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RESEARCH ARTICLE

STUDY OF THE PREVALENCE OF RHEUMATOLOGICAL MANIFESTATIONS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN A TERTIARY CARE CENTRE IN NORTH KERALA

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ABSTRACT

Background: Unlike the vascular complications of diabetes mellitus(DM) which are life threatening, rheumatological manifestations lead to considerable morbidity and their treatment can result in significant improvement in the quality of life. Some of these have a close association with DM and may lead to the diagnosis of previously undiagnosed DM. This study aims to find out the prevalence of rheumatological manifestations in DM so that the commonly associated conditions can be looked for and early treatment ensured. **Methods:** A cross-sectional study was done over 1 year in patients with diabetes mellitus in a tertiary care centre in North Kerala. History and relevant details were collected using a questionnaire and physical examination was carried out to look for rheumatological manifestations. Investigations were done whenever necessary. Statistical analysis of the data was done. **Results:** This study included 219 patients with a mean age of 60.98 years. 139 patients (63.4%) were having some form of rheumatological manifestations. There was statistically significant association between duration of diabetes and the presence of conditions such as frozen shoulder, charcot's joint, cheiroarthropathy, flexor tendinitis, dupuytren's contracture and osteoarthritis. **Conclusions:** There is a definite increased prevalence of rheumatological manifestations in people with DM and the prevalence increases with duration of diabetes. There was statistically significant association between the rheumatological manifestations and the microvascular complications of DM. Osteoarthritis was the most prevalent manifestation but the older mean age of our study population may have acted as a confounding factor.

Keypoints

- There is increased prevalence of rheumatological manifestations in patients with type 2 diabetes mellitus
- Prevalence increases with duration of diabetes
- There was statistically significant association between duration of diabetes and the presence of conditions such as frozen shoulder, charcot's joint, cheiroarthropathy, flexor tendinitis, dupuytren's contracture and osteoarthritis.
- There was statistically significant association for rheumatological manifestations like frozen shoulder, carpal tunnel syndrome, flexor tendinitis, charcot's joint and osteoarthritis with the microvascular complications of diabetes.

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INTRODUCTION

Diabetes mellitus (DM) is a chronic illness with a high prevalence in the new era of urbanization. Type 2 DM constitutes 85-95% of all diabetic cases worldwide. As per WHO, the global prevalence of DM is expected to increase to 300million by 2025¹. DM is associated with a number of macro and microvascular complications which contribute to significant mortality in diabetic patients. There are many rheumatological manifestations which occur more in the diabetic population than in the general population.

Even though these rheumatological manifestations are not life threatening, they cause significant morbidity and have a profound effect on the quality of life. The rheumatological manifestations associated with DM are the following:

SYNDROMES OF LIMITED JOINT MOBILITY: It mainly involves musculoskeletal structures of the upper limb and is mostly associated with duration of diabetes mellitus, poor metabolic control and presence of microvascular complications².

Diabetic cheiroarthropathy: Also known as stiff-hand syndrome, it presents as thick, rigid, tight, waxy skin mainly on the dorsal aspect of the hands. It is also characterized by flexion deformities which result in painless restriction of flexion and extension of interphalangeal, metacarpophalangeal and wrist joints. It is primarily a clinical diagnosis and the imaging findings are non-specific³. The clinical signs used for the diagnosis are the 'prayer sign' and the 'table top sign'. The ultrasonographic findings include thickening of flexor tendon sheaths and subcutaneous tissues⁷. MRI shows thickening and enhancement of the flexor tendon sheaths⁴. Biopsy of involved skin shows marked deposition of periarticular collagen⁵. Diabetic cheiroarthropathy is a reversible condition if recognized early. It is also considered as a marker of other diabetic microvascular complications especially diabetic retinopathy⁶. Treatment includes strict glycemic control, NSAIDs and physiotherapy.

