COMMON MUSCULOSKELETAL DISORDERS IN DIABETES MELLITUS PATIENTS

ABSTRACT OBJECTIVE

To determine the frequency of common musculoskeletal disorders complications among type 1 and type 2 diabetic mellitus patients and to find the association with BMI. Also to assess the level of awareness about Physical Therapy among diabetic patients.

METHODS

A cross-sectional (descriptive) survey of diabetic patients aged above 35 years with a history of minimum 5 years of disease, taken from physical therapy unit of Karachi, Pakistan. It was conducted through self-administered structured performa. 375 patients fulfilling the inclusion criteria were selected and studied. Analysis was carried out using the statistical package for social sciences.

RESULT

There were 42.1% males and 57.9% females participated in the study. More than 90% participants were type 2 diabetics. The most common manifestations were osteoarthritis affecting both extremities (n=238), frozen shoulder (n=176), tendinitis (n=55) and fibromyalgia (n=50) noticed in both types of DM. A significant association was found between BMI and the duration of disease with respect to type 2 DM. More than half of the participants were aware of the various effects of physical therapy in diabetes.

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INTRODUCTION

Insulin, a hormone that is produced by the pancreas, controls the blood glucose levels. Due to the malfunctioning of this hormone in any aspect that is, either in its production or its action or both, leads to high blood glucose levels. The inability of insulin to control the blood glucose level leads to a situation known as "Diabetes Mellitus" or hyperglycemia, which is a group of metabolic diseases.¹ It is a chronic condition of high morbidity and mortality.² For DM, according to American Diabetes Association classification system, there are four basic types of DM that is, "Type I DM", "Type II DM", "Gestational Diabetes Mellitus" (GDM) and "other specific types". These terms emphasize on the management and treatment of DM rather than the cause of the disease.³ Among these types, Type I DM and Type 2 DM are the most common and usually seen. In Type 1 DM, the absence of insulin leads to poor metabolism of protein, fat and carbohydrate. Type 2 DM represents approximately 90% of all cases. These patients have insufficient amount of insulin production or the amount is not balanced for their level of glycemia with primary defect in insulin resistance.³

Diabetes mellitus affect connective tissues in many ways and causes different alterations in periaricular and skeletal systems⁴. It can cause chronic damage which is unalterable and progressive affecting various organs and systems of the body. Although the precise cause of diabetes related musculoskeletal (MSK) disorders and complications remains uncertain, there is confirmation that hyperglycemia alters the structural matrix and mechanical properties of tissues by accelerating non-enzymatic glycosylation and abnormal collagen deposition in periaricular connective tissues leading to diffuse arthrofibrosis¹. It may alter or modify the presentation, severity and pathophysiology of many musculoskeletal syndromes. Common therapies, treatments and management may differ in their effects and actions for patients with other diseases as compared to diabetic patients. Diabetes mellitus affects the musculoskeletal system of the human body, as a result, various musculoskeletal complication are seen affecting the limbs, feet and spine as a whole. Musculoskeletal complaints (MSCs) are among the major health problems worldwide and the most frequent cause of long-term sickness run off in Norway⁶ Increased mortality has been reported among individuals with chronic widespread MSCs, which further emphasizes that this group of patients may constitute an important public health problem. A survey was done which showed that DM was associated with higher prevalence of chronic MSCs, in particular chronic widespread MSCs.⁴ Diabetes mellitus (DM), a worldwide high prevalence disease, is associated with a large variety of rheumatic manifestations. It acts as a base for many musculoskeletal disorders and complications, causing pain, disease or even disability which later on affects and disturbs the quality of life of an individual. If it is left untouched than the awful part is the fact it acts as a food to many rheumatic conditions and associated circumstances which becomes the major cause of crippling deformities and other disabilities for many diabetic patients. But if it is correctly diagnosed it is usually controllable by the particular handling and management given by a multidisciplinary team work⁷. The selected disorders are: burning of feet and numbness of feet, delayed wound healing, Callusities formation, pressure ulcers and incidence of fracture. Other musculoskeletal problems occur with increased frequency in diabetic patients, including Dupuytren's disease, carpal tunnel

synovitis, osteoarthritis involving both, extremities, rheumatoid arthritis, fit Systemic Lupus Erythematosus.

In 2004, the National Health Interview Survey showed that 58% of diabetic patients would be disabled. Recent data show that the prevalence of diabetes in the hands and shoulders is 1.5% in type 1 or type 2 diabetes is 30%. Statistics show that MSK diseases in diabetic burden of degenerative joint diseases were more than inflammatory arthropathies (20.1%) in patients with functional disability are in day as the number of diabetic patients and hence can create a major public health problem.

