International Journal of Health Sciences, Qassim University, Vol. 10, No. 1 (Jan-Mar 2016)

The Musculoskeletal Manifestations of Type 2 Diabetes Mellitus in a Kashmiri Population

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Abstract

Objectives: Diabetes mellitus (DM), is affecting an ever increasing number of people worldwide. Diabetes is associated with several musculoskeletal manifestations. These may involve, the upper as well as the lower limb. We conducted this study to find out the prevalence of musculoskeletal problems in type 2 diabetics in the Kashmiri population.

Methodology: The study was conducted on 403 patients with diabetes and 300 controls. All patients underwent screening for any musculoskeletal abnormalities. The patients with musculoskeletal abnormalities were further assessed to find the exact diagnosis according to predefined criteria.

Results: The hand was involved in 80 patients [19.8%] in the diabetic group and 15 (5%) patients of the control group. The elbow was affected in 56 patients [14%] in the diabetic group and 24 patients [5.9%] in the non-diabetic group. The shoulder involvement was diagnosed in 61 patients [15%] on the diabetic cohort and 15 patients in the non-diabetic cohort. All the upper limb figures showed a statistically significant difference i.e. P value <0.05.

Conclusion: The prevalence of musculoskeletal complications in type 2 diabetics in Kashmir is quite high.

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Introduction

Diabetes Mellitus is a very common disorder. The prevalence of diabetes for all age groups worldwide was 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]

Diabetes is associated with a number of complications including renal disease, peripheral neuropathy, retinopathy, and vascular events. Due to its multi-systemic nature, the development of additional manifestations such as musculoskeletal complications is possible. Rheumatic disorders in DM have been associated with disease duration, degree of metabolic control, and the presence of end organ damage.

Musculoskeletal complications of diabetes can be grouped into the following categories. [2, 3]

a. consequences of diabetic complications.
b. consequences of metabolic derangements inherent to diabetes.
c. syndromes that may share etiologic mechanisms with microvascular disease.
d. probable associations.

The complications are also grouped into various groups according to the presentation. [3, 4] These are

1. Syndromes of limited joint mobility mainly involve upper limb musculoskeletal structures and seem to be associated with diabetes duration, poor metabolic control and presence of microvascular complications. These include diabetic chieroarthropathy, Dupuytrens contracture, trigger finger and adhesive capsulitis.
2. Osteoporosis. Which may occur due to the disease but can also be a consequence of the treatment.
3. DISH. Diffuse idiopathic skeletal hyperostosis. There is ligamentous ossification of the anterolateral aspect of the spinal column, sometimes leading to bony ankylosis.
4. Neuropathies. These include the neuropathic arthritis, carpal tunnel syndrome, diabetic amyotrophy and reflex sympathetic dystrophy.
5. Diabetic muscle infarction.

As one can appreciate that the hands, shoulders, feet, muscles, and skeleton are some of the frequently affected sites. Although there is often no "cure" for these problems, there are treatments available that can significantly improve function and quality of life for diabetics with rheumatologic problems. [5]

The prevalence of these complications in the region of Kashmir is unknown. The aim of this study was to find the prevalence of regional musculoskeletal manifestations in the Kashmiri population.

Material and methods

A cross-sectional study was performed in 403 adult DM patients and 300 non-diabetic subjects attending the OPD of the SKIMS MC Bemina from June 2013 to April 2015. DM patients were ≥30 years old and fulfilled the National Diabetes Data Group Classification which defines diabetes as present from any two of the following tests on different days. [6]

(1) Symptoms of diabetes plus casual plasma glucose concentration≥200 mg/dL.
(2) Fasting plasma glucose≥126 mg/dL.
(3) 2-h plasma glucose≥ 200 mg/dL during an oral glucose tolerance test.

For all patients with diabetes a GALS (gait, arm, legs, spine) screening was performed which if significant lead to REMS (Regional examination for musculoskeletal system) and the following abnormalities were noted. 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, 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.

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

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

Adhesive capsulitis; Adhesive capsultis was defined as history of unilateral and/or bilateral pain in the deltoid area with no history of trauma and equal restriction of active and passive glenohumeral movement in a capsular pattern (external rotation > abduction > internal rotation)

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

Bicipital tendinitis; Anterior shoulder pain worsened with active flexion, tenderness over the bicipital groove, and positive Yergason's maneuver and/or Speed's test.

