Original Article

Prevalence of Musculoskeletal Manifestations and its Associated Factors in Patients with Type 2 Diabetes Mellitus in Ernakulam District: A Cross-Sectional Study

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Abstract

Introduction: India is referred to as the "Diabetes Capital of the World" with a weighted prevalence of diabetes of 11.4%. In addition to microvascular and macrovascular complications, musculoskeletal manifestations of diabetes mellitus (MMDMs) also cause significant pain, morbidity, and a decrease in quality of life. Previous studies in our country were from tertiary healthcare centres, and the actual community-based prevalence of MMDMs is unknown. The study aims to determine the prevalence of MMDMs and the factors associated with them in the Ernakulam district of Kerala. **Methods:** A community-based cross-sectional study was done in 600 adults with diabetes in the Ernakulam district of Kerala. Cluster sampling was adopted. Through the probability proportional to sample size method, 20 clusters were identified with each having 30 participants. The study participants were clinically examined for various MMDMs. **Results:** The prevalence of MMDMs was found to be 44.83%. Osteoarthritis knee emerged as the most prevalent MMDM involving 22% of the participants, followed by frozen shoulder, in 12.2%. Diabetic cheiroarthropathy, trigger finger, and carpal tunnel syndrome were noted in 6.7%, 4.7%, and 3.8% of participants, respectively. Multivariable analysis showed a significant association between MMDMs and increased BMI, higher socioeconomic status, longer duration of diabetes, and unsatisfactory physical activity. **Conclusion:** This study highlights the need for regular musculoskeletal system assessment in patients with diabetes which needs to be made mandatory in clinical practice and also conducting screening for the same in the community level to prevent further complications and to improve quality of life.

Keywords: Complications of diabetes, community prevalence, diabetes mellitus, musculoskeletal manifestations

Introduction

Diabetes mellitus (DM) is the continual presence of high blood glucose levels arising from impaired insulin secretion or action.[1] In a cross-sectional study done nationwide (ICMR-INDIAB-17), the prevalence of diabetes was found to be 11.4%.[2] Although Kerala is said to be a yardstick in many health indicators and literacy, it is infamously dubbed the "diabetes capital" of India. A recent study done in Ernakulam district showed the prevalence of DM to be 21.1%.[3] DM, recognized as a multiorgan ailment, continues to pose a global health challenge. Its complications can result in considerable discomfort and impairment, impacting individuals' lives' personal, social, and professional aspects. Traditionally, microvascular complications include retinopathy, nephropathy, and neuropathy and macrovascular complications include coronary heart disease, stroke, and peripheral vascular diseases (PADs), which contribute significantly to morbidity. In addition to these well-recognized complications, T2DM is acknowledged to impact various other systems, like digestive systems, a diverse range of cancers, cognitive functioning, and musculoskeletal manifestation.[4] Persons with diabetes commonly experience musculoskeletal pain, which is more frequent in comparison to the general population.[5]

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The musculoskeletal manifestations associated with diabetes mellitus (MMDMs) comprise fibroproliferative disorders of soft tissue (such as Dupuytren's contracture, cheiroarthropathy, frozen shoulder, trigger finger), joint tissue disorders (including Charcot foot, gout, and osteoarthritis), and bone-related disorders (like diffuse idiopathic skeletal hyperostosis (DISH)) H) H, osteoporosis, and impaired fracture healing).[6] Some of these conditions result from complications of DM, such as peripheral neuropathy, and others appear to be directly induced by metabolic abnormalities, involving glycosylation that damages tissues.[7]

MMDMs are characterised by pain and impairment in daily activities which pose a considerable threat to the quality of life (QoL) of patients with DM. Early identification and intervention alleviate pain, enhance QoL, and decrease morbidity and mortality. Despite the high prevalence of DM, there is limited literature available on MMDMs in India. The existing studies conducted in India are primarily based on secondary or tertiary medical institutions, and there is a lack of data from community settings. Hence, this study aims to determine the prevalence of MMDMs and the factors associated with it in the Ernakulam district.

