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Original Article

Pattern of Musculoskeletal Manifestations in Patients with Diabetes Mellitus

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Abstract

Background: *Musculoskeletal complications of diabetes have been generally ignored and poorly treated as comparedto other complications. Hence we carried out this study to find the prevalence of musculoskeletal manifestations indiabetes mellitus and its relation with age, gender and control of diabetes.*

Materials and methods: *In the present study 100 patients of Diabetes Mellitus (DM) were studied. This was a cross sectional observational study carried out in Physical medicine and Rehabilitation Out Patient Department (OPD) of Chattagram Maa-O-Shishu Hospital Medical College between October 2020 to March 2021. P urposive sampling was done. Duration of diabetes, control of diabetes and any musculoskeletal complaints were noted. Correlation of musculoskeletal manifestations with age, occupation, duration of diabetes, and control of diabetes was evaluated and statistical analysis was done. After collection of all data those were analyzed by SPSS 20.*

Results: *Among the 100 patients of DM more patients were female (72%) and most were at age group 41 to 50 years (45%). Duration of DM showed 35% patients were suffering from DM for 11- 15 years and 21% were suffering from DM for 16 -20 years. Regarding different musculoskeletal complications among DM patients adhesive capsulitis was (11%), curpal tunnel syndrome was (6%), OA knee was (10%) and planter fasciitis was (8%). Other less common complications were also found . Different complications in relation with age, gender differences and control status of DM were not significant.*

Conclusions: *Musculoskeletal manifestations are frequent in diabetis mellitusand common complications are more among patients with higher age and findings are not related with control of diabetes.*

Key words: Adhesive capsulitis; Complications; Diabetes mellitus; Musculoskeletal.

INTRODUCTION

Diabetes Mellitus (DM) is a very common endocrine disorder. The prevalence of diabetes for all age groups worldwide estimated to be of 2.8% in 2000 and is predicted to affect 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.[1]

For the complications and consequences DM is among the first seven leading causes of death worldwide[2]. It affects multiple organs such as nervous system, musculoskeletal systems kidneys, heart, skin and eyes. In other words, DM brings along many recognized complications that grab the immediate attention of both clinicians and patients. Musculoskeletal system involves 60– 70% of body mass and includes muscles, bones, joints and the surrounding connective tissues.[3] Many diabetic patients suffer from musculoskeletal manifestations which cause substantial morbidities in their lives.[4] About 20–33% of people globally and about one in two adults were found to have a musculoskeletal disorder in the US.[5]

Among the common musculoskeletal disorders in DM patients include Osteoarthritis (OA) Rheumatoid Arthritis (RA) Charcot's Foot (CF) Adhesive Capsulitis (AC) Osteoporosis, Limited Joint Mobility (LJM) Fibromyalgia Syndrome (FMS) Dupuytren's Contracture (DC) Trigger Finger (TF) and Carpal Tunnel Syndrome (CTS).[6] Musculoskeletal pain and loss of function can be caused due to restricted movement, flexibility and abilities.[7]

The musculoskeletal complications are often ignored and highly under recognized. They can be very incapacitating and contribute to significant physical disability and impair quality of life. The exact pathophysiology of these complications is not known, however, connective tissue disorders, neuropathy or vasculopathy may have a synergistic effect. It is postulated that prolonged hyperglycaemia results in collagen glycosylation. This glycosylated collagen is less soluble, offers increased resistance to collagenases and accumulates in connective tissue, which not only alters extracellular matrix structure and functions but also impairs cell viability thus resulting in various manifestations.[8] Certain pro-inflammatory cytokines such as tumor necrosis factor alpha [TNF-α], interleukin-6 [IL-6] and interleukin-1 beta (IL-1β) have been found to be involved in musculoskeletal pain. TNF-α, a pleiotropic cytokine, is known to facilitate pathological conditions such as inflammation, arthritis, IR, immunomodulation, autoimmune diseases and apoptosis.[7-9]

There are lack of documentations of on musculoskeletal complications in DM in our context. This study is designed as an initiative to throw some light into this unexplored and neglected area by identifying the common musculoskeletal complaints and studying their association with the duration and severity of DM.