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. Radiographic aspects are important in diagnosing Charcot neuroarthropathy, although they are not present in patients with stage 0 disease.

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.

Diabetic amyotrophy; The diagnosis was based on a clinical presentation [wasting of the proximal upper or lower extremity muscles or the paraspinal muscles, preceded by severe pain and dyesthesia of the involved part], the presence of diabetes and neural studies.

Diabetic sclerodactyly was defined as thickening of the skin on the dorsal aspect of the hand in association with limited joint mobility in the absence of Raynaud phenomenon, calcinosis, and telangiectasia.

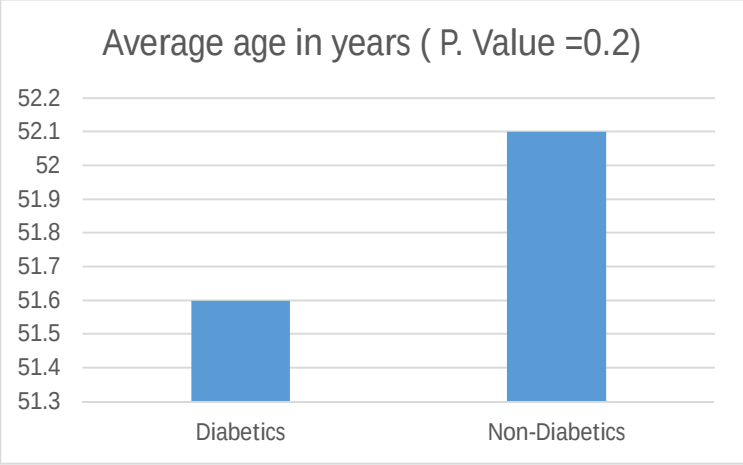
Diabetic osteolysis was characterized by osteoporosis of the proximal phalanges in the hands and feet, documented by X-ray radiographs.

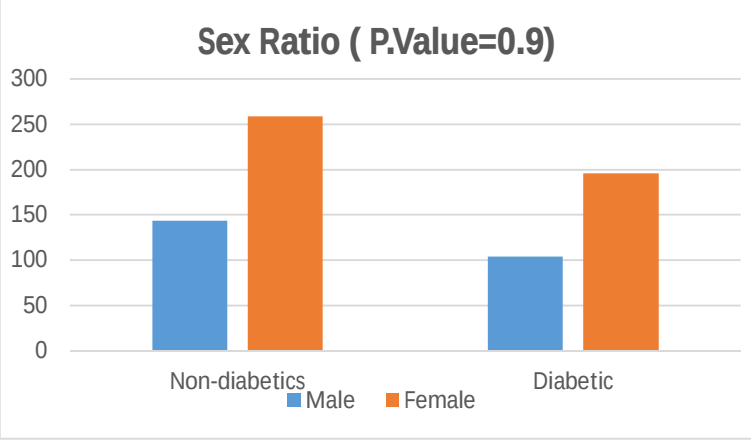
Diabetic muscle infarction was defined as a palpable painful mass with swelling and induration of the surrounding tissue without systemic symptoms, in addition to evidence of edema in the muscle on magnetic resonance imaging.

Results

Table 1

Number of Patients	Diabetics : 403	Non Diabetic: 300	P value
Age [average in years]	51.6	52.1	0.2
Male : Female	144/259	104/196	0.9
Disease duration	6.9 yrs [average]	-	
GALS screening	223 [55.33%]	83 [27.6%]	<0.001


Average age in years (P. Value =0.2)
52.2
52.1
52
51.9
51.8
51.7
51.6
51.5
51.4
51.3
Diabetics
Non-Diabetics


Sex Ratio (P.Value=0.9)
300
250
200
150
100
50
0
Non-diabetics
Diabetic
Male
Female

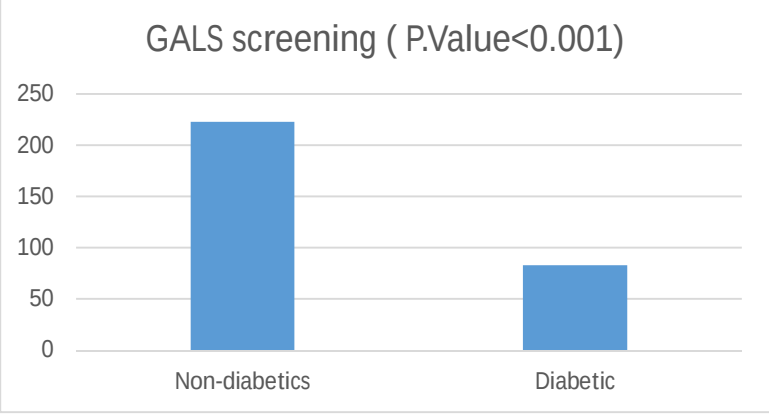

GALS screening (P.Value<0.001)
250
200
150
100
50
0
Non-diabetics
Diabetic

Table 2. Region wise breakup of the complications and their prevalence

Table 2A.

