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Hand abnormalities in diabetics: Prevalence and predictors in Erbil city

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Abstract

Background and objective: The characteristics of diabetic foot disease are well documented in Erbil city; henceforth it would be appropriate to evaluate the problem of diabetic hand syndrome in this environment and to assess the frequency and the most important clinical and biochemical risk factors for the development of these complications.
Methods: This is an observational case-control study done over a period of one year. A total of 100 consecutive patients with type 2 diabetes mellitus were enrolled and described as cases. One hundred age- and sex-matched nondiabetic individuals were taken in the control group; all were examined and then underwent the appropriate investigations.
Results: Of the total 100 diabetic patients, 63% had macrovascular complications and 60% had one or more hand disorders. Limited joint mobility (47% vs. 18%, respectively; *P* = 0.0001) and Dupuytren's contracture (16% vs. 2%, respectively; *P* = 0.001) were significantly higher in type 2 diabetes mellitus patients than in the controls, but not trigger finger. These hand soft-tissue changes correlated significantly with poor glycemic control.
Conclusion: This study shows a high prevalence of hand disorders in diabetic patients with the limited joint mobility being the most common hand disorder. The hand soft tissue changes are under recognized in diabetic patients, occurring in 60% of the cases. We recommend that physicians should consider examining the periarticular region of the joints in the hands in each diabetic patient.
Keywords: Diabetes mellitus; Dupuytren's contracture; Trigger finger; Limited joint mobility; Hand soft tissues changes.

Introduction

Musculoskeletal complications of diabetes mellitus (DM) are the most common endocrine arthropathies. These have been generally under recognized and poorly treated compared with other complications, such as neuropathy, retinopathy, and nephropathy. These manifestations, which are some of the causes of chronic disability, involve not only the joints but also the bones and the soft tissues.[1] Diabetes is complicated by musculoskeletal problems of upper extremity and particularly the hand, which called "the diabetic hand." The term includes limited joint mobility (LJM) that occur particularly in Diabetes Mellitus in addition to the non diabetic hand changes, such as trigger finger and Dupuytren's contracture.[2] Limited joint mobility is a painless and nondisabling complication of diabetes caused by thickening and stiffness of periarticular connective tissues. It involves the small joints of the hand and is often neglected until hand deformity is severe enough to interfere with daily life. Patients with LJM typically have limited extension of the metacarpophalangeal, proximal and distal interphalangeal joints, generally beginning in the ulnar digits and spreading radially. Limited joint mobility has been recognized as the most common and earliest long-term complication of type I DM and it also occurs in type 2 DM.[3] Trigger finger (TF), one of the most common causes of hand pain and

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disability, the flexor tendon causes painful popping or snapping as the patient flexes and extends the digit. The patient may present with a digit locked in a particular position, most often flexion, which may require gentle, passive manipulation into full extension.[4] Studies have shown that, compared with a nondiabetic population, trigger finger in diabetic patients is more common in female patients, more often bilateral, more often multidigit, and relatively sparing the index and small fingers.[5] Dupuytren's contracture is a progressive disorder that affects the palmar fascia, causing the fibrous tissue to shorten and thicken.[6] Excessive myofibroblast proliferation and altered collagen matrix composition lead to thickened and contracted palmar fascia. The resultant digital flexion contractures may severely limit function.[7] The prevention and treatment of the complications of chronic diseases depend on understanding their prevalence and risk factors[8]. In Erbil city, there is a lack of reports that describe the hand soft tissue changes in diabetic patients. No previous studies had been conducted to assess the prevalence of hand soft tissue changes in diabetic patients or to evaluate the predisposing factors. Thus, the aim of this study was to evaluate the frequency of hand manifestations in adult diabetic patients visiting Rizgary Teaching Hospital in Erbil city and to identify their predictors.