Materials and Methods

Study design and sampling

A community-based cross-sectional study was performed on 600 participants with diabetes in the rural and urban areas of Ernakulam district, Kerala. The study included patients with self-reported DM who were diagnosed after 30 years of age with a history of diabetes for at least 3 years. Adults with diagnosed rheumatological diseases, thyroid disorders, acute illness, or recent hospitalisations in the past 1 month, non-ambulant or bedridden patients, and those who were pregnant were excluded. Since there were no previous community-based studies, a pilot study was conducted at Njarackal in Ernakulam district among 30 participants, and the prevalence of MMDMs was found to be 36.67%. Expecting similar results with 95% confidence, a relative precision of 15%, and applying a design effect of two, the minimum sample size was found to be 590. Twenty clusters were selected by probability proportional to size sampling from the community development (CD) blocks/towns of Ernakulam district from population census 2011 data. Thirty individuals from each cluster were included; hence, the final sample size of the study was 600 individuals.

Data collection

The data collection was done with epicollect 5 over 3 months (March–June 2023) through house-to-house visits. One ward was selected randomly from each cluster. With the help of Accredited Social Health Activists (ASHA), the exact location of the selected ward was identified. Sociodemographic details were collected by using a structured questionnaire. Information about diet, physical activity, smoking, and alcohol consumption was collected through the utilization of the WHO STEPS (Stepwise Approach to Surveillance) Questionnaire. The control of diabetes was assessed using cutoff values recommended by the Indian Council of Medical Research (ICMR) guidelines for the management of type 2 diabetes, incorporating parameters such as blood glucose levels (fasting and postprandial) and HbA1c levels. Participants were clinically examined with the following criteria for detecting MMDMs.[8] The colour of the ration card was used to assess the socioeconomic status. BMI was calculated as per WHO Asian BMI classification.

The clinical assessment of MMDMs was done by the following methods:[6,8,9]

Diabetic chieroarthropathy

Prayer sign: The participant is unable to bring the palmar surfaces of their fingers together when their hands are positioned as if in prayer.

Tabletop sign: The participant cannot lay their palms flat on a table, preventing the palmar surfaces from touching the table.

Dupuytren's contracture

Diagnosed by finding a nodule either in the palm or on the fingers, skin tethering either in the palm or on the finger, presence of a pretentious band, contracture in digital flexion, and palpable thickening of the palmar fascia, resulting in a flexor deformity observed especially in the second, third, fourth, or fifth fingers.

Flexor tenosynovitis

Diagnosed by a palpable nodule or thickening in the flexor tendon and/or experiencing locking sensations in extension and flexion of any finger.

Adhesive capsulitis (frozen shoulder)

Characterised by pain in the shoulder for at least 1 month, inability to lie on the affected shoulder, and restricted active and passive shoulder joint movements of 50% in at least three planes.

Carpal tunnel syndrome

Diagnosed by the relevant history and by clinical examination –

Tinel sign: Percussion of the carpal tunnel (the patient reports pain resembling an electric sensation along the course of the median nerve).

Phalen test: The patient has to hold the hands against each other in full palmar flexion; paraesthesias occur in 60 s in this position.

Charcot foot

Clinically detected by painless swelling and deformity at the weight-bearing joints in a patient with long-standing diabetes and loss of protective sensation of the foot assessed by vibration perception test and monofilaments.

Osteoarthritis

Diagnosed using Altman's clinical criteria of the presence of knee pain and at least three of the following:[10]

1) Age >50 years, 2) Crepitus on active motion, 3) Morning stiffness <30 min, 4) Tenderness of the bony margins of joint, 5) Bony enlargement, and 6) Lack of palpable warmth of synovium.

Disordered fracture healing

Malunion or non-union of fractured bones was detected clinically, and relevant details of the location of the fracture were collected from patients who developed fractured bones after the onset of diabetes.

Risk of osteoporosis in the study population was assessed based on OSTA (Osteoporosis Self-Assessment Tool for Asians) = 0.2 [weight (kg) – age (year)].