HAND	Non-Diabetic =(300)	Diabetic = (403)
Chieroarthropathy	4 [1.3%]	72 [17.8%]
Dupuytrens contracture	3 [1%]	23 [5.7%]
Flexor tenosynovitis	10 [3.3%]	76 [18.8%]
Dequervains tenosynovitis	5 [1.6%]	29 [7.1%]
Carpal tunnel syndrome	7 [2.3%]	45 [11.1%]
Sclerodactyly	-	9 [2.2%]

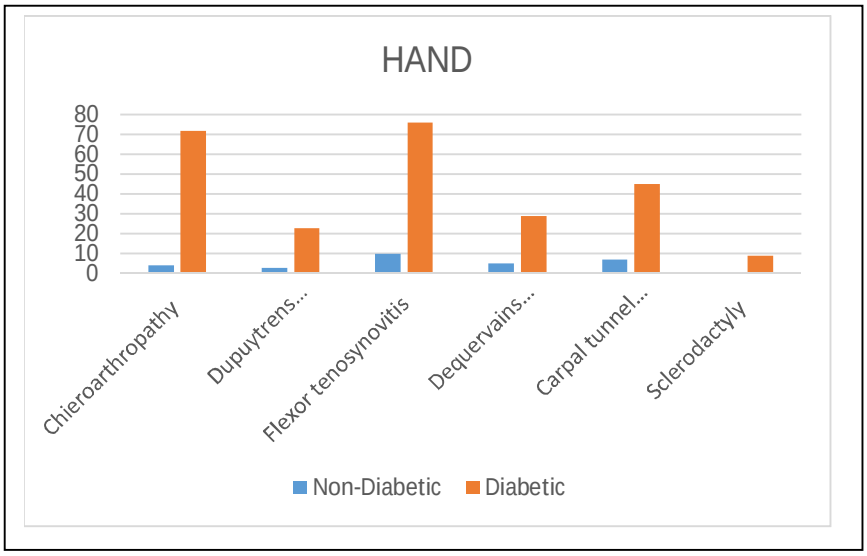


Table No: 2B

ELBOW		
Olecranon bursitis	3 [1%}	12 [2.9%]
Lateral epicondylitis	13 [4.3%]	29 [7.1%]
Medial epicondylitis	15 [5%}	45 [11.1%]

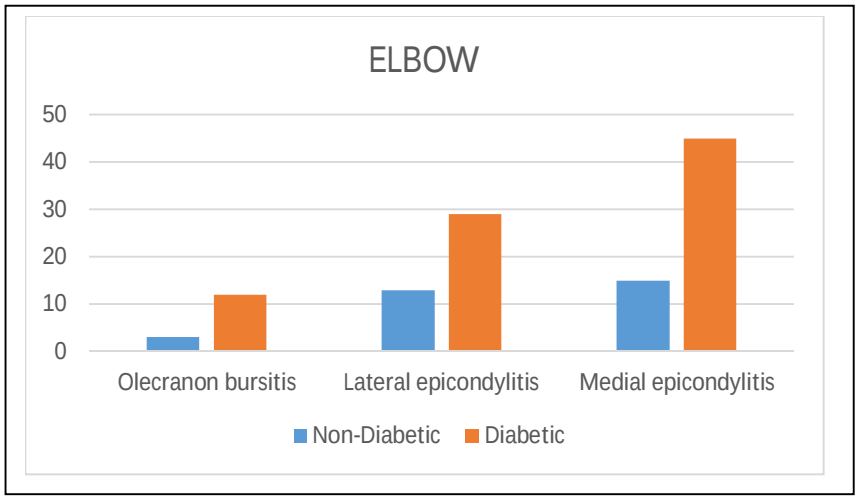


Table No: 2C

SHOULDER			
Rotator cuff tear		**6 [2%]**	**24 [5.95%]**
Bicipital tendinitis		**5 [1.6%]**	**20 [4.96%]**
Adhesive capsulitis	**11 [3.6%]**	**53 [13.1%]**	