Methods

A total of 100 consecutive patients with type 2DM and 100 age, gender matched non-diabetic controls were examined for hand changes. Patients were included provided they had a history of DM for at least two years, diagnosed according to the World Health Organization (WHO) diagnostic criteria as a fasting plasma glucose level of 126 mg/dL (7.0 mmol/l).[9] The study was carried out at Rizgary Teaching Hospital in Erbil city and was approved by the Institute's ethics committee. Subjects with known connective tissue disorders, rheumatoid arthritis, infective arthritis, gouty arthritis, end stage renal disease, thyroid disorders, chronic liver disease and a history of antiepileptic drug use were excluded. All subjects were undergone through a thorough clinical examination. The demographic parameters [age, gender and body mass index (BMI)] were noted on each subject. All findings were objectively recorded according to the following definitions: The prayer sign and flattening sign were used for qualitative assessment of limited joint mobility. The prayer sign is described as the inability to fully flatten the two palms when opposed and clasped together. The flattening sign is described as the inability to fully flatten the palm on a flat surface.[10] LJM farther staged using Brink-Starkman classification system:[11] stage 0, no abnormality; stage 1, skin thickening with no contracture; stage 2, bilateral fifth finger contracture; stage 3, other fingers involved bilaterally; stage 4, bilateral finger and wrist involvement; and stage 5, bilateral finger, wrist and other joint involvement. Flexor tenosynovitis or stenosing tenosynovitis or trigger finger was diagnosed by palpating a nodule or thickened flexor tendon with locking phenomenon during finger flexion or extension. The diagnosis of Dupuytren's contracture was based on one of the following features: a palmar or digital nodule; tethering of palmar or digital skin; a pretendinous band and a digital flexion contracture, palpable thickening of the palmar fascia, with a flexor deformity of the second, third, fourth, or fifth fingers.[12] Regarding the macrovascular complications is a disease of large blood vessels in the body including the coronary arteries, the aorta, and the sizable arteries in the brain and the limbs.[13] We also recorded the hemoglobin A1C (HbA1c) levels of the patients, measured by immunoassay, using the COBAS C311 chemistry analyzer. Poor glycemic control was considered when HbA1c levels were more than 6.5% according to the recommendations of the World Health

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Organization (WHO) which considered An HbA1c of 48 mmol/mol (6.5%) is recommended as the cut-off point for diagnosing diabetes.[14] While the non-diabetic controls underwent blood glucose examination after an (8 to 10) hours overnight fast, and only those with fasting plasma glucose (FPG) of less than 100mg/dL were recruited for the study.

Data management and statistical analysis:

Data recorded on a specially designed questionnaire, collected and entered into the computer and then analyzed using appropriate data system which is called the statistical package for the social sciences (version 22). The results were compared between patients with different variables, with a statistical significance level of <0.05. The results were presented as rates, ratio, frequencies, percentages in tables and figures. Chi square and t-tests were performed to compare between both groups. Binary logistic regression was done to predict the most important factors contributing to the occurrence of different hand disorders.

Results

Except for MVC, there were non-significant statistical relationships between study groups and baseline characteristics. The cases did not differ from controls regarding all baseline features except MVC in which most cases (63%) had complications in contrast to control patients in which most of them (66%) did not develop MV complications (P >0.05) as shown in Table 1. The age ± SD of cases (59.3± 8.5) was matched to that of the control group (59.7 ± 7.1). There was no difference between them (*P* = 0.73).

Table 1: Baseline characteristics of study samples.

Parameters	Categories	Study samples		*P* value
		Cases	Controls	
Gender	Male	51(49.5%)	52(50.5%)	0.88
	Female	49(50.5%)	48(49.5%)	
MVC	Yes	63(64.9%)	34(35.1%)	0.0001
	No	37(35.1%)	66(64.9%)	
Smoking	Yes	15(44.1%)	19(55.9%)	0.32
	No	67(48.9%)	70(51.1%)	
	Ex-smoker	18(62%)	11(38%)	
BMI	Normal	24(41.4%)	34(58.6%)	0.25
	Overweight	67(52.7%)	60(47.3%)	
	Obese	9(60%)	6(40%)	
Manual labour	Yes	38(55%)	31(45%)	0.29
	No	62(47.3%)	69(25.7%)	

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There was a significant statistical relationship between study groups and LMJ and DC. The prevalence of LMJ was higher among cases (47%) while only (18%). The same for DC, diabetic patients had more DC (16%) in comparison to only (2%) of non-diabetic patients (*P* <0.05). There was a non-significant statistical association between study groups and TF. The vast majority of both groups did not have TF. 9% of cases and 6% of controls had TF (*P* = 0.42). The details are shown in Table 2. There was a significant statistical association between hand disorders and HbA1c levels. LMJ, DC and TF were more prevalent in patients with HbA1c concentrations higher than 6.5 units in comparison to lower levels (P <0.05). In contrast, there was a non-significant statistical relationship between hand disorders and duration of diabetes and MVC (P >0.05) as shown in Table 3.