Frozen Shoulder: Also known as adhesive capsulitis, it is characterized by an insidious and progressive loss of active and passive mobility of glenohumeral joint, due to the capsular contraction⁷. It usually presents as progressive painful limitation of mobility on both active and passive movements of shoulder, especially abduction and external rotation⁸. It has a much higher prevalence in patients with diabetes mellitus⁹. Patients with longer duration of diabetes and on treatment with insulin have an increased prevalence of shoulder calcification. Adhesive capsulitis is a diagnosis of exclusion. So conditions with similar presentation such as rotator cuff tear or contusion, trauma to shoulder, bone contusion, labral tear, subacromial bursitis, cervical or peripheral neuropathy have to be ruled out. Also look for any radiographic evidence of osteoarthritis. Treatment includes analgesics, corticosteroid injection into the glenohumeral joint and subacromial bursa, physiotherapy and kinetotherapy¹⁰.

Stenosing flexor tenosynovitis: Also known as trigger finger, it is due to proliferation of fibrous tissue in the tendon sheath resulting in restriction of movement. The thumb and third or fourth fingers are most commonly involved⁸. The prevalence of trigger finger is much higher in diabetic population (5-36%) than in general population (2%)¹¹. It is associated with duration of the diabetes but not with the glycaemic control¹². Imaging is not needed for diagnosis since the classic presentation of popping and locking of a trigger finger is adequate to make a diagnosis. Treatment includes NSAIDs, corticosteroid injection into tendon sheath, splinting, modification of activities to avoid triggering of fingers and surgical release¹³.

Dupuytren's contracture: It is characterized by thickening and shortening of the palmar fascia which results in flexion contracture of the affected finger. It usually involves 3rd and 4th fingers and may affect bilaterally¹⁴. The prevalence of Dupuytren's contracture among diabetics (20-63%) is higher than among non-diabetics (13%)⁹. It has a strong association with duration of DM, poor long term control of diabetes and presence of microvascular complications¹⁵. Treatment consists of optimal glycaemic control, physiotherapy, topical steroid injection and surgery for refractory cases.

OSTEOPOROSIS: It can occur in a diabetic patient as a direct consequence of the disease or as a result of treatment. It is more associated with type 1 DM¹⁶. Association with type 2 DM is not yet established. Oral hypoglycemic agent thiazolidinedione can cause a reduction in bone mass and increase the risk for fracture¹⁷.

DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS (DISH): It is also known as Forestier's disease. It is characterized by ligamentous ossification of the anterolateral aspect of the spinal column which sometimes results in bony ankylosis. DISH has got a close association with type 2 DM and it is also associated with hyperuricemia, dyslipidemia and metabolic syndrome¹⁸. Cervical and lumbar segments of the spine are the frequently involved areas. It is usually asymptomatic but can also present as pain, stiffness, limited range of spinal movement and increased risk of unstable spinal fractures after trivial trauma. It may also manifest as dysphagia, airway obstruction and as radiculopathies. Diagnosis is based on

radiographic criteria (proposed by Resnick and Niwayama) and it requires 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 changes¹⁹. In 1985, Utsinger proposed a revised diagnostic criterion by including the involvement of peripheral entheses. He suggested that symmetric peripheral enthesopathy and continuous ossification along the anterolateral aspect of 2 or more contiguous vertebral bodies supports a probable diagnosis of DISH²⁰. Treatment is generally symptomatic with analgesics and physiotherapy.

NEUROPATHIES

Neuropathic arthritis (Charcot joint /diabetic neuroarthropathy): It is characterized by acute inflammation in its early stages which later on leads to bone and joint fractures, dislocations, instability and gross deformities²¹. Charcot's neuroarthropathy is associated with longstanding diabetes and presence of peripheral neuropathy. The prevalence among diabetic population is found to be 8-13%²². The diagnosis is based on clinical features, laboratory tests and imaging studies. Clinical features include mainly erythema, warmth, foot deformity, along with history of long duration of diabetes. Radiographic findings are important in diagnosing Charcot's neuroarthropathy, even though there are no findings in patients with stage 0 disease. At this stage, magnetic resonance imaging (MRI), scintigraphy, white blood cell count are used, of which MRI offers the highest diagnostic accuracy²³. Aim of treatment is to maintain structural stability of the foot and ankle with use of appropriate footwear and prevention of skin ulceration. Surgery is reserved for patients with severe ankle and midfoot deformities which are prone for skin ulceration²⁴.

