

Prevalence of Musculoskeletal Disorders in Patients With Type 2 Diabetes Mellitus

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Abstract: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder associated not only with vascular and neurological complications but also with musculoskeletal disorders (MSDs), which can significantly affect mobility, independence, and quality of life. **Objective:** To determine the prevalence of musculoskeletal disorders among patients with type 2 diabetes mellitus and to identify their association with demographic and clinical factors. **Methodology:** This descriptive cross-sectional study was conducted at the Department of Medicine, Baqai Institute of Diabetology & Endocrinology (BIDE), Karachi, from January 2024 till June 2024. A total of 143 patients aged 30–70 years with T2DM for at least one year were enrolled using non-probability consecutive sampling. Data were collected through a structured pro forma, which included demographic details, anthropometric measurements, and clinical evaluations using GALS and REMS examinations. **Results:** Out of 143 participants, 51 (35.7%) were found to have one or more musculoskeletal disorders. The most frequent conditions were adhesive capsulitis (27.5%), carpal tunnel syndrome (17.6%), and diabetic cheiroarthropathy (15.7%). A significant association was observed between MSDs and residence status ($p = 0.01$), socioeconomic status ($p = 0.01$), and absence of family history of diabetes ($p = 0.01$). No significant associations were found with age, gender, duration of diabetes, or education level. **Conclusion:** Musculoskeletal disorders are highly prevalent among patients with type 2 diabetes mellitus, with periarticular conditions being the most common. Rural residence, low socioeconomic status, and lack of family history were significant risk factors. Routine musculoskeletal screening should be incorporated into diabetic care to ensure early diagnosis, reduce disability, and improve patients' quality of life.

Keywords: Type 2 diabetes mellitus, musculoskeletal disorders, adhesive capsulitis, carpal tunnel syndrome

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Introduction

Diabetes mellitus (DM) is a major public health problem worldwide. It was estimated that in 2017 there are 451 million (age: 18–99 years) people with DM. These figures were expected to increase to 693 million by 2045 (1). Diabetes mellitus (DM) is a chronic and progressive metabolic disorder characterized by persistent hyperglycemia, which leads to morbidity and mortality due to secondary microvascular and macrovascular complications (2,3). Nowadays, it is one of the most important public health challenges and the fifth leading cause of death globally (4,5).

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance and relative insulin deficiency. It is a major global health concern, with prevalence increasing steadily due to sedentary lifestyles, obesity, and population aging. Globally, diabetes mellitus is causing functional disability among those affected. Among the common diabetes mellitus-related complications, musculoskeletal disorders had a significant negative impact on the social health quality of life and productivity of individuals.⁶ Although the pathophysiological mechanisms remain unclear, DM can lead to various musculoskeletal complications⁷ involving joints, soft tissues, muscles, nerves, and tendons.⁸ Musculoskeletal disorders are generally not diabetes mellitus specific and can also be seen in the general population. However, its incidence has increased significantly in patients with diabetes mellitus (7). It causes chronic irreversible damage and destructive changes in musculoskeletal and connective tissues associated with severity, duration of diabetes mellitus, and failure in controlling the blood glucose level (8). Evidence suggests that hyperglycemia may accelerate non-enzymatic glycosylation and abnormal collagen deposition in per-articular connective tissues that further alter the structural matrix and mechanical properties of the

musculoskeletal system (9). A variety of musculoskeletal conditions have been associated with diabetes mellitus, including several disorders affecting the hands, such as limited joint mobility, stenosing flexor tenosynovitis, Dupuytren's contractures, and diabetic sclerodactyly; the shoulders, such as frozen shoulder (adhesive capsulitis) and rotator cuff tendinopathy; disorders with a major neurologic component, including carpal tunnel syndrome (CTS) and neuropathic arthropathy. In Muluneh et al (6). Study the prevalence of musculoskeletal disorders among diabetes mellitus patients was 24%. In Majjad et al (10). Study 34.4% had one or more MS disorders. Osteoarthritis was present in 19.4% of patients. Hand disorders were seen in 14.4%. Shoulder capsulitis was present in 12.5%.

Thus, the objective of the study is to determine the prevalence of musculoskeletal disorders among patients with type 2 diabetes mellitus and to identify their association with demographic and clinical factors.