Physical therapy can be the mainstay of treatment for patients suffering from musculoskeletal disorders. A study conducted by Hooper et al. showed that patients with diabetes mellitus can get pure immersion in a heated pool at 37°C in medication, weight and a good glycemic control. Some of the benefits that were observed were the pain caused by the rheumatoid arthritis and associated problems, it can manage the musculoskeletal imbalances and at the same time on the postural correction, stretchings of weak and shortened muscles in order to resulting deformities and disabilities so as to making them independent and improving their life. Most of these disorders can be diagnosed by some radiological inspection may be but some radiological inspection may be differential diagnosis. No definite treatment and treatments used in the general population recommended for diabetic subjects. Therapist is specially trained to decide the availability for individual diabetic patients. Benefits that can be observed are levels, drop off use of oral hypoglycemic agents, body fat and stress, and improve the circulatory system. There is a definite balance and ultimately decrease risk of diabetes and musculoskeletal syndromes. Most previous studies related to the association of diabetes and musculoskeletal disorders included a control group or differentiated into type 1 and type 2 diabetes or included only skeletal syndrome⁸. Therefore, No previous study has been conducted to assess the prevalence of musculoskeletal disorders manifestations in diabetic patients. So the purpose of our study was not to specify a single aspect rather, various aspects were examined that is, to determine the frequency of common musculoskeletal disorders in diabetic patients, which musculoskeletal disorders are common among Type 1 DM and Type 2 DM, association between DM and body mass index, assess the level of awareness regarding therapy to them.

METHODOLOGY

Study Design and Setting

participants were taken from physiotherapy unit of hospitals during one year.

Sample Size and Technique

The sample size of 375 participants which was calculated by using the formula for calculating sample size on the basis of prevalence.

Prevalence was taken at 50% because no relevant data was available. The bound of error was taken at 5% with 95% confidence interval. Sample was selected through convenience sampling technique.

Inclusion Criteria

- Patients with both genders
- DM since 5 years
- Age above 35 years

Data Collection Method

Data was collected through self administered structured Performa in Standard English language. The Performa was divided into three sections. Firstly, the demographic data was collected for all the diabetic patients including their age, gender and BMI. Secondly, the clinical information including: duration of disease (in years), type of diabetes(type 1 or 2), MSK disease found in an individual such as; Carpal Tunnel Syndrome, Osteoarthritis, Frozen Shoulder, Tendinitis, Synovitis, Rheumatoid Arthritis, Systemic Lupus Erythematosus, Fibromyalgia and Dupuytren's Contracture, and other possible problems related to diabetes including Fracture, Burning Feet, Numbness of Feet, Delayed Wound Healing, Pressure ulcer and Callosities formation. Finally, six questions were asked to assess the level of awareness regarding the role of Physical therapy in DM.

Data Entry and Analysis

For data analysis the data was entered on SPSS version 17. Percentages and frequencies were calculated for the categorical data whereas mean and standard deviation was calculated for numerical data. Chi square was used as test of significance for finding association between different variables. P-value less than 0.05 was taken as significant.

Ethical Consideration

Participants who were fulfilling the inclusion criteria were explained the nature of the study and verbal consent was obtained from the participants. They were informed that their identity will be kept anonymous.

RESULT

A total of 375 Diabetic mellitus patients filled the Performa during the study period .The mean age of the patients including 158(42.1%) male patients while 217(57.9%) patients were female. Patient suffering DM since 5 years or more included in the study. Type 1 DM was in 57(15.2%) patients included 21 males and 36 females while Type 2 DM was in 318(84.8%) included 136 males and 182 females.

TABLE 1

The most common musculoskeletal manifestations were located among diabetic patients in respect to their specific type and it came across that osteoarthritis was affecting both upper and lower extremities (n=238), frozen shoulder (n=176), and tendinitis (n=55)fibromyalgia (n=50) were the most widespread diabetic complications noticed in both type 1 and type 2

TABLE 2

The awareness concerning various effects of physical therapy, mixed association was seen. More than half of the population (83.2%) believed that physical therapist can help in relieving pain, while half of the population (48%) was aware of physical therapist role in identifying-early changes in area at risk and in deformity prevention. Apart from fewer cases reported as shown in table 2, most of the population was unaware of physical therapist role in increasing muscle movement and strength, enhancing wound healing and maintaining blood circulation by recommending different exercises.

Table 3

A significant association was seen between the BMI and duration of DM, out of 375 diabetic patients, 175patients with overweight and obesity presented with type 2 DM where as 143 patients were with normal weight and under weight .

No connection was seen between long standing type 1DM and overweight as minimum number of diabetes patients (n=26) were reported as overweight and obese. Hence according to table 3 patients with overweight and obesity may have a risk of type 2 DM.While studying the related disorders in diabetic patients we came across that foot problems are added observed with other major manifestations. These includes burning foot, numbness of foot, pressure ulcers and callosities formation. Among these, numbness of foot (n=173) and burning of foot (n=125) were the most frequent.