Carpal tunnel syndrome (CTS): It is an entrapment neuropathy caused by the compression of median nerve between the carpal ligament and other structures within the carpal tunnel. It presents as paresthesia, especially nocturnal, over cutaneous distribution of thumb, index and lateral half of ring fingers. It is also characterized by spontaneous pain, positive tinnel sign and Phalen test. The prevalence of CTS in diabetic population is about 20%, but the incidence rises to 75% in patients with limited joint mobility²⁵. Conservative management includes analgesics, steroids, splinting, activity modification and vitamin B6 supplementation²⁶. Surgery is indicated in those who fail to respond to conservative therapy and in those with moderate to severe symptoms²⁷.

Diabetic amyotrophy: It consists of symptoms such as burning, severe aching pain in the hip and thigh, followed by weakness and wasting of muscles with marked weight loss. It is associated with poor glycaemic control²⁸. The most accepted mechanisms for this condition are inflammatory, immune-mediated and vascular radiculoplexopathy²⁹. Treatment consists of immunosuppressive therapy with cyclophosphamide and methyl prednisolone along with good glycaemic control.

Reflex sympathetic dystrophy: It is a component of complex regional pain syndrome. It is characterized by burning pain, allodynia and hyperalgesia with marked autonomic features in the form of local edema, altered sweating and skin colour³⁰. CRPS is of two types – CRPS 1 and CRPS 2. It is proposed that diabetes mellitus and other endocrine disorders such as hyperthyroidism and hyperparathyroidism and metabolic disease can act as predisposing conditions³¹.

Diabetic muscle infarction: It is an uncommon complication of DM. It usually presents as acute onset myalgia and swelling of thigh muscle. It may also involve the calf muscle and muscles of upper limb. MRI is the diagnostic test of choice. T2 weighted MRI images show marked muscle oedema extending into the perifascicular and subcutaneous tissue³². Treatment is mainly symptomatic with pain relief and short-term immobilization.

MATERIALS AND METHODS

A cross-sectional observational study was conducted involving diabetic patients attending the outpatient and inpatient facilities of a tertiary care centre in north Kerala. Patients were diagnosed as diabetic based on the ADA criteria 2007 (Fasting blood glucose >126mg/dl, Postprandial blood glucose >200mg/dl, Symptoms of diabetes plus random blood glucose >200mg/dl, HbA1c > 6.5). Patients with history of injury or fracture in the joint region, those with end stage renal disease or chronic liver disease and those with rheumatoid arthritis or other rheumatological diseases were excluded from the study. The study was done over a period of 1 year and 219 patients who met the selection criteria were included. Demographic characteristics such as age and sex were recorded. Symptoms suggestive of joint involvement such as pain, stiffness, restriction of joint movement and swelling of the joint with the duration of the symptoms were documented. History regarding the duration of diabetes, age of onset of diabetes, mode of treatment, and family history of diabetes were documented. Presence of other comorbidities like hypertension and ischemic heart disease was documented. On general physical examination, vital parameters such as pulse, blood pressure, and temperature were recorded. The anthropometric measurements such as weight and height were taken. The body mass index was calculated using the formula "weight in kilograms/ (height in metre)²". Waist and hip circumference were measured. A detailed examination of various systems with special focus on the locomotor system was done. Diagnosis of Dupuytren's contracture was based on one or more of the following features: palmar or digital nodule; tethering of palmar or digital skin; a pre-tendinous band or a digital flexion contracture. Trigger finger was diagnosed by a palpable nodule or thickened flexor tendon with locking phenomenon during extension or flexion of any finger. Diagnostic criteria of adhesive capsulitis was patients with pain in the shoulder for at least 1 month, inability to lie on the affected shoulder and restricted active and passive shoulder joint movements in at least three planes. Cheiroarthropathy was detected by the "prayer sign" and the "table top sign". Diagnosis of diffuse idiopathic skeletal hyperostosis was based on the radiographic criteria. Hip, knee, ankle, wrist and small joints of hands were examined for features of charcot's joint, osteoarthritis and any form of rheumatological manifestation. Patient was also examined for presence of neuropathy (sensory or motor) and retinopathy (using ophthalmoscope).