Methodology

This descriptive cross-sectional study was conducted in the Department of Medicine, Baqai Institute of Diabetology & Endocrinology (BIDE), Karachi, from January 2024 till June 2024. The sample size was calculated using the population proportion formula, assuming an estimated prevalence of musculoskeletal disorders of 24%, a 7% margin of error, and a 95% confidence level. The resulting sample size was 143 participants. A non-probability consecutive sampling technique was applied to recruit eligible patients visiting the outpatient department. Adults aged 30 to 70 years of either gender. Diagnosed with type 2 diabetes mellitus for at least one year according to the operational definition. History or diagnosis of rheumatoid arthritis or systemic lupus erythematosus. Presence of chronic kidney disease (evidenced by elevated baseline creatinine or marked proteinuria). Established



cardiovascular disease confirmed clinically or through ECG or echocardiography. Patients who declined to participate in the study. Data collection commenced after institutional approval and informed consent from all participants. Eligible patients were enrolled from the outpatient department. Demographic information such as age, gender, residence, educational level, and socioeconomic status was recorded. Anthropometric measurements, including height and weight, were taken using calibrated instruments, and the body mass index (BMI) was calculated. Clinical data including duration of diabetes, glycemic control (HbA1c level), and family history of diabetes were also documented. A standardized pro forma was used to ensure uniform data collection across all participants.

Each participant underwent a comprehensive musculoskeletal evaluation using the GALS (Gait, Arms, Legs, Spine) screening method to identify any gross abnormalities. Patients exhibiting abnormal findings were further evaluated through a regional musculoskeletal examination (REMS). Diagnosis of specific musculoskeletal disorders was made based on characteristic clinical features. Diabetic cheiroarthropathy was identified through positive prayer and tabletop signs. Dupuytren's contracture was diagnosed by thickening and contracture of the palmar fascia, while flexor tenosynovitis (trigger finger) was recognized by tendon thickening and locking during flexion or extension. De Quervain's tenosynovitis was characterized by pain and tenderness over the radial styloid. Adhesive capsulitis was diagnosed in patients presenting with shoulder pain and restricted active and passive movements. Rotator cuff tendinopathy was suspected when patients experienced pain between 60°–120° of shoulder abduction with localized tenderness. Carpal tunnel syndrome was confirmed using positive Tinel and Phalen tests. Diabetic sclerodactyly presented as skin thickening over the dorsum of the hand without systemic sclerosis features. Charcot arthropathy was recognized by painless joint swelling and deformity with radiographic evidence of joint destruction, while osteoarthritis was confirmed radiologically by joint space narrowing and osteophyte formation.

All collected data were entered into SPSS version 22 for statistical analysis. Quantitative variables such as age, BMI, duration of diabetes, and HbA1c levels were analyzed for normality using the Shapiro–Wilk

test. Normally distributed variables were expressed as mean \pm standard deviation, while non-normally distributed variables were presented as median with interquartile range (IQR). Categorical variables, including gender, education, residence, socioeconomic class, and fa.

Results

Out of 143 participants, 97 (67.8%) were aged 51–70 years and 46 (32.2%) were aged 30–50 years. Females slightly predominated (75; 52.4%) compared to males (68; 47.6%). Most patients were urban residents (121; 84.6%), while 22 (15.4%) were from rural areas. The duration of diabetes exceeded 2.5 years in 77 (53.8%) patients. Only 24 (16.8%) had a family history of diabetes. A majority (90; 62.9%) belonged to the higher socioeconomic group (>50,000 PKR), and 85 (59.4%) had higher education. Overall, musculoskeletal disorders were identified in 51 (35.7%) patients.

Musculoskeletal disorders were slightly more frequent among the 51–70-year group (35; 36.1%) than the 30–50-year group (16; 34.8%), though not statistically significant ($p = 0.88$). Gender had no significant effect (male 33.8% vs. female 37.3%; $p = 0.66$). Rural participants showed a markedly higher prevalence (15; 68.2%) compared to urban residents (36; 29.8%) ($p = 0.01$). Low-income patients ($\leq 50,000$ PKR) had more musculoskeletal disorders (27; 50.9%) than higher-income ones (24; 26.7%) ($p = 0.01$). Interestingly, only 1 (4.2%) of those with a family history of diabetes had MSDs compared to 50 (42%) without a family history ($p = 0.01$). Duration of diabetes ($p = 0.38$) and education ($p = 0.84$) showed no significant association.