DISCUSSION

This fact cannot be denied that Diabetes mellitus is a complex disease to understand and intricate to manage. Fulfilling our aims of study, some most prevalent musculoskeletal complications (MSK) were seen in diabetic patients irrespective to its particular type. These manifestations include Adhesive capsulitis of shoulder, Osteoarthritis affecting both extremities; upper and lower, tendinitis, Fibromyalgia and Carpal tunnel syndrome as shown in table 1. A study conducted by Perttu ET Aikklä in Turku, Finland evaluated 425 diabetic patients and found a significant association in both types of diabetes mellitus and MSK complications¹¹.

These expanding complications in diabetic patients are more often due to their highly affected muscles performance and lower limb mobility^{7,11,12,14}. This is why osteoarthritis affecting lower extremity was most frequently seen in present study as a foremost complication of Diabetes mellitus. A similar study conducted in Kolkata from November 1991 to November 2000 found an association between osteoarthritis of specifically lower extremity and diabetes mellitus⁶. Another study also conducted in Kolkata from 2003-2005, 80 patients were studied out of which 43 patients presented with rheumatological disorders. Among these diabetic patients frozen shoulder, carpal tunnel syndrome and limited joint mobility were more general¹³. Reported by P E Aikklä in his cross-sectional study on diabetic patients revealed frozen shoulder as the common diabetic complication present in both types of DM¹¹.

In our study most common diabetic complication associated to type 1 DM were frozen shoulder, osteoarthritis affecting lower extremity, carpal tunnel syndrome

TABLE 1				
MUSCULOSKELETAL DISORDERS	VALUES	TYPE 1 DM PATIENTS		TYPE 2 PATIENTS
		n	%	n
Carpel Tunnel Syndrome	Positive	8	14.03	46
	Negative	49	85.96	272
Frozen Shoulder	Positive	36	63.15	140
	Negative	21	36.84	178
Osteoarthritis (LL)	Positive	30	52.63	167
	Negative	27	47.36	178
Tendinitis	Positive	5	1.57	50
	Negative	52	91.2	268
Synovitis	Positive	8	14.03	39
	Negative	49	85.96	279
Rheumatoid Arthritis	Positive	3	5.26	36
	Negative	54	94.7	282
Fibromyalgia	Positive	7	12.28	43
	Negative	50	87.7	275
Dupuytren's Contracture	Positive	5	1.57	16
	Negative	52	91.2	302
Osteoarthritis (UL)	Positive	5	1.57	36
	Negative	52	91.2	282

TABLE 2			
Physiotherapy can:	Response	n	%
Relieve pain by electrotherapy modality	Agree	312	83.2
	Disagree	46	12.3
	Don't know	17	4.5
Identify early changes in area at risk	Agree	182	48.5
	Disagree	161	42.9
	Don't know	32	8.5
Prevent deformity	Agree	180	48
	Disagree	159	42.4
	Don't know	36	9.6
Increase muscle movement & strength	Agree	30	8
	Disagree	150	40
	Don't know	195	52
Enhance wound healing	Agree	39	10.4
	Disagree	189	50.4
	Don't know	147	39.2
Maintain blood circulation by recommending exercise	Agree	29	7.8
	Disagree	187	49.86
	Don't know	159	42.4

turkey observed 102 patients and found dupuytren's contracture the most frequent MSK complication in type 2 diabetic patients'. According to some similar studies dupuytren's contracture was found as the most frequent diabetic complication present in both types of diabetes with almost equal ratio. [14,18] but in agreement with the present study dupuytren's contracture (n=21) was not found to be the most common complication and it was comparatively more common in type 2 diabetes.

According to Yarmaz MN and Mert M fibromyalgia was more common in patients suffering from type 2 DM as compared to type 1 DM¹⁹. Similarly in the present study fibromyalgia was more frequently seen in type 2 DM patient than type 1 (n=43 Vs n=7) where as another study conducted in Zefrin, Israel, found an association between fibromyalgia and DM²⁰. According to them fibromyalgia was almost equally significant in both types of DM, in contrast to our study we found its significance more in type 2 DM.

A strong correlation between tendinitis and type 2 diabetes was suggested by the study of M. E. Mavrikakis conducted at Alexandra General Hospital in Athens, Greece, who enrolled 824 adult type 2 diabetics and deep-rooted an association between the tendinitis and type 2 diabetes²¹ as also observed in the present study.

