

Musculoskeletal Disorders in Type 2 Diabetes Mellitus

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Abstract

Introduction: Diabetes mellitus (DM) is a chronic metabolic disease of high morbidity and mortality, which has become a public health problem. Musculoskeletal complications occur with DM and significantly compromise the patients' quality of life. The most common musculoskeletal manifestations of diabetes mellitus are Muscle cramps, Muscle infarction, Loss of deep tendon reflexes, Peripheral neuropathy, Reflex Sympathetic Dystrophy Syndrome, Stiff Hands Syndrome, Neuropathic joints, Carpal tunnel syndrome, Adhesive capsulitis of the shoulder, Tenosynovitis, Diffuse Idiopathic Skeletal Hyperostosis and Dupuytren contracture.

Aim of the work: investigate the association between DM and musculoskeletal disorders in sohag governorate population.

Patients and Methods: Cross sectional clinical study included 200 adults with definite diagnosis of Diabetic patient with musculoskeletal disorder recruited from patients attending to the outpatient clinic of the Diabetes & internal medicine, Sohag University Hospital. All of the patients selected and underwent: Complete clinical assessment, Careful general, musculoskeletal examination, Laboratory assessment.

Results: 53% of our diabetic cases had musculoskeletal manifestations.

Conclusion: about 53% of the type 2 diabetics suffer from musculoskeletal manifestations. The most common manifestations are seen in carpal tunnel syndrome which seen in 30% of our cases.

Key words: Musculoskeletal Disorders, Diabetes Mellitus.

Introduction

Diabetes mellitus (DM) is a chronic metabolic disease of high morbidity and mortality, which has become a public health problem. In 1985, the world prevalence of DM was approximately 30 million cases, increasing to 177 million in 2000. Based on current tendencies, more than 360 million individuals will have the disease by 2030 ⁽¹⁾.

In type 2 DM, which represents most of the DM cases (around 95%), there is insulin resistance, excessive hepatic production of glucose, and abnormal fat metabolism, resulting in a relative deficiency of that hormone. The prevalence of type 2 DM increases more than that of type 1 DM, because of the increase in obesity and the reduction in physical activities as

countries become more industrialized ⁽¹⁾.

Musculoskeletal complications occur with DM and significantly compromise the patients' quality of life. The incidence of DM and the life expectancy of diabetic patients have both increased, resulting in an elevation in the prevalence and clinical importance of those osteomuscular changes ⁽²⁾.

Musculoskeletal disorders are common in type 1 and 2 diabetic subjects, and examination of periarticular regions of the hands, the joints, shoulders and feet, as well as the skeleton, should be included in the evaluation of patients with DM. Most musculoskeletal complications seem to be associated with the duration of DM and appear in diabetic patients of

younger age than their counterparts in the general population. Musculoskeletal disorders in these patients are probably related to the long-term glycaemic control of the diabetes. However, no direct association could be proven with the metabolic control of the disease⁽³⁾.

The most common musculoskeletal manifestations of diabetes mellitus are Muscle cramps, Muscle infarction, Loss of deep tendon reflexes, Peripheral neuropathy, Reflex Sympathetic Dystrophy Syndrome, Stiff Hands Syndrome, Neuropathic joints, Carpal tunnel syndrome, Adhesive capsulitis of the shoulder, Tenosynovitis, Diffuse Idiopathic Skeletal Hyperostosis and Dupuytren contracture⁽³⁾.

Aim of the work: investigate the association between DM and musculoskeletal disorders in sohag governorate population.

Patients and Methods:

Design: Cross sectional clinical study.

Patients: 200 adults with definite diagnosis of Diabetic patient with musculoskeletal disorder recruited from patients attending to the outpatient clinic of the Diabetes & internal medicine, Sohag University Hospital.

Methods:

- All of the patients selected and underwent:

A- Complete clinical assessment:

All patients selected and underwent complete history taking and full clinical examination with focus on:

Demographics features;

Such as age, sex, age at onset of the disease, duration of the disease, joints affected, extra-articular features, family history, residence, treatment regimen, treatment complications and

prognosis of the disease, association with other medical conditions such as: Diabetes diagnosed by demonstrating any one of the following:

History of diabetes manifestations plus plasma glucose concentration >200mg/dl

Fasting plasma glucose >126mg/dl

Glycated hemoglobin (HbA1C) ≥ 48 mmol/mol (≥ 6.5 DCCT %)

Hypertension Normal blood pressure at rest is within the range of 100–140 millimeters mercury (mmHg) systolic and 60–90 mmHg diastolic High blood pressure is present if the resting blood pressure is persistently at or above 140/90 mmHg for most adults Traditionally, the National Institute of Clinical Excellence recommends three separate sphygmomanometer measurements at one monthly intervals

Careful general, musculoskeletal examination

For all patients with diabetes aGALS (gait, arm, legs, spine) screening was performed which if significant lead to REMS (Regional examination for musculoskeletal system) and the following abnormalities were note The various rheumatologic manifestations were diagnosed on the basis of the following clinical features.