Fasting and postprandial blood sugars and HbA1C were done. Renal function test including blood urea, serum creatinine and serum uric acid was done. Urine was analysed for sugar, ketone bodies and protein. Complete blood count, erythrocyte sedimentation rate and liver function test were done. X-rays of the affected joints were taken wherever necessary. Nerve conduction study was done in cases of suspected peripheral neuropathy.

RESULTS

Of the 219 patients studied, 60% were males and 40% were females. Majority were in the 51-70 year age group. 70 patients (32%) belonged to the age group of 61-70 years closely followed by 68 patients (31%) in the 51-60 year age group. 139 patients (63.4%) were found to have rheumatological manifestations. Most common was osteoarthritis seen in 46 patients (21%), followed by frozen shoulder in 34 patients (15.52%). Carpal tunnel syndrome was found in 22 patients (10%), Charcot's joint in 8 patients (3.7%), cheiroarthropathy in 5 patients (2.3%), DISH in 6 patients (2.7%), flexor tendinitis in 16 patients (7.3%), Dupuytren's contracture and gout in 1 patient each (0.5%). (Fig 1). Rheumatological manifestations like frozen shoulder, carpal tunnel syndrome and osteoarthritis were more prevalent in females where as flexor tendinitis was more common in males. Majority of patients with rheumatological manifestations (25.9%) had a duration of diabetes ranging from 11 to 15 years. Frozen shoulder, Charcot's joint, cheiroarthropathy, flexor tendinitis, Dupuytren's contracture and

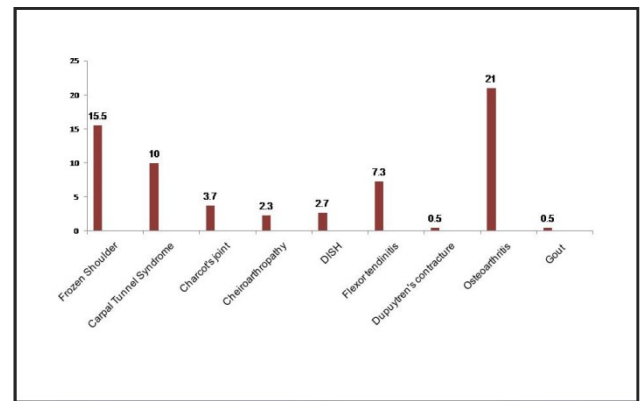


Fig. 1. Prevalence of rheumatological manifestations in patients with type 2 DM

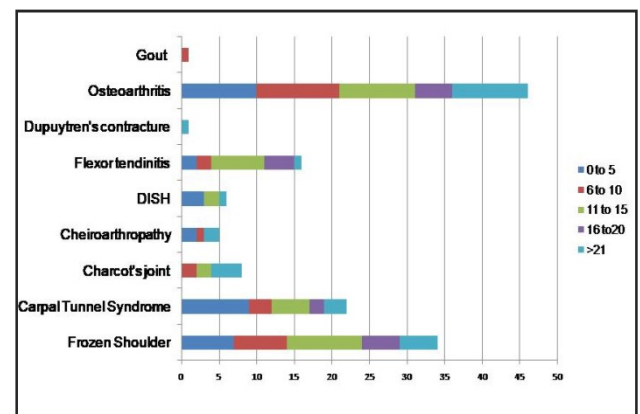


Fig. 2. Association between presence of rheumatological manifestations and duration of diabetes