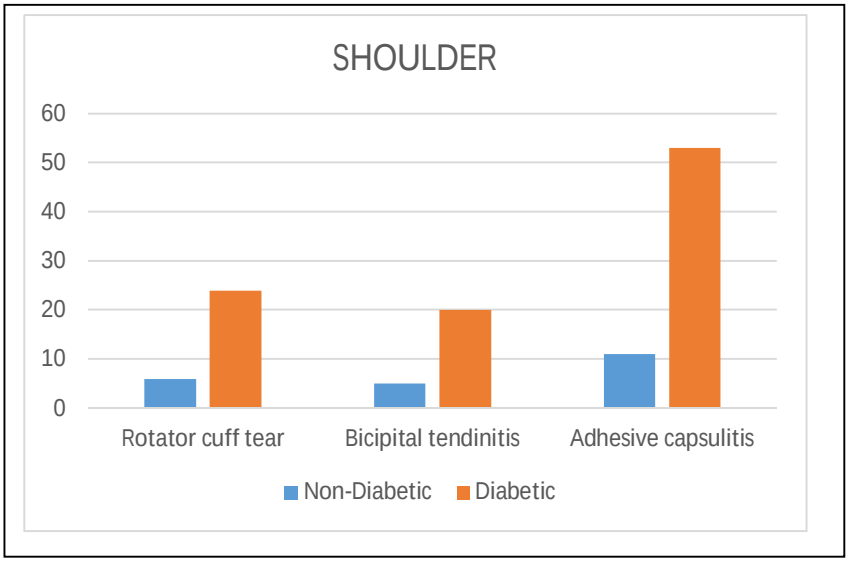


Table No: 2D

HIP		
Trochanteric bursitis	**2 [0.6%]**	**8 [1.9%]**

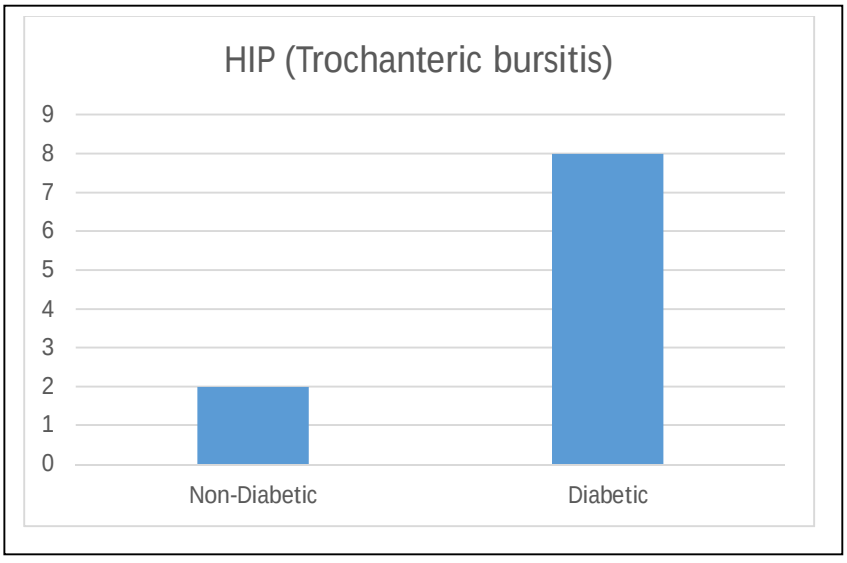


Table No: 2E

KNEE		
Prepatellar bursitis	**3 [1%]**	**16 [3.97%]**
Anserine bursitis	**45 [15%]**	**90 [22.3%]**