Table 2: Distribution of various hand disorders among cases and controls.

Parameters	Categories	Study samples		*P* value
		Cases	Controls	
LJM	Present	47(72.3%)	18(37.7%)	0.0001
	Absent	53(28%)	82(72%)	
DC	Present	16(88.9%)	2(11.1%)	0.001
	Absent	84(46.1%)	98(53.9%)	
TF	Present	9(60%)	6(40%)	0.42
	Absent	91(49.1%)	94(50.9%)	

Table 3: Distribution of hand disorders among cases in relation to HbA1c, duration of DM and MVC.

Variable	Hb A1c			Duration of DM			MVC		
	< 6.5 (n=6)	≥ 6.5 (n=66)	*P* value	≥ 10 years (n=37)	< 10 years (n=35)	*P* value	Yes (n=49)	No (n=23)	*P* value
LJM	5 (10.6%)	42 (89.4%)	0.001	24 (51%)	23 (49%)	0.18	33 (70%)	14 (30%)	0.15
DC	1 (6.2%)	15 (93.8%)	0.01	9 (56.3%)	7 (43.7%)	0.87	8 (50%)	8 (50%)	0.24
TF	0 (0%)	9 (100%)	0.02	4 (44.4%)	5 (55.6%)	0.38	8 (88.9%)	1 (11.1%)	0.09

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There were non-significant statistical relationships between hand disorders among diabetic cases and manual labor, type of therapy and gender except for LMJ and manual labor (P >0.05) as shown in Table 4. The most important predictors of hand disorders among diabetic patients are shown in Tables 5-7 as described below:

- HbA1c: Patients with HbA1c levels of less than 6.5 units associated with protective effects against developing hand disorders. Odds ratios were much less than one in LMJ, DC and TF. Patients with controlled diabetes had less chance to develop hand disorders.

- MVC: Presence of MVC associated with increased risks of developing LMJ by 2.2 times, TF by 8.7 times while it was protective for DC but these findings were statistically not significant (P >0.05).

- Manual labor: Diabetic patients who were manual laborer had greater chance to develop LMJ by 7.7 times compared to non -manual laborers, while it had no effects on developing DC and TF.

- Gender: Being male was associated with increased risk of developing TF by approximately four times in contrast it had a decreased risk of acquiring LMJ and DC.

Table 4: Distribution of hand disorders among cases in relation to manual labor, type of therapy and gender.

Variable	Manual labour			Type of therapy				Gender		
	Yes (n=35)	No (n=37)	P	Insulin (n=11)	Oral (n=56)	Both (n=5)	P	Male (n=32)	Female (n=40)	P
LJM	29 (61.7%)	18 (38.%)	0.01	7 (14.9%)	37 (78.7%)	3 (6.4%)	0.95	20 (42.5%)	27 (57.5%)	0.11
DC	3 (18.7%)	13 (81.3%)	0.08	2 (12.5%)	13 (81.3%)	1 (6.2%)	0.98	6 (37.5%)	10 (62.5%)	0.23
TF	3(%)	6(%)	0.76	2 (22.2%)	6 (66.7%)	1 (11.1%)	0.56	6 (66.7%)	3 (33.3%)	0.32

Table 5: Predictors LMJ among diabetic patients.

LMJ	Sig.	O.R	95% O.R	B
HbA1c	0.001	0.115	0.03–0.3	-2.167
Duration	0.679	0.798	0.2–2.3	-0.226
MVC	0.150	2.224	0.7–6.6	0.799
Manual	0.001	7.774	2.5–23.7	2.051
Treatment (insulin)	0.950	1.418	0.13–14.7	0.350
Gender (male)	0.192	0.508	0.18–1.4	-0.677

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Table 6: Predictors of DC among diabetic patients.

DC	Sig.	O.R	95% O.R	B
HbA1c	0.005	0.040	0.004–0.37	-3.224
Duration	0.575	1.466	0.38–5.5	0.382
MVC	0.116	0.344	0.09–1.3	-1.068
Manual	0.008	0.133	0.3–0.58	-2.021
Treatment (insulin)	0.631	1.861	0.04–12.5	-0.343
Gender (male)	0.093	0.330	0.09–1.2	-1.108

Table 7: Predictors of TF among diabetic patients.