The subjects were classified based on the risk categories: low risk (OSTA > −1), medium risk (−1 < OSTA < −4), or high risk (OSTA < −4).[11,12]

Statistical analysis

Data obtained from the study were entered into Microsoft Excel, and the analysis of the collected data was conducted using SPSS version 21. All categorical variables were mentioned as frequency and percentages. Quantitative variables were expressed as mean with standard deviation. To find the association between independent categorical variables with MMDMs, a Chi-square test was used. A *P* value of less than 0.05 was considered to be statistically significant. To determine the independent predictors of MMDMs, multivariable logistic regression was done and was expressed as odds ratio with 95% confidence interval.

Ethical aspects

Before the commencement of the study, clearance was obtained from the Dissertation Review Committee and Institutional Ethics Committee Amrita Institute of Medical Sciences (ECASM-AIMS-2023-008) issued on 20-01-2023.Written informed consent was obtained from each participant before collecting the data. Privacy was ensured during the time of interview, and confidentiality of all the information collected was maintained. All study procedures were according to the guidelines laid down in the Declaration of Helsinki.

Results

This community-based study was conducted on 600 participants with DM from Ernakulam district to determine the prevalence of MMDMs. The mean age of the study participants is 61.5 ± 9.5 years. The mean duration of diabetes in the study population was 9.42 ± 6.04. The sociodemographic characteristics of the study population are mentioned in the table [Table 1].

About 43% of the study participants had only diabetes and no other comorbidities. More than half of the study participants (52%) had hypertension along with DM. About 13% and 24% of them had associated coronary artery disease and dyslipidemia, respectively. About 3.6% had other diseases along with diabetes like cancer, asthma, COPD, CLD, and so on.

Sixty-nine [44.83% (95% CI 40.80–48.91)] participants had MMDM, of which 221 (36.8%) individuals exhibited one MMDM, while 46 (7.6%) participants displayed two distinct MMDMs. Only two (0.33%) of the study participants presented with three concurrent MMDMs [Figure 1].

Osteoarthritis knee emerged as the most prevalent manifestation, affecting 22% (95% CI 18.90–25.71) of participants, followed by adhesive capsulitis of the shoulder, which was observed in 12.2% (95% CI 9.55–14.78) of individuals. Additionally, diabetic cherioarthropathy, trigger finger, and carpal tunnel syndrome were noted in 6.7% (95% CI 4.81–8.97), 4.7% (95% CI 2.99–6.48), and 3.8% (95% CI 2.44–5.70) of participants, respectively. A history of fracture after the onset of diabetes was reported in 39 (6.5%) individuals, while disordered fracture healing, characterised by non-union or malunion, was prevalent in 7 participants (1.2%). Thus, about 18% of those who had fracture after onset of diabetes was found to have disordered fracture healing. Less common were Dupuytren's contracture and Charcot's foot, each with a prevalence of 1% [Table 2]. Univariable logistic regression analysis to determine the association of MMDMs and its determinants showed that overweight or obesity ($P < 0.001$), higher socioeconomic status ($P = 0.009$), duration of diabetes exceeding 10 years ($P = 0.024$), those who received treatment in private institutions ($P = 0.033$), and unsatisfactory levels of physical activity ($P = 0.009$) were all significantly associated with musculoskeletal manifestations [Appendix]. Furthermore, the determinants which had a *P* value less than 0.02 were included for multivariable logistic regression. Following multivariable logistic regression analysis, the adjusted odds ratio was calculated and it was seen that four of the determinants, namely, socioeconomic status (aOR 1.59, $P = 0.030$), duration of diabetes (aOR1.497, $P = 0.020$), BMI (aOR 2.49, $P < 0.001$), and physical activity (aOR 2.195, $P = 0.024$), were found to be the independent predictors associated with MMDMs [Table 3].