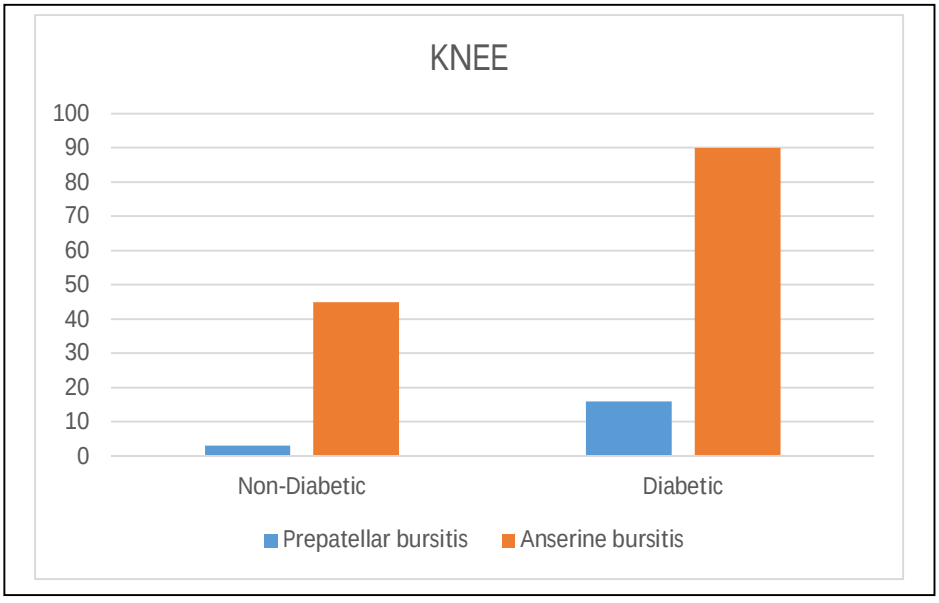


Table No: 2F

FOOT		
Neuroarthropathy	**-**	**4 [1%]**

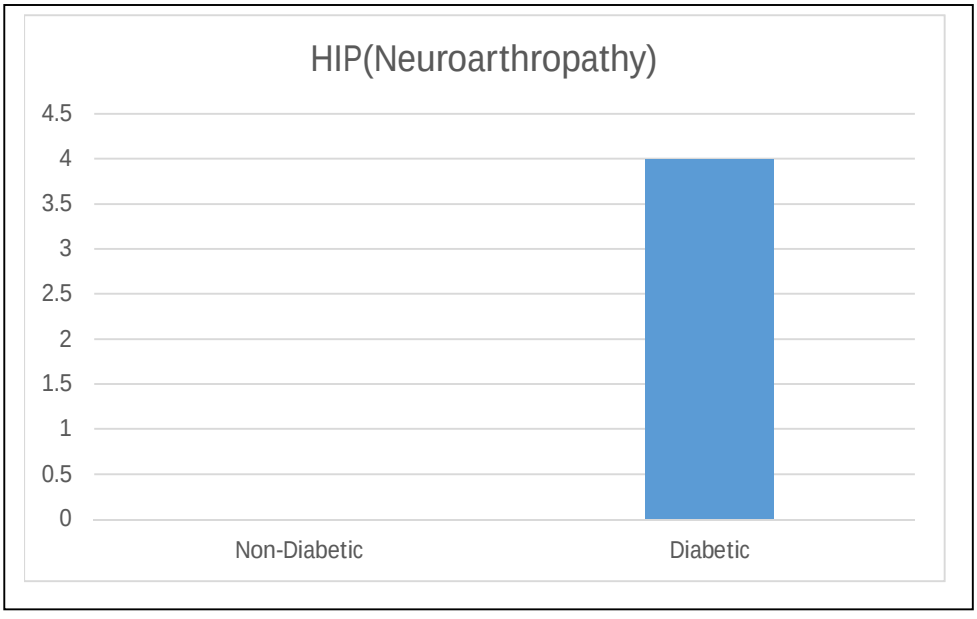


Table No: 2G

SPINE		
DISH	**9 [3%]**	**49 [13%]**

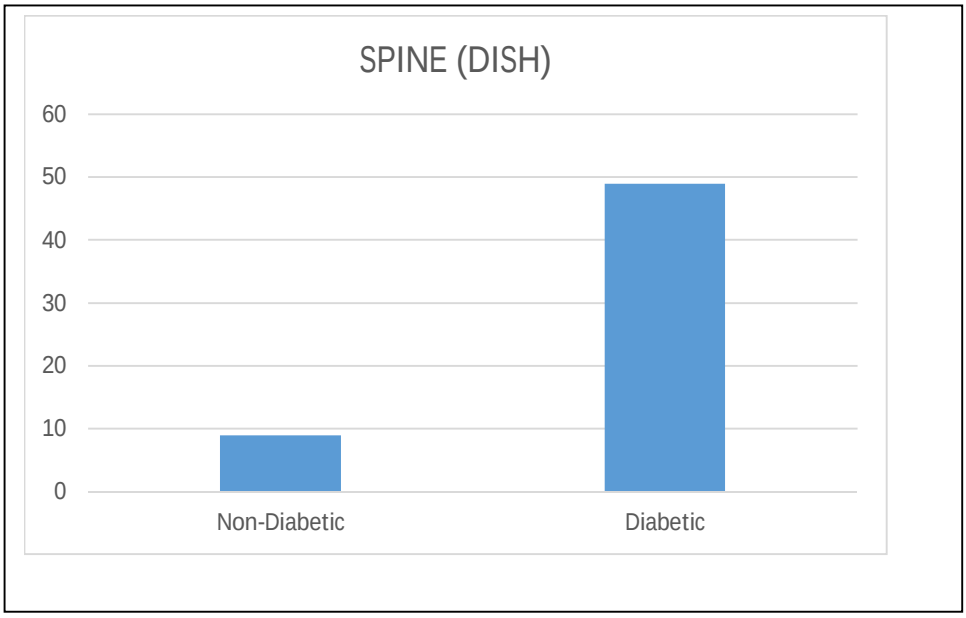


Table No: 2H