Diabetic chieroarthropathy; Two clinical sign were essential for the diagnosis: prayer sign (the patient is unable to approximate the palmar surface of the fingers when raising the hands as if in prayer) and the tabletop sign (when the patient is asked to lay the palms flat on the tabletop he is unable to touch the palmar surface of the fingers to the table).

Dupuytren's contracture; the presence of a palmar or digital nodule, 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.

Flexor tenosynovitis; Palpable nodule or thickening flexor tendon, and/or locking during extension and flexion of any finger

De Quervain's tenosynovitis; Pain and tenderness over radial styloid with a positive Finkelstein maneuver.

Olecranon bursitis; Pain, tenderness, and swelling at the location of the olecranon bursa.

Lateral epicondylitis; Pain and tenderness over the lateral epicondyle with pain against resistance on wrist extension.

Medial epicondylitis; Pain and tenderness over the medial epicondyle with pain against resistance on wrist flexion.

Rotator's cuff tendinitis; Shoulder pain on active abduction (specially 60° and 120°), tenderness over the greater tuberosity, and positive Impingement sign.

Trochanteric bursitis; Pain and tenderness at the location of the trochanteric bursa.

Pre-patellar bursitis; Pain, tenderness, and swelling at the location of the pre-patellar bursa.

Anserine bursitis Pain, tenderness, and swelling at the location of the anserine bursa

Osteoporosis; Osteoporosis was diagnosed on the basis of Singh's criteria based on the trabecular pattern of the proximal femur.

DISH; The diagnosis of DISH was based on radiologic features. Radiographic criteria for the diagnosis require the involvement of at least four contiguous thoracic vertebral segments, preservation of intervertebral disc spaces and the absence of apophyseal joint degeneration or sacroiliac inflammatory changes.

Neuroarthropathy; The diagnosis is based on clinical features, laboratory tests and imaging studies. Clinical

features include erythema, warmth, foot deformity, a medical history of long-standing diabetes.

Carpal tunnel syndrome; was diagnosed by the relevant history, the Tinel sign, triggered by the percussion of the carpal tunnel [the patient reports pain resembling an electric sensation along the course of the median nerve] and, the Phalen test - the patient has to hold the hands against each other in full palmar flexion, paresthesias beginning between 30 to 120 s in this position. These findings were confirmed by electrodiagnostic tests.

Laboratory assesment included:

- Complete blood count {CBC}.
- Erythrocytic sedimentation rate {ESR}.
- C-reactive protein {CRP}.
- Alanine aminotransferase {ALT}.
- Serum creatinine.
- Fasting and post prandial blood sugar.
- Urine analysis.
- Glycosylated hemoglobin (HbA1c) and lipid profile [cholesterol, high-density lipoprotein, low-density lipoprotein (LDL), and triglycerides] tests was done for all patients.
- Nerve conduction velocity.
- Muscle conduction velocity.

Inclusion criteria:

- 1) Diabetic patients.
- 2) Age > 18 years.
- 3) Diagnosed as type 2.

Exclusion criteria:

- 1) Type 1 diabetes mellitus.
- 2) Diagnosed as having rheumatoid arthritis or other rheumatological autoimmune disease.
- 3) Young patient 18> years.

Results

Mean age of our patients was 52 years with range from 30 to 76 years, 56% were females, 445 were males, also half of them were housewives, and they were from rural areas. Majority of our cases (64%) had family history of diabetes. Mean of duration of DM was 10 years, with range from 1 to 33 years.

53% of our cases had musculoskeletal manifestations in form of (Carpal tunnel syndrome 30%, Polyneuropathy 22%, Trigger fingers 20%, De Quervain 9%, Tendinitis 5%, Frozen shoulder 3%, Diabetic foot 2%, and only 1% had limited joint mobility) as shown in **table 1**. Onset of this manifestations was acute in 75% of cases and gradual in 24% of them, we also reported that course was progressive in 73% of patients and stationary in 26% of them. Mean of duration of this manifestations was 5 years with range from 6 months to 15 years. 34% of our patients had hypertension, 11% had dry mouth, also 11% had dry eye, and few patients had other extra-musculoskeletal manifestations as heart failure, liver failure, skin ulcer, asthma, pulmonary edema, and skin pigmentations.