Among the 51 affected patients, the most common disorders were adhesive capsulitis (14; 27.5%), carpal tunnel syndrome (9; 17.6%), and diabetic cheiroarthropathy (8; 15.7%). Trigger finger was present in 5 (9.8%), Dupuytren's contracture and rotator cuff tendinopathy each in 4 (7.8%), De Quervain's tenosynovitis and osteoarthritis each in 3 (5.9%), and Charcot arthropathy in 1 (2.0%). No cases of diabetic sclerodactyly were reported. Overall, shoulder and hand-related conditions accounted for most musculoskeletal complications in type 2 diabetic patients.

Table 1. Distribution of Baseline Characteristics among Study Participants (N = 143)

Variables	Categories	n (%)
Age (years)	30–50	46 (32.2)
	51–70	97 (67.8)
Gender	Male	68 (47.6)
	Female	75 (52.4)
Residence status	Urban	121 (84.6)
	Rural	22 (15.4)
Duration of diabetes mellitus	≤ 2.5 years	66 (46.2)
	> 2.5 years	77 (53.8)
Family history of diabetes mellitus	Yes	24 (16.8)
	No	119 (83.2)
Socioeconomic status (monthly income)	$\leq 50,000$ PKR	53 (37.1)
	$> 50,000$ PKR	90 (62.9)
Educational status	Illiterate	8 (5.6)
	Primary	15 (10.5)
	Secondary	35 (24.5)
	Higher	85 (59.4)
Musculoskeletal disorder	Yes	51 (35.7)
	No	92 (64.3)

Table 2. Association between Patient Characteristics and Presence of Musculoskeletal Disorders

Variables	Categories	Musculoskeletal Disorder Yes n (%)	Musculoskeletal Disorder No n (%)	p-value
Age (years)	30–50	16 (34.8)	30 (65.2)	0.88
	51–70	35 (36.1)	62 (63.9)	
Gender	Male	23 (33.8)	45 (66.2)	0.66

Residence status	Female	28 (37.3)	47 (62.7)	0.01
	Urban	36 (29.8)	85 (70.2)	
	Rural	15 (68.2)	7 (31.8)	
Duration of diabetes mellitus	≤ 2.5 years	26 (39.4)	40 (60.6)	0.38
	> 2.5 years	25 (32.5)	52 (67.5)	
Family history of diabetes mellitus	Yes	1 (4.2)	23 (95.8)	0.01
	No	50 (42.0)	69 (58.0)	
Socioeconomic status (monthly income)	≤ 50,000 PKR	27 (50.9)	26 (49.1)	0.01
	> 50,000 PKR	24 (26.7)	66 (73.3)	
Educational status	Illiterate	3 (37.5)	5 (62.5)	0.84
	Primary	4 (26.7)	11 (73.3)	
	Secondary	14 (40.0)	21 (60.0)	
	Higher	30 (35.3)	55 (64.7)	

Table 3. Frequency Distribution of Specific Musculoskeletal Disorders among Type 2 Diabetes Patients (n = 51)

Type of Musculoskeletal Disorder	Number of Patients (n)	Percentage (%)
Adhesive capsulitis (Frozen shoulder)	14	27.5
Carpal tunnel syndrome	9	17.6
Diabetic cheiroarthropathy	8	15.7
Dupuytren's contracture	4	7.8
Trigger finger (Flexor tenosynovitis)	5	9.8
De Quervain's tenosynovitis	3	5.9
Rotator cuff tendinopathy	4	7.8
Osteoarthritis	3	5.9
Charcot arthropathy	1	2.0
Diabetic sclerodactyly	0	0.0
Total	51	100