OTHERS		
Osteoporosis	**73 [24.3%]**	**120 [30%]**
Diabetic osteolysis	**-**	**1 [0.22%]**
Amyotrophy	**-**	**1 [0.22%]**
Diabetic muscle infarction.	**-**	**- [0%]**

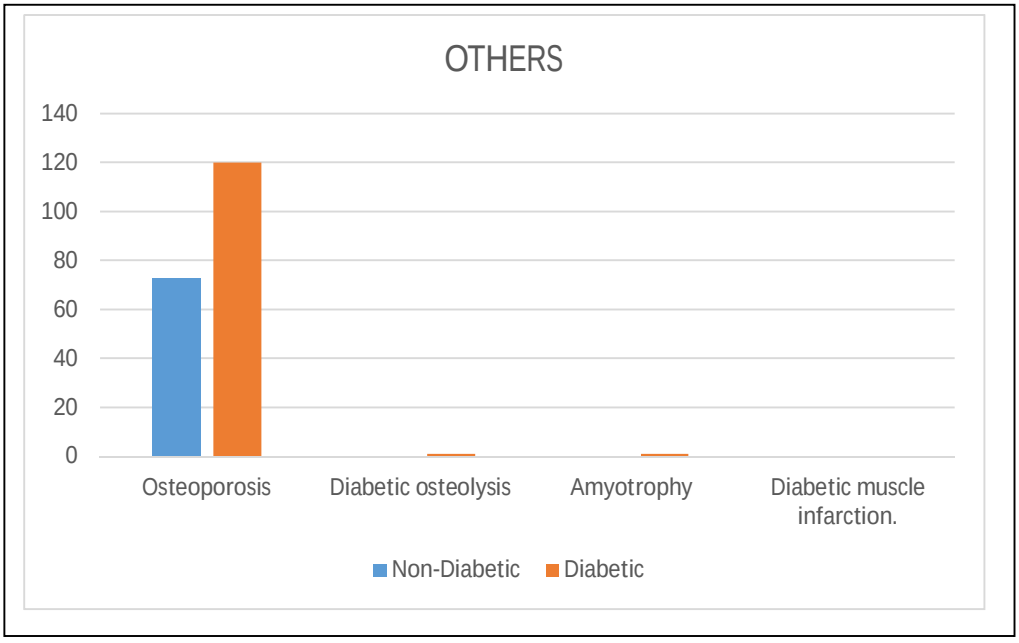
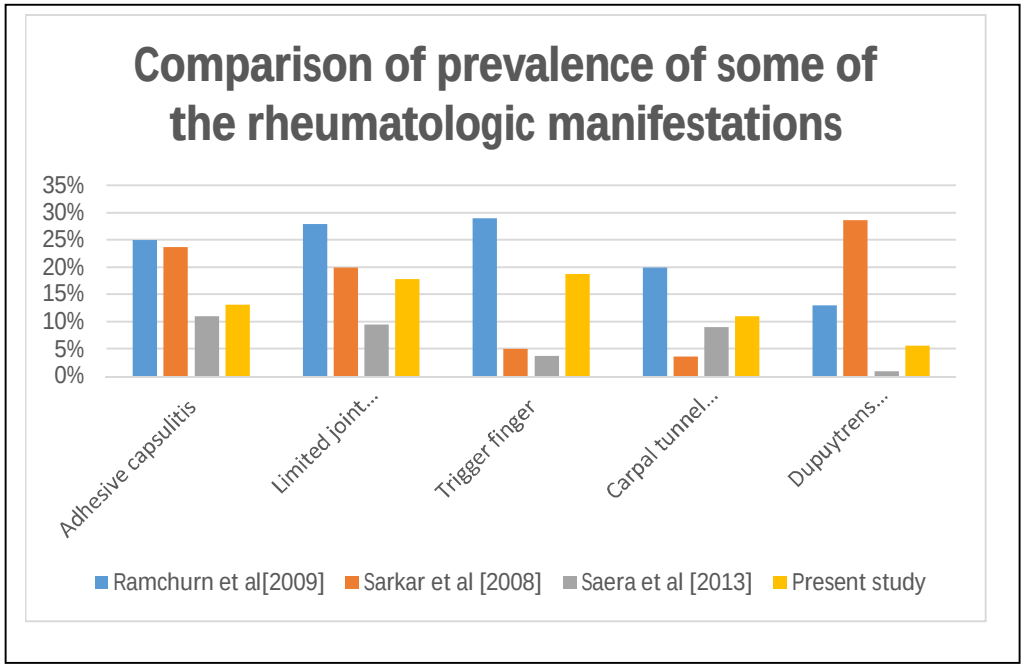