In the study, the distribution of osteoporosis risk among the participants was determined using OSTA score. Out of the total of 600 participants, 414 individuals, constituting 69.2% of the

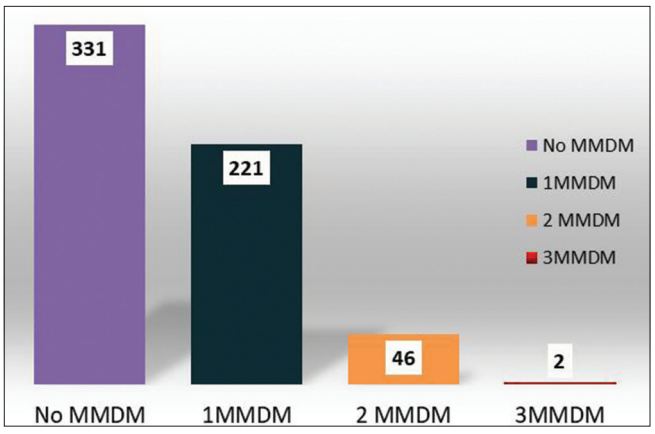

Figure 1: Pattern of prevalence of MMDMs in the study population

Table 1: Sociodemographic details of the study population (*n*=600)

Variable	Frequency	Percentage (%)
Age (years)		
30-39	10	1.7
40-49	54	9
50-59	199	33.2
60-69	197	32.8
≥70	140	23.3
Gender		
Male	229	38.2
Female	371	61.8
Duration of diabetes		
≤10 years	347	57.8
>10 years	253	42.2
Area of Residence		
Urban	230	38.3
Rural	370	61.7
Marital Status		
Unmarried	7	1.2
Married	512	85.3
Divorced	2	0.3
Living in separation	10	1.7
Widow/widower	69	11.5
Education		
Illiterate	13	2.2
Primary school	73	12.2
Middle school	92	15.3
High School	110	18.3
Higher Secondary	178	29.7
Graduate/Postgraduate	134	22.3
Occupation		
Professional	92	15.3
Homemaker	251	41.8
Skilled labour	146	24.3
Unskilled labour	52	8.7
Unemployed	17	2.9
Retired	42	7
Socioeconomic status*		
APL	367	61.2
BPL	233	38.8
Place Of Treatment		
Govt institution	272	45.3
Private institution	328	54.7
Tobacco usage		
Uses tobacco	45	7.5
Never used tobacco	543	90.5
Quit	12	2
Alcohol consumption		
Ever used	59	9.84
Never used	541	90.16
Physical activity (PA)		
No regular exercise	476	79.4
Unsatisfactory PA (<150 mins/week)	65	10.7
Satisfactory PA (>150 mins/week)	59	9.9
BMI		
Underweight	5	0.8
Normal	132	22
Overweight	128	21.3
Obese	335	55.8
Investigation done in last 6 months		
HBA1c	107	17.8
FBS	382	63.6
PPBS	177	29.4
No values available	85	14.2
Control of diabetes** (*n*=515)		
Ideal	84	16.3
Satisfactory	69	13.4
Unsatisfactory	362	70.3

*Socioeconomic status as per color of the ration card. White and Blue card APL (Above povery line), Pink and yellow card- BPL (Below poverty line). †Control of diabetes classified as per ICMR 2018 guidelines for type 2 diabetes mellitus where ideal- HbA1c <7, Satisfactory- HbA1c 7-8 and Unsatisfactory control >8. ‡Body Mass Index as per Asian BMI classification

Table 2: Prevalence of various musculoskeletal manifestations of diabetes mellitus in the study participant

Characteristic	Frequency (*n*)	Percentage (%)
Osteoarthritis	133	22
Adhesive capsulitis of shoulder	73	12.2
Diabetic cherioarthropathy	40	6.7
Trigger finger	27	4.7
Carpel tunnel	23	3.8
Disordered fracture healing* (non-union/malunion)	7	1.2
Dupuytren's contracture	6	1
Charcot's foot	6	1

study population, had a very low risk of osteoporosis. Meanwhile, a medium risk of osteoporosis was discerned in 160 participants, constituting 26.6% of the total study population. Furthermore, a smaller subset of 25 participants, equivalent to 4.2%, fell into the category of severe risk for osteoporosis [Figure 2].

Discussion

The prevalence of MMDMs in this cross-sectional study which involved 600 study participants was found to be 44.83%. Higher socioeconomic status, increased diabetes duration, increased BMI, and decreased physical activity were found to be the independent predictors associated with MMDMs on multivariable logistic regression. All the previous studies were conducted in secondary or tertiary healthcare centres.