MATERIALS AND METHODS

This was a cross sectional observational study carried out in Physical medicine and Rehabilitation Out Patient Department (OPD) of Chattagram Maa-O-Shishu Hospital Medical College between October 2020 to March 2021. Patients with diagnosed case of Diabetes Mellitus having FBS>7mmol/l, 2hrs post prandial blood sugar >11.1mmol/l or HbA1c > 6.5 along with musculoskeletal pain were included in the study.Non diabetic patients suffering from musculoskeletal pain werealso included as controls. Patients withany history of trauma or fracture in or around the joint, patients with malignant condition, patient suffering from stroke or any neurological deficit causing unable to communicate with physician were excluded from the study.
Detailed history about duration of diabetes, control of diabetes, any musculoskeletal complaints and details of ongoing treatment was noted. Complete physical examination with special reference to musculoskeletal examination wasdone. Fasting and postprandial blood sugar and HbA1c was estimated. Musculoskeletal complication assessment was done by clinical examination. GALS (Gait, arm, legs, spine) screening was performed where each of component was examined in details which if significant lead to REMS (Regional Examination of Musculoskeletal System) in which various joints were evaluated for abnormalities on inspection, palpation, movement of joints, and functional assessment of joints for any abnormalities. X-ray and if needed MRI was done.Correlation of musculoskeletal manifestations with age, BMI, duration of diabetes, and control of diabetes was evaluated and statistical analysis was done. Assessment of various musculoskeletal complications was done as follows –

- Adhesive capsulitis was defined as history of unilateral and/or bilateral pain in the shoulder

with no history of trauma and equal restriction of active and passive movement in a capsular pattern (External rotation > abduction >internal rotation).

- Tendonitis was considered positive with presence of inflammation in either of the two tendons i.e. rotat or cuff or biceps with a history of pain in the anterior shoulder region and active movements restricted in the corresponding muscles.
- Flexor tenosynovitis or trigger finger was diagnosed by palpating a tender nodule or thickened flexor tendon with locking phenomenon during movement of any finger.
- DCT (Dupuytren's contracture) was defined aspalpable thickening of palmer fascia with flexor

deformity of 2nd, 3rd, 4th and 5th finger.

- CTS (Carpel tunnel syndrome) was considered with positive Tinel's/ Phalen's sign, loss of power of abductor pollicis brevis, thenar wasting and reduced sensation in 1st, 2nd and 3rd finger that is inthe distribution of the median nerve.
- LJM (Limited Joint Mobility) or diabetic chieroarthropathy was characterized by thick, tight

waxy fingers over the dorsal aspect of hands with flexion deformity of metacarpophalangeal and interphalangeal joint and inability to make a fist together with wrist maximally flexed forming the prayer sign.

- Diabetic foot, Charcot foot and osteomyelitis was diagnosed by acute, inflammatory swelling and characteristic laboratory and radiographic feature.
- Diabetic amyotrophy was defined as a severe painfuland atrophic shoulder girdle or thigh and/or backmuscles.
- The diagnosis of DISH (Diffuse Idiopathic Skeletalhy Perostosis) was defined flowing ossification along at least four continuous vertebral bodies, preservation of discspace, vertebral body marginal sclerosis and absence of apophyseal joint ankylosis or sacroiliac joint erosion or fusion.

Statistical analysis was done using statistical software SPSS 20 was used.

Written informed consent was obtained from all subjects and confidentiality of data was assured. The study has been approved by the institutional ethics committee.

RESULTS

Table I Gender and age group of the patients

Gender	Number	Percent
Male	28	28%
Female	72	72%
Age groups		
<30 years	15	15%
31-40 years	18	18%
41- 50 years	45	45%
51-60 years	13	13%
>60 years	9	9%

Table I showing gender distributions and age group where more patients were female (72%) and most were at age group 41 to 50 (45%).

Table II Duration of DM

Duration of DM	Number	Percent
>5 years	2	2%
6-10 years	23	23%
11-15 years	35	35%
>16-20 years	21	21%
>21 years	19	19%

Table II showing duration of DM, where 35(35%) patients were suffering from DM for 11-15 years and 21(21%) were suffering from DM for 16 -20 years.

Table III Pattern of Musculoskeletal complications

Complications	Number	Percent
RCT (Rotator Cuff Tendinitis)	9	9.0%
AC (Adhesive Capsulitis)	11	11.0%
TE(Tenis elbow)	1	1.0%
DQT (De Quervain's Tenosynovitis)	1	1.0%
TF (Triger Finger)	6	6.0%
CTS (Carpal Tunnel Syndrome)	6	6.0%
DC (Dupuytren's Contracture)	3	3.0%
LJM (Limited Joint Mobility)	3	3.0%
OA KNEE (Osteoarthritis)	10	10.0%
CJ (Charcots Joints)	3	3.0%
DISH (Diffuse Idiopathic Skeletal Hyperostosis)	7	7.0%
PF (Planter Fascitis)	8	8.0%
AT (Achillis Tendinitis)	2	2.0%
DA (Diabetic Amyotrophy)	2	2.0%

Table III showing different musculoskeletal complications among DM patients where Adhesive capsulitis was 11(11%), curpal tunnel syndrome was 6(6%), OA KNEE was 10(10%) and planter fasciitis was 8(8%). Other less common complications were also found .

