to weak association represented total of 16.3%. NIDDM patients constituted 17.2%, while 14.6% of IDDM had such lesions, this result is close to that of Situm et al[24] where 10.8% of their patients had such lesions, 50.3% of them had NIDDM.

In the present study, the four types of skin manifestations were more among uncontrolled diabetes. A similar result was reported in Iran[17] (64% of their patients with skin manifestations among diabetic patients had uncontrolled DM). A higher figure was reported in Pakistan[25], who found that a majority (93.4%) of their patients with skin manifestations among diabetic patients had uncontrolled DM and only 6.6% showed glycemic control. This in itself was indicative of high tendency of diabetic complications to occur in uncontrolled DM. A study carried out in Mosul[26] reported that 38.5% of diabetic patients had foot lesions, after six months of weekly sessions of education about management of diabetes and life style modifications, only 5.8% reported such lesions. The results go with the present study notes about achieving glycemic control to reduce skin manifestations, it has been reported that educational approach allows the patient, educators, and physician to work together as a team to negotiate goals that are specific and achievable in order to decrease diabetic complications including skin manifestations[27]. Thus, education of patients is helpful in treating present complications and preventing newer one.

In conclusions: All DM patients had at least one type of skin manifestation. Skin infections were the prevalent especially in older (50 and above) NIDDM patients of five years' disease-duration or more. Thus, the study recommends the need for multidisciplinary team approach including diabetic educators, social workers, psychologist and dermatologist to increase adherence to treatment, continuity of follow up and applying a dermatological routine exam for early discovery of skin manifestations and ensuring its availability as a part of the standard care in diabetic centers.

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