Osteoarthritis were found to be significantly associated with the duration of diabetes. (Table 1) (Fig 2). Charcot's joint & flexor tendinitis were more prevalent in diabetic patients with coronary artery disease (CAD) while carpal tunnel syndrome was associated with peripheral vascular occlusive disease (PVOD). Osteoarthritis was more prevalent in diabetic patients with CAD, PVOD as well as cerebrovascular disease, probably because of the increased age of patients with these conditions. This study showed a significant relation between occurrence of rheumatological manifestations such as frozen shoulder, carpal tunnel syndrome, charcot's joint, flexor tendinitis and osteoarthritis with diabetic neuropathy (Table 2). It also showed an increased prevalence of rheumatologic manifestations such as frozen shoulder, charcot's joint, flexor tendinitis and osteoarthritis in patients with diabetic nephropathy (Table 3). There was significant association for occurrence of rheumatologic manifestations like frozen shoulder, carpal tunnel syndrome, charcot's joint, flexor tendinitis and osteoarthritis with diabetic retinopathy (Table 4).

DISCUSSION

In our cross sectional observational study, conducted over a period of 1 year in a tertiary care hospital, 219 patients with type 2 diabetes mellitus were studied. Patients belonged to age ranging from 35 to 90 years with a mean age of 60.98 years. Study population included 132 (60.3%) males and 87 (39.7%) females. A detailed medical history, general and systemic examinations were done to look for presence of the rheumatological manifestations. Investigations such as complete blood count, fasting and postprandial blood sugars, renal function tests and urine analysis were done and X-rays of hand, shoulder, knee, spine and other involved joints were taken wherever necessary. In our study, 139 patients (63.4%) were found to have some form of rheumatological manifestations. This is quite agreeable with the study done by Tapas Kumar and Adwitiya Das³³ where the prevalence of rheumatological manifestations was 53.33%.

Table 1. Association between rheumatological manifestations and duration of diabetes

CONDITION	Prevalence	Duration of DM in Years					Total	p value
		0-5	6-10	11-15	16-20	>21		
Frozen shoulder	Y	7	7	10	5	5	34	0.001
	N	92	55	20	9	9	185	
Carpel Tunnel Syndrome	Y	9	3	5	2	3	22	0.22
	N	90	59	25	12	11	197	
Charcot's joint	Y	0	2	2	0	4	8	0.001
	N	99	60	28	14	10	211	
Cheiroarthropathy	Y	2	1	0	0	2	5	0.03
	N	97	61	30	14	12	214	
DISH	Y	3	0	2	0	1	6	0.28
	N	96	62	28	14	13	213	
Flexor tendinitis	Y	2	2	7	4	1	16	0.001
	N	97	60	23	10	13	203	
Dupuytren's contracture	Y	0	0	0	0	1	1	0.005
	N	99	62	30	14	13	218	
Osteoarthritis	Y	10	11	10	5	10	46	0.001
	N	89	51	20	9	4	173	
Gout	Y	0	1	0	0	0	1	0.63
	N	99	61	30	14	14	218	

It is also comparable with the study done by Kabade et al³⁴ in which the overall prevalence of rheumatological manifestations in type 2 diabetes mellitus was 50.5%. In our study, we found significant association between duration of diabetes and presence of rheumatological manifestations such as charcot's joint, osteoarthritis and frozen shoulder. But no significant association was found for carpal tunnel syndrome, DISH and cheiroarthropathy. Frozen shoulder was detected in 15.5% (34 patients) of the study population which is lesser than in the study done by Sarkar et al³⁵, in which the prevalence of frozen shoulder was 23.75%. But it agrees with the studies by Aydeniz et al³⁶ and Mathew AJ et al³⁷ in which the prevalence of frozen shoulder was 15% and 16.45% respectively. The mean age of the patients with frozen shoulder in our study was 65.97 years. It is agreeing with the studies done by Arikka P E³⁸ and Balci N³⁹ where they described an increased prevalence of frozen shoulder after the age of 50 years. The prevalence of carpal tunnel syndrome in our study was 10% (22 patients). This result was comparable with a study conducted by Chammas et al⁴⁰ where the prevalence of carpal tunnel syndrome in type 2 DM patients was found to be 15-25%. The mean age of patients with carpal tunnel syndrome in our study was 64.68 years. The presence of carpal tunnel syndrome was more frequently observed in females (19 patients) than in males (3 patients) and was statistically significant.