Table 3
Comparison of prevalence of some of the rheumatologic manifestations

	Ramchurn et al [2009]	Sarkar et al [2008]	Saera et al [2013]	Present study
Adhesive capsulitis	**25%**	**23.7%**	**11%**	**13.1%**
Limited joint mobility [chieroarthropathy]	**28%**	**20%**	**9.5%**	**17.8%**
Trigger finger	**29%**	**5%**	**3.8%**	**18.8%**
Carpal tunnel syndrome	**20%**	**3.7%**	**9%**	**11.1%**
Dupuytrens contracture	**13%**	**28.7%**	**1%**	**5.7%**



403 patients with diabetes were studied along with a control group of 300 non diabetic patients.

There were 144 [35.7%] males and 259 [64.3%] females with a mean age of 47.5 years (SD ± 10.2) in the diabetic group. BMI in the diabetic cohort was found to be 27.1(SD±5.2).

The mean duration of diabetes was 6.9 years. Only Type 2 diabetics were included in the study. Only 61 patients (14.9%) had controlled diabetes, with mean HbA1c level of 8.1.

Vascular complications were observed in 107 [26.5%] patients in the form of retinopathy, neuropathy and nephropathy.

223 (55.33%) diabetic patients had positive GALS screening examination with REM showing positive rheumatological findings in 133 [33.03%]. In comparison 83 [27.6%] of the non-diabetic patients had a positive GALS screening.

The hand was involved in 80 patients [19.8%] in the diabetic group and 15 (5%)

patients of the control group. The elbow was affected in 56 patients [14%] in the diabetic group and 24 patients [5.9%] in the non-diabetic group. The shoulder involvement was diagnosed in 61 patients [15%] on the diabetic cohort and 15 patients in the non-diabetic cohort. These figures and the differences in the lower limb manifestations is shown in table. All the upper limb figures showed a statistically significant difference i.e. P value <0.05.

Amongst the lower limb figures, both osteoporosis and pes anserinus tendinitis were present in larger numbers in both groups. This is probably due to osteoporosis being common in the Kashmiri population and a significant number of our patients having symptomatic knee osteoarthritis.

There was a significant association between certain manifestations and predictors: CTS and retinopathy, shoulder capsulitis and retinopathy, flexor tenosynovitis with retinopathy and neuropathy, diabetic cheiroarthropathy and diabetic sclerodactyly with retinopathy.