A tertiary centre-based cross-sectional study conducted at Chennai showed that 61.44% of the diabetic patients had at least one musculoskeletal problem and age was found have a significant association with it.[13]

A study done in Northwest India by RP Agrawal *et al*.[14] in 2017 in a tertiary centre reported a prevalence rate of 57%

Table 3: Results of multivariable logistic regression analysis for independent predictors of MMDM

Variable	Musculoskeletal manifestations		*P*
	Crude odds ratio (95%CI)	Adjusted Odds ratio (95%CI)	
Socio-economic status			
APL	1.56 (1.11-2.18)	1.461 (1.032-2.07)	0.030
BPL	Ref	Ref	
Duration of diabetes			
>10 years	1.46 (1.05-2.02)	1.497 (1.067-2.10)	0.020
≤10 years	Ref	Ref	
BMI			
Overweight/obese	2.48 (1.64-3.75)	2.490 (1.630-3.81)	<0.001
Underweight/normal	Ref	Ref	
Physical activity			
Unsatisfactory	2.15 (1.20-3.88)	2.195 (1.19-4.017)	0.024
Satisfactory	Ref	Ref	

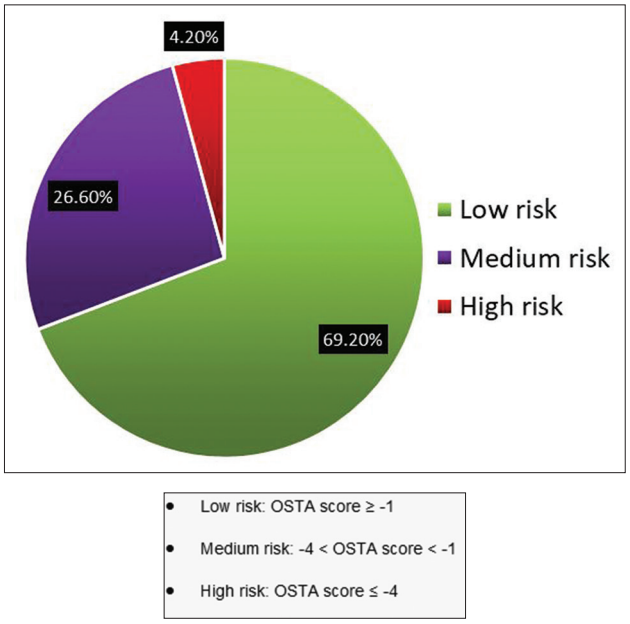

Figure 2: Risk of osteoporosis in study population based on OSTA score (Osteoporosis Self-Assessment Tool for Asians)

for musculoskeletal manifestations among diabetic patients. Diabetes duration (OR: 5.127), BMI (OR: 7.429), and age (OR: 4.731) were found to be significant risk factors which had association with MMDMs. Since these were hospital-based studies, the prevalence of musculoskeletal manifestations is slightly higher than that of this community-based study, probably because the participants in the above-mentioned studies would have had more advanced disease than the general community-based population which might have involved diabetic patients with lesser severity. Some of the above studies involved radiological findings for diagnosis as they were done in tertiary hospital settings which could have picked up more MMDMs than in a community study.

The morbidity profile in this study revealed that 53% of the participants had hypertension. A study done in Ethiopia also showed that more than half (55%) of the type 2 diabetic patients were hypertensive.[15] A systematic review that included 92 studies from around the globe showed that hypertension rates typically were high in diabetes patients with most studies having rates above 50%.[16] This supports the evidence of a high noncommunicable disease comorbidity burden in our country.

This study showed that the ideal glycaemic control was seen only in 16.3%, satisfactory control was seen in 13.4%, and more than 70% had unsatisfactory control as per ICMR cut-offs. A study done in Mumbai also showed that 8.2% had ideal glycaemic control and 28.2% had satisfactory glycaemic control, while the majority of patients 63.6% had unsatisfactory glycemic.[15] Thus, the lack of good glycaemic control was noticed, which highlights the need for better and affordable health care and medications for favourable health outcomes in patients with diabetes.