In the present study it was analyzed that more cases of degenerative disorders such as osteoarthritis reported comparatively than inflammatory disorders such as carpal tunnel syndrome, tendinitis and synovitis. A similar study conducted at Bangabandhu Sheikh Mujib medical university, Dhaka to find the pattern of MSK disorders, 2062 patients were examined and came to a conclusion that degenerative disorders are more frequent than inflammatory ones of MSK in diabetic patients²². Similar results were also observed in our study that with in 375 patients, degenerative disorders such as osteoarthritis were more common in diabetic patients than inflammatory disorders such as carpal tunnel syndrome, tendinitis and synovitis. In the current study we found an association linking MSK manifestations and its features with long term diabetes mellitus. In such patients, with the growing age, amplified number of MSK problems were seen as also previously reported in some studies^{23,24,25}. In company with the prevalence of common MSK complication in long standing diabetes mellitus, we also merged one more aspect of related problems in our questionnaire in order to further investigate common complications and related MSK disorders of foot. It is usually observed that diabetic patients typically go through foot problems along with major MSK manifestations and it is also noticed in our study as well that maximum number of diabetic patients reported several foot problems in which burning feet (n=125) and numbness of feet (n=173) were the most widespread. In previous studies it has been established that foot complications account for 20% of all diabetic patients because of disturbed sensibility⁷. According to another study, diabetic foot complications were the most common and serious manifestation in diabetic patients noticed¹⁴.

Another association was established in the present study between the body mass indexes (BMI) and chronic diabetes mellitus as shown in table 3. We found that about 60% (n=175) of diabetic patients were overweight or obese and presented with type 2 DM. Whereas a small number of obese diabetic patients (n=26) were categorized in type 1 DM. Overweight or obese people may

TABLE 3			
BMI (BODY MASS INDEX)	TYPE 1 DM PATIENTS	TYPE 2 DM PATIENTS	
	N	%	N %
UNDER WEIGHT	1	1.7%	2 .62%
NORMAL WEIGHT	30	52%	141 44%
OVER WEIGHT	16	28%	119 37%
OBESITY GRADE 1	8	14%	39 12%
OBESITY GRADE 2	1	1.7%	13 4%
OBESITY GDRAGE 3	1	1.7%	4 1.2%

and synovitis were present with similar frequency and fibromyalgia where as no significant association was seen in tendinitis and osteoarthritis affecting upper extremity with type 1 DM. According to one study conducted by Singh R at Auckland, New Zealand reported a strong association between risk of developing carpal tunnel syndrome and type 1 DM¹⁶

A strong relation was seen in type 2 DM and diabetic manifestations including frozen shoulder¹⁵, carpal tunnel syndrome and osteoarthritis affecting lower extremity¹⁵. Some disorders were strongly linked to type 2 DM than type 1 DM that is, these disorders were more frequent in type 2 DM than type 1 DM such as tendinitis(n=50 Vs n=5), rheumatoid arthritis(n=36 Vs n=3) and fibromyalgia(n=43 Vs n=7). Apart from frozen shoulder and Osteoarthritis affecting lower extremity, few cases of musculoskeletal complications were seen in type 1 DM. Therefore, we concluded that type 1 diabetic patients are comparatively less affected with MSK disorders¹⁷. Similar results were also obtained by a study done by Suzan, M. after in which MSK complications were more common in type 2 DM, 252 patients were included in the study 45 patients suffered from musculoskeletal complications, maximum patients (91%) had type 2 DM. Their findings also suggested frozen shoulder and carpal tunnel syndrome as the most frequent manifestation in type 2 DM⁸. Similar study conducted in Gaziantep, turkey also found frozen shoulder as the most common complication⁹

A pilot study carried out at Hippokratia University Hospital in Thessaloniki, Greece revealed osteoarthritis as the most frequently encountered MSK complication in type 2 diabetic patients⁴. Another cross-sectional study carried out at Adnan Menderes University Hospital in Gaziantep

cross-sectional epidemiologic study conducted in rural, suburban and urban areas of 1996-1999, accomplished a strong association between type 2 DM and obesity²⁶. A survey conducted in United States to unearth the prevalence and obesity among diabetic adults. The study was based on two surveys done by "Third National Nutrition Examination" (NHANES III 1999-2002). They indicated that mainstreams of adults with diagnosed diabetes mellitus are overweight or obese and their percentage is 85.2%²⁷.

In our part of the world, due to lack of awareness and consistent awareness programs, the level of awareness regarding physical activity and its effects. As shown in table 2, most patients were aware from the general education that is, physical therapist conducting electrotherapy modalities but they are still unaware from the advantages and effects of physical therapy in variety either we talk about its role in prevention or even in increasing muscle strength. Unfortunately, no prior studies to assess the level of awareness concerning physical therapy. Therefore, present study assistance in terms of providing a snapshot awareness status regarding field of physiotherapy that further recommendations can quantify.

The limitation of the study is that only diabetes were included in the study v tertiary care hospital, diabetic center residents otherwise more actual snapshot skeletal disorders could be observed in patient visits private clinics.

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