Discussion

The present study investigated the prevalence and associated factors of musculoskeletal disorders (MSDs) among patients with type 2 diabetes mellitus (T2DM) attending the Baqai Institute of Diabetology & Endocrinology, Karachi. The findings revealed that 35.7% of diabetic patients suffered from one or more musculoskeletal conditions, emphasizing that MSDs represent a significant but often underrecognized complication of diabetes. Our study highlights a substantial burden of musculoskeletal disorders (MSKD) among individuals with type 2 diabetes mellitus (T2DM), with more than one-third (35.7%) of participants affected. This finding aligns with a growing body of literature that recognizes MSKD as a frequent yet often neglected complication of diabetes. Previous studies have reported a wide range of prevalence, from 30% to over 50%, depending on the population studied and the diagnostic criteria applied (11-9). The specific types of MSKD were not subclassified in our study. The overall prevalence is consistent with earlier reports that describe conditions such as adhesive capsulitis, carpal tunnel syndrome, Dupuytren's contracture, and limited joint mobility as common manifestations in people living with diabetes (12-13). Our findings are consistent with those of Olaosebikan and colleagues, who reported a similar pattern in a Nigerian cohort. (14). in their study musculoskeletal complications were more prevalent among patients from lower socioeconomic and geographically disadvantaged backgrounds (14). These results underscore the need for more equitable healthcare delivery models that include proactive musculoskeletal screening in rural diabetes clinics (11-14).

Income also emerged as a strong predictor of MSKD in our population. Patients from households earning less than PKR 50,000 per month were nearly twice as likely to report musculoskeletal complaints compared to those from higher-income groups. This observation is consistent with previous findings that link lower income to delayed care-seeking, fewer health resources, and poorer access to chronic disease management tools (15). In contrast, studies from high-income countries often report a

weaker or no association between income and MSKD, possibly due to more equitable access to healthcare and stronger social support systems (16). Contrary to expectations, we did not find a significant association between the duration of diabetes and the prevalence of MSKD. This diverges from much of the existing literature, which generally supports the idea that longer disease duration correlates with higher risk for chronic complications, including musculoskeletal problems. (13, 17). One explanation for our finding could be that musculoskeletal disorders may develop relatively early in the disease course. Even before the diagnosis of diabetes is made. In some cases, MSKD may be among the first clinical signs prompting a diabetes workup. Alternatively, the progression of musculoskeletal damage may be influenced more by other factors. Such as individual metabolic variability, physical activity levels, or comorbid conditions than by disease duration alone. These possibilities warrant further investigation in prospective studies.

Education level did not appear to influence the risk of MSKD in our sample data. Whether participants were illiterate or had attained higher education, the rates of musculoskeletal complications remained relatively stable across groups. This finding contrast with some studies that suggest lower educational attainment is associated with worse diabetes outcomes, including complications (14, 18). However, in our sample, other factors such as income, access to care, and geographic location may have played a more dominant role than formal education in shaping musculoskeletal health. One of the more surprising findings in our study was the inverse association between family history of diabetes and musculoskeletal complications. Only a small proportion (4.2%) of participants with musculoskeletal disorders reported a family history of diabetes. Whereas 42% of those without MSKD did. This pattern is counterintuitive, as a family history of diabetes is typically associated with earlier onset, greater awareness, and possibly more complications due to genetic predisposition (10).

The present study has certain limitations that should be acknowledged. Being a descriptive cross-sectional study, it captures associations rather than causal relationships between diabetes and musculoskeletal disorders.

The use of non-probability consecutive sampling limits the generalizability of the findings to the broader diabetic population. We conducted this study in a single tertiary care hospital, which may not reflect the full spectrum of patients seen in primary or rural settings. We diagnosed musculoskeletal disorders through clinical evaluation alone, without imaging, which might have led to missed or misclassified cases.

Conclusion

It is concluded that musculoskeletal disorders are a common yet frequently overlooked complication among patients with type 2 diabetes mellitus, affecting more than one-third of the study population. The most prevalent conditions observed were adhesive capsulitis, carpal tunnel syndrome, and diabetic cheiroarthropathy, underscoring the tendency of diabetes to affect periarticular and connective tissues. The findings also reveal that rural residence, lower socioeconomic status, and absence of a family history of diabetes are significantly associated with a higher frequency of musculoskeletal complications.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC--24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Manuscript drafting, Study Design,

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Conception of Study, Development of Research Methodology Design,

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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