This finding is agreeing with the study done by Comi G et al⁴¹. In our study, Charcot's joint was found in 8 patients (3.7%). This finding is consistent with the study done by Nather A et al⁴² about the evaluation of the epidemiology of diabetic foot problems (DFP) and predictive factors for major amputations, in which charcot's joint was found to have a prevalence of 2%. It is also consistent with the study done by Jobin P et al⁴³ where the prevalence of charcot's joint was 1.4%. But it is lower than that found in the study by Agarwal et al⁴⁴ in which the prevalence was 7.8%. The most common site affected was mid foot (62.5%). The mean age of patients with charcot's joint in our study was 72 years and the mean duration of diabetes was 17.9 years. This is comparable with a study done by Salini D et al⁴⁵ in which the mean age of patients diagnosed with charcot's joint was 63 ± 8.36 years and the mean duration of diabetes for charcot's joint to develop was 18.01 ± 8.23 years. The prevalence of cheiroarthropathy in our study was 2.3% (5 patients). It is much less considering the prevalence of cheiroarthropathy in the study done by Gurinder et al⁴⁶ in which the prevalence was 32%. The mean age of occurrence of cheiroarthropathy in our study was 65.1 years and the mean duration of diabetes was 12.8 years. The prevalence of DISH in our study was 2.7% (6 patients). In a study performed by Douloumpakas et al⁴⁷, the prevalence of DISH was found to be 6%. But this is much lower compared to the study done by Sarkar et al³⁵ in which the prevalence was 28%. The mean age for the occurrence of DISH in our study was 63 years and the mean duration of diabetes was 8.8 years. The prevalence of flexor tendinitis in our study was 7.3% (16 patients).

It is agreeing with the study done by Gurinder et al⁴⁶ in which the prevalence was 8%. Studies done by Mathew et al³⁷ and Sarkar et al³⁵ showed the prevalence of flexor tenosynovitis to be 5 and 4.4% respectively whereas the study carried out by Chammas et al⁴⁰ showed the prevalence to be 20%. The mean age for occurrence of flexor tendinitis in our study was 64.56 years and the mean duration of diabetes was found to be 12.8 years.

Table 2. Relation between rheumatological manifestations and presence of diabetic neuropathy

DN		NO	YES	P value
Frozen shoulder	N	176	9	0.001**
	Y	25	9	
Carpal tunnel syndrome	N	185	12	0.004*
	Y	16	6	
Charcot's joint	N	196	15	0.02*
	Y	5	3	
Cheiroarthropathy	N	197	17	0.35
	Y	4	1	
DISH	N	197	16	0.08
	Y	4	2	
Flexion Tendinitis	N	189	14	0.03*
	Y	12	4	
Dupuytren's Contracture	N	201	17	0.08
	Y	0	1	
Osteoarthritis	N	166	7	<0.001**
	Y	35	11	
GOUT	N	200	18	0.91
	Y	1	0	

Dupuytren's contracture was present only in one patient in our study constituting a prevalence of 0.5%. It is not comparable with results from the study done by Gurinder et al⁴⁶ in which the prevalence of dupuytren's contracture was 13%. But Mathew et al³⁷ described a low prevalence of 2.25%. The age of the patient in our study was 82 years and the duration of diabetes was 25 years. Osteoarthritis was the most prevalent rheumatological manifestation in our study group. The prevalence was 21% (46 patients). This was consistent with results from the study conducted by Sarkar et al³⁵ and Mathew AJ et al³⁷ where the prevalence of osteoarthritis knee was 23.75% and 20.04%. But in our study, majority was geriatric population above 60 years of age. So age may have been a confounding factor causing this increased prevalence of osteoarthritis.