Mean of blood glucose was 206, and mean of CBC parameters and serum creatinine was within normal range. 39% of our cases received insulin, 58% take oral hypoglycemic, and only 3% take combination. 20% of patients take multivitamin, 18% take NSAIDS, few patients take other treatments as Antibiotics, Physiotherapy, alphinern, urosolvin, cerebrolysin, gabapentin, calcium, lyrica.

Table 1. Musculoskeletal manifestations

Variable		Value
Presence of musculoskeletal manifestations	Yes	53(53%)
	No	47(47%)
Type of musculoskeletal manifestations	Carpal tunnel syndrome	16(30.19%)
	Polyneuropathy	12(22.64%)
	Trigger fingers	11(20.75%)
	De Quervain	5(9.43%)
	Tendinitis	3(5.66%)
	Frozen shoulder	3(5.66%)
	Diabetic foot	2(3.77%)
	Limited joint mobility	1(1.89%)
Onset	Acute	40(75.47%)
	Gradual	13(24.53%)
Course	Progressive	39(73.58%)
	Stationary	14(26.42%)
Duration of musculoskeletal manifestations	Mean±SD	5.43±3.87
	Median(range)	5(0.5-15)

Discussion

Mean age of our patients was 52 years with range from 30 to 76 years, 56% were females, 44% were males, also half of them were housewives, and they were from rural areas. Majority of our cases (64%) had family history of diabetes. This was similar to **Egede et al.** ⁽⁴⁾ as the mean age of their patients was 56.71±14 years.

Mean of duration of DM was 10 years, with range from 1 to 33 years, this was in agreement with **Gregg et al.** ⁽⁵⁾ as in their study they found that the mean duration of diabetes was 11.21±8.5 years.

Similar study from Morocco showed increased association of diabetic neuropathy, diabetic retinopathy, poor adherence to medication and lack of physical activity with different musculoskeletal problems in diabetics ⁽⁶⁾.

We found that 53% of our cases had musculoskeletal manifestations in form of (Carpal tunnel syndrome 30%, Polyneuropathy 22%, Trigger fingers 20%, De Quervain 9%, Tendinitis 5%, Diabetic foot 2%, and only 1% had limited joint mobility, and Frozen shoulder observed in only 3% of our cases, this was less than the 25% reported from a British cohort ⁽⁷⁾.

Ramchurn et al. ⁽⁷⁾ found a significant association between shoulder adhesive capsulitis and other MSK complications of diabetes, notably CTS, flexor tenosynovitis, and limited joint mobility. Similarly, a Japanese group examined 302 diabetic patients in a case-control study and demonstrated a significant association between different types of complications, especially flexor tenosynovitis and limited joint mobility ⁽⁸⁾.

On the other hand in study of **Agrawal et al.** ⁽⁹⁾ OA (50%), adhesive capsulitis (45.31%) and LJM (37.5%)

were among the most common MSK manifestations of DM. First described by **Jung et al.** ⁽¹⁰⁾ in adult diabetics, LJM is a condition of stiffness principally involving the hands but may occasionally extends to the proximal upper extremities and spine. **Agrawal et al.** ⁽⁹⁾ reported LJM in 22.6% patients, while **Sarkar et al.** ⁽¹¹⁾ found it to be the most common MSK manifestation in their study population.

Onset of this manifestations was acute in 75% of our cases and gradual in 24% of them, we also reported that course was progressive in 73% of patients and stationary in 26% of them. Mean of duration of this manifestations was 5 years with range from 6 months to 15 years.

We also found 34% of our patients had hypertension, 11% had dry mouth, also 11% had dry eye, and few patients had other extra-musculoskeletal manifestations as heart failure, liver failure, skin ulcer, asthma, pulmonary edema, and skin pigmentations, **Ardic et al.** ⁽¹²⁾ demonstrated that hand and shoulder syndrome was most likely associated with retinopathy but not nephropathy or neuropathy.

Over the past years, it has been shown that these strong predictors predisposed to the development of MSK complications in diabetic patients, ^(13, 14) of which the most important is blood glucose control, we found mean of blood glucose was 206, and mean of CBC parameters and serum creatinine was within normal range, also urine analysis was normal in 79% in our cases, 10% of them had pus in urine, only 3% had calcium, oxalate crystal, and 5% had turbid urine.

Conclusion:

From the above observation it is clear that about 53% of the type 2 diabetics suffer from musculoskeletal

manifestations. The most common manifestations are seen in carpal tunnel syndrome which seen in 30% of our cases. Development of these manifestations is associated with glycemic status, age and BMI. Future studies with larger sample size are required to substantiate this observation. It could be concluded that thorough examination of musculoskeletal system should be made a part of physical examination in diabetics. So life style modification and exercises to various joints should be part of diabetic management.

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