TF	Sig.	Sig.	95% O.R	B
HbA1c	0.998	0.050	0.001–0.06	-19.212
Duration	0.933	1.071	0.21–5.27	0.069
MVC	0.072	8.736	0.82–92.78	2.167
Manual	0.756	0.766	0.14–4.09	-0.266
Treatment (insulin)	0.571	0.464	0.32–6.6	0.711
Gender (male)	0.130	3.894	0.67–22.6	1.359

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Discussion

Our study showed three important findings. First, the hand soft tissue changes were more prevalent and more severe compared with non-diabetic controls and its present in (60%) of our cases. Second, the most common hand change was LJM (47% of cases). Third, there was a significant association between poor glycemic control and the development of hand changes. Similarly, the prevalence of hand disorder is reported in the Mota. et al study where the prevalence was 50%.[15] LJM was common in diabetic patients with prevalence of (47%) compared to controls with a prevalence of (18%), this is in line with Pandey et al. study,[16] in addition, the diabetic patient had severe forms of LJM according to Brink-Starkman classification system (stage 2 and more); about (16%) had stage 2, (24%) had stage 3 and (6%) had stage 4 (Table 8). Of the two tests to identify LJM, the prayer sign was relatively more sensitive than the table test. In the prayer sign test, where the palms of the hands are placed against each other, the early lesions in either hand are magnified compared with when each hand is placed separately on a table for the table test. In our study, LJM is associated with poor glycemic control and macrovascular complications which is associated with increased risks of developing LMJ by 2.2 times, and with manual labour since diabetic patients who were manual labourer had greater chance to develop LMJ by 7.7 times compared to non-manual laborers, this finding is in line with those reported by other authors,[17] regarding the gender being female was associated with increased risk of developing LJM. Dupuytren's contracture has been reported in (16%) of diabetic patients compared to controls with a prevalence of (2%). Physical therapy may be beneficial for early or mild cases. Varied success has been reported with local corticosteroid injections. Surgical intervention may be needed for severe cases.[18] DC is associated with a poor glycemic control which is statistically significant, also with the female gender. In the present study, the prevalence of trigger finger did not differ between patients and controls, (9%) of cases and (6%) of control and the overall prevalence was low in both groups. Of those who had trigger finger, there was a significant correlation between poor glycemic control and macrovascular the complications which associated with increased risks of TF by 8.7 times. Also, TF was associated with gender since the male gender was associated with increased risk of developing TF by

Table 8: LJM stages among cases and controls (P = 0.001).

LJM stages	Study group		Total
	Cases	Controls	
0	53 (53%)	82 (82%)	135 (67.5%)
1	1 (1%)	7 (7%)	8 (4%)
2	16 (16%)	11 (11%)	27 (13.5%)
3	24 (24%)	0 (0%)	24 (12%)
4	6 (6%)	0 (0%)	6 (3%)
Total	100 (100%)	100 (100%)	200 (100%)

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approximately four times. Our study showed associations between hand soft tissue changes in T2DM patients with poor glycemic control which was the most important predictor and affect the three types of hand deformities in our study, this is in line with the findings obtained in a British cohort that demonstrated a strong association between musculoskeletal manifestations and poor blood glucose control.[19] Vascular complications are another important predisposing factor, since the presence of MVC associated with increased risks of developing LMJ by 2.2 times, TF by 8.7 times while it was protective for DC but these findings were statistically not significant. This is in line with Ardic et al. study.[20] The strengths of the present study include a good number of patients with type 2DM along with their matched controls who were assessed for hand soft tissue changes as well as other diabetic complications. The limitations include a lack of objective assessment of functional impairment by measuring hand strength to grade the disability caused by these hand changes. Also, the lack of baseline data for our population to allow comparative projections of these changes with increasing duration of diabetes is an inevitable weakness of cross-sectional studies.

Conclusion

The examination of periarticular regions of the hands and its joints should be included in the evaluation of patients with DM because the hand disorders are common in patients of type 2 DM and many of these complications are potentially treatable, especially if diagnosed early. LJM is the most common hand disorder present in type 2 DM. Most of the hand disorders seem to be associated with poor glycemic control and macrovascular complications.

Conflicts of interest

The authors report no conflicts of interest.

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