Discussion

Diabetes mellitus (DM) affects connective tissues in many ways and causes different alterations in periarticular and skeletal systems. Diabetes mellitus is associated with a great variety of musculoskeletal manifestations, many of which are subclinical and correlated with disease duration and its inadequate control. [7] These complications are often found, and, although less valued than the vascular ones, they significantly compromise the patients' quality of life. [8]

Epidemiologic studies have identified several personal, occupational and psychosocial factors related to the musculoskeletal disorders. [9] Even though the exact pathophysiology of most of these musculoskeletal disorders remains obscure, however, connective tissue disorders, neuropathy or vasculopathy may have a synergistic effect on the increased incidence of musculoskeletal disorders in DM. [10] According to Crispin and Alcocer, prolonged hyperglycemia in uncontrolled diabetic patients results in collagen glycosylation. Glycosylated collagen is less soluble, offers increased resistance to collagenases and accumulates in connective tissue, which not only alters the extra cellular matrix structure and function but also affects cell viability. [3] Also, vascular endothelial growth factor, which is associated with DM vascular disease, appears to be involved in the synovial proliferation of the subacromial bursa and shoulder joint contraction in type 2 DM patients with rotator cuff tendinopathy. [11] Finally, Rosenbloom et al. demonstrated an association between limited joint mobility syndrome and microvascular disease, suggesting that alterations in periarticular connective tissue are related to changes occurring in the microvasculature. [12] Rheumatic disorders in DM have been associated with disease duration, degree of metabolic control, and the presence of end organ damage. [13, 14, 15] The concurrent effect of advanced age in patients with type 2 diabetes mellitus must be considered. Aging tendons and ligaments are subjected to degenerative changes, whereby the number of tendon cells per unit of surface area is decreased, the tenocytes become slender, and there is reduced protein synthesis in the organelles, particularly in the rough endoplasmic reticulum. Comparison of some of the findings of our study with findings from some other studies are shown in the table. [16, 17, 18]

33% of our patients had musculoskeletal manifestations. This figure is higher than several other studies. The main reason for this is that our study included pes anserinus tendinitis and osteoporosis amongst the musculoskeletal manifestations. The presence of these two entities was on a higher side compared to other findings. Osteoarthritis was present in a significant number of our patients thereby contributing to a pes anserinitis independently. Similarly osteoporosis affects a large number of people in Kashmir.

Apart from these two manifestations, hand, elbow and shoulder were the most commonly affected areas. Adhesive capsulitis was present in 13.1% patients, flexor tenosynovitis in 18.8% and cheiroarthropathy in 17.8%.

It is also clear that lack of good control of the blood sugar levels and complications of diabetes (such as diseases of the central or peripheral nervous systems, myopathy, renal insufficiency) may influence muscle strength and joint function. This may amplify the musculoskeletal signs and symptoms.

It is estimated that more than 50% of diabetic patients will suffer from chronic disability. [19] 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 is not surprising that these metabolic abnormalities may be present in the early clinical stages of type 2 diabetes. Type 1 diabetes is diagnosed at an early stage because of a relatively acute clinical onset characterized by extreme elevations in glucose concentrations, whereas type 2 diabetes is usually diagnosed later in life, when many patients already have chronic complications. These subjects could definitely have had glucose intolerance or mild type 2 diabetes mellitus for a significant length of time before diabetes is diagnosed. [20]

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. [21, 22] This leads to loss of independence, and it may predict future hospitalization, institutionalization, and death. [23]

Very often, the presentation of rheumatic manifestations is the initial presentation of endocrine disease. Being aware of the presentation as well as the unique physiology of these complaints will help alert the clinician to an early diagnosis of endocrine disease. In addition understanding whether certain endocrine disease occurs more often in rheumatologic illness will enable the clinician to investigate their occurrence early, leading to earlier intervention and resulting in decreased morbidity from these concomitant illnesses. [24, 25, 26, 27, 28, 29]

Our study does show that the prevalence of musculoskeletal manifestations in diabetes mellitus type 2 is quite high in our region of the world. Elderly people are a growing segment of the population in our part of the world, and non-insulin-dependent type 2 diabetes mellitus is an age-related disease. Therefore, musculoskeletal manifestations of diabetes must be regarded as a fundamental public health problem. Some joint diseases, especially cheiroarthropathy, are often precursors of chronic diabetic complications. Prevention and strict control of this metabolic disorder is essential, because it has been demonstrated that limited joint motion is related to duration of disease and hyperglycemia.

It is important for the rheumatologist, diabetologist as well as the orthopedist to understand this association. All patients with diabetes should be screened for the rheumatologic signs and symptoms and institution of early rehabilitative methods may reduce the disease burden in this population.

Acknowledgment: We acknowledge the help rendered by Parvaiz Ahmed Zargar in the completion of this manuscript

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