Table 3. Relation between rheumatological manifestations and presence of diabetic nephropathy

DNPH		NO	YES	p value
Frozen shoulder	N	166	19	0.01*
	Y	25	9	
Carpal tunnel syndrome	N	174	23	0.13
	Y	17	5	
Charcot's joint	N	190	21	<0.001**
	Y	1	7	
Cheiroarthropathy	N	187	27	0.49
	Y	4	1	
DISH	N	186	27	0.56
	Y	5	1	
Flexion Tendinitis	N	183	20	<0.001**
	Y	8	8	
Dupuytren's Contracture	N	191	27	0.12
	Y	0	1	
Osteoarthritis	N	158	15	0.001**
	Y	33	13	
GOUT	N	190	28	0.87
	Y	1	0	

Table 4 : Relation between rheumatological manifestations and presence of diabetic retinopathy

DR		NO	YES	p value
Frozen shoulder	N	141	44	<0.001**
	Y	13	21	
Carpal tunnel syndrome	N	146	51	0.001*
	Y	8	14	
Charcot's joint	N	153	58	0.001*
	Y	1	7	
Cheiroarthropathy	N	150	64	0.53
	Y	4	1	
DISH	N	151	62	0.24
	Y	3	3	
Flexion Tendinitis	N	153	50	<0.001**
	Y	1	15	
Dupuytren's Contracture	N	154	64	0.29
	Y	0	1	
Osteoarthritis	N	133	40	<0.001**
	Y	21	25	
GOUT	N	154	64	0.29
	Y	0	1	

The most commonly affected was knee joint. The mean age of patients with osteoarthritis was 66 years and the mean duration of diabetes was 12.5 years. The potential relationship between diabetes mellitus and the development of osteoarthritis needs to be clarified. At the molecular level, recent studies show a potential contribution of adipokines to the development of OA⁴⁸. Gout was seen only in one patient (0.5%). This was comparable with the study done by Jobin Petal⁴⁹ where the prevalence of gout was 1.4%. The age of our patient having gout was 60 years and his duration of diabetes was 6 years. In our study, there was statistically significant association between duration of diabetes and the occurrence of rheumatological manifestations such as frozen shoulder, charcot's joint, cheiroarthropathy, flexor tendinitis, dupuytren's contracture and

osteoarthritis. But no significant association was observed between the occurrence of carpal tunnel syndrome, DISH or gout and duration of diabetes. This is agreeing with results of the study by Majjad A et al⁵⁰ in which they observed an increased prevalence of musculoskeletal manifestations especially of hand when the duration of diabetes mellitus was more than 10 years. In our study, 43 patients were having coronary artery disease and among them, 25 were showing some form of rheumatological manifestations. And our study shows that there is statistically significant association between occurrence of rheumatological manifestations such as charcot's joint, flexor tendinitis and osteoarthritis and presence of coronary artery disease. Our study also included 12 patients with cerebrovascular disease and 11 of them had some form of rheumatological manifestations but none of them had any statistically significant association except osteoarthritis. All patients who had peripheral vascular occlusive disease (6patients) in our study had some sort of rheumatological manifestation but only carpal tunnel syndrome and osteoarthritis showed statistically significant association. In our study group, 18 patients had diabetic neuropathy and 15 of them showed rheumatological manifestations of which frozen shoulder, carpal tunnel syndrome, charcot's joint, flexor tendinitis and osteoarthritis showed statistically significant association. 65 patients had diabetic retinopathy and 45 of them had some form of rheumatological manifestation of which frozen shoulder, carpal tunnel syndrome, charcot's joint, flexor tendinitis and osteoarthritis had statistically significant association. In our study group, 28 patients had diabetic nephropathy and among them 20 showed rheumatological manifestations of which frozen shoulder, charcot's joint, flexor tendinitis and osteoarthritis had statistically significant association. Unlike the study by Gurinder et al⁴⁶, our study couldn't establish a statistically significant relation of diabetic cheiroarthropathy and dupuytren's contracture with microangiopathic complications of diabetes mellitus.

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Conflict of interest: None

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