Table IV Distribution of age, gender and control of DM with different MSK complications

	Age		Gender		DM	
	<50	>50	Male	Female	Control	Uncontrolled
AC	10	6	5	11	11	5
OA KNEE	14	2	3	13	11	5
TF	10	4	3	11	10	4
CTS	10	3	6	7	7	6
RCT	6	6	4	8	6	6
PF	7	5	4	8	10	2
DISH	6	3	4	5	7	2

Table IV showing different complications in relation with age <50 years and >50 years, gender differences and control status of DM.

DISCUSSION

Our study showed three important findings. First, the frequency of musculoskeletal manifestations in DM is high. Second, the most common musculoskeletal manifestations were adhesive capsulitis and osteoarthritis of knee. Third, there was a significant association between vascular and musculoskeletal complications and the development of musculoskeletal manifestations. In a study Carpal tunnel syndrome is observed in up to 20% of patients with diabetes.[10] But compared to Carpal tunnel syndrome, adhesive capsulitis was observed in 11% of our patients; however, thiswas less than the 25% reported from a British cohort.[11] Adhesive capsulitis is a chronic disabling condition associated with pain, requiring long-term treatment in the form of physiotherapy and repeated injections. Unfortunately, the treatment is more prolonged in diabetic patients and surgical intervention may be required if the condition is not treated early.[12,13]

It is estimated that more than 50% of diabetic patients will suffer from chronic disability.[1] Some factors that contribute to chronic disability in diabetic patients include vascular complications, in addition to predisposing conditions, such as obesity and low physical activity.

It was reported that patients with type 2 diabetes had greater impairments in mobility and more difficulties performing basic Activities of Daily Living (ADL) than similarly aged non-diabetic persons.[12] This leads toloss of independence and it may predict future hospitalization, institutionalization and death.[13] Many studies have evaluated MSK manifestations in diabetic patients, but most assessed only an individual component, especially MSK involvement of the hands and shoulders. Only few studies evaluated the whole MSK system, including the limbs and back. Amongst these was a pilot study on 208 patients with type 2 diabetes in which musculoskeletal complications, excluding osteoarthritis, were detected in 38% of the cases.[3] A higher prevalence (58%) was reported by other authors in acohort of 80 patients with type 2 diabetes.[14] The lower prevalence of musculoskeletal manifestations in our

cohort could berelated to the fact that we excluded other mechanical joint and muscular conditions, which was a common finding in our study population. There is strong evidence that the development of one complication predisposes to the development of another. We found a significant association between shoulder adhesive capsulitis and other musculoskeletal complications of diabetes, notably carpal tunnel syndrome, 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.[15]

Over the past years, it has been shown that these strong predictors predisposed to the development of musculoskeletal complications in diabetic patients, of which the most important is blood glucose control.[3] In our study, there was no association between blood glucose control and MSK manifestations although we calculated the mean HbA1c level from results obtained during the last three visits, as a single HbA1c level does not correlate with tissue levels of advanced glycosylation end products. These contradicts the results obtained in a British cohort that demonstrated a strong association between musculoskeletal manifestations and poor blood glucose control.[11]

Several studies have suggested that hyperglycaemia may play a vital role in musculoskeletal disorders and pain.[9] Diabetes causes a disturbance in insulin metabolism that leads to hyperglycaemia, which commonly leads to other complications. Impaired insulin action on target tissues can be a result of faults in insulin secretion and/or decreased tissue responses to insulin, which may cause abnormalities in carbohydrate, fat and protein metabolism.[16] Hyperglycemia may induce chronic inflammation that can lead to systemic changes in body organs.

Diabetes has major effects on connective tissues, which significantly impacts tendons, ligaments, bones and cartilage.[16] An increased prevalence of connective tissue and musculoskeletal disorders has been observed in persons with diabetes. The alterations observed in connective tissue in persons with diabetes have suggested that various factors can lead to musculoskeletal pain.The cartilage extracellular matrix can alter due to metabolic abnormalities linked with diabetes.

CONCLUSION

Musculoskeletal complications are common in both controlled and uncontrolled DM. There are varieties of MSK complications and early interventions are needed to overcome the further progressions.

LIMITATIONS

Single center study with small sample size.

Conflict of interest: none

DISCLOSURE

All the authors declared no competing interest.

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