Many studies have attributed the decrease in physical activity to results in various metabolic diseases including diabetes and obesity.[16,17] Only 9.9% of the participants in this study had a satisfactory physical activity of >150 mins per week as advised by WHO for patients with chronic disease. This study also showed that decreased physical activity (aOR 2.195, $P = 0.024$) is associated with MMDM. Hence, it is imperative to take measures to make awareness among patients with diabetes to improve physical activity to prevent complications including MMDMs. The prevalence of obesity and overweight in this study was 21.3% and 55.8%, respectively, which might also be attributed to decreased physical activity in a majority of the study subjects. Many other studies done in India also support the evidence of a very high prevalence of obesity in patients with DM. A more recent study done in 2020 in Belgavi, India, on diabetic patients showed a prevalence of 58.68% for generalised obesity in patients with T2DM, similar to the findings of this study[18] This study showed that MMDMs are significantly associated with increased BMI (aOR 2.49, $P < 0.001$). Thus, more focus is needed to decrease BMI in diabetic patients to prevent MMDMS. The study also showed that participants from a higher socioeconomic class had a significant association with MMDMs, which could also be related to a sedentary lifestyle.

In this study, the most prevalent MMDM was osteoarthritis of the knee with 133 (22%) of 600 participants. A study done in Trivandrum, Kerala, showed that osteoarthritis knee was prevalent in 20.64% of the study participants (95% CI 16.14–25.16).[19] A study from Northwest India showed that about 36% of diabetic patients had osteoarthritis,[20] in which X-rays were used to diagnose and thus could have picked up those who did not have evident symptoms, resulting in a higher prevalence than found in this community-based study which was done using Altman clinical criteria.

The prevalence of adhesive capsulitis of the shoulder in this study was 12.2%. The estimated prevalence from the literature is 11–30% in those with diabetes.[21] Some studies show the prevalence of adhesive capsulitis is more prevalent in the younger diabetic population. Since the mean age of our study population was around 60 years, the prevalence of adhesive capsulitis was lower.[22]

In this cross-sectional study, diabetic cheiroarthropathy was noted in 6.7% of the participants. A study by Singla *et al.* in Himachal Pradesh shows that the prevalence of DC is 9.14%.[23] Various studies show a varied prevalence of DC depending on the study population, glycaemic control, duration of diabetes, and so on. Since cheiroarthropathy is associated with microvascular complications of DM like retinopathy, recognition is important. Good control of diabetes is of extreme importance in the management of the disease.[24,25]

In a research conducted by Tapas Kumar in Kolkata, the prevalence of trigger fingers was observed to be 4.69%.[26] Another study by Sarkar *et al.* showed a prevalence of 5% for trigger fingers.[27] This current study also observed a prevalence of trigger finger at 4.7% (95% CI 2.99–6.48), consistent with findings from other studies conducted in India.

A metanalysis by Ardeshir Moayeri *et al.* shows that DM is associated with an increased risk of fractures.[28] The negative impact of T2DM on bone regeneration appears to operate on cellular, molecular, and biomechanical fronts, thus compromising the bone healing process post fracture. This study showed that a disordered fracture healing was prevalent in 7 of the 600 participants (1.2%).

This study showed a low prevalence of Dupuytren's contracture and Charcot's foot of 1% each. A cross-sectional study done by Shravya *et al.* showed that the prevalence of Dupuytren's contracture in the tertiary care centre was found to be 2.9%.[29] Since no radiological investigations were involved in detecting Charcot's foot, some of the less apparent cases might have been missed in this community-based study.

A metanalysis by Yuhao SI *et al.* from China showed that the prevalence of osteoporosis in T2DM patients was 37.8% with increased frequency in females than in males and also with increasing age.[30] This study showed that 26.6% of the total study population had medium risk and 4.2% had severe risk for osteoporosis, while others had only very low risk. Many studies have reported that the greatest risk of osteoporosis occurred at a lower BMI and then the risk steeply decreased to nearly stabilise in higher values of BMI.[29] Most of the study participants in this cross-sectional study show very low risk of osteoporosis, probably because the majority of the study participants were obese or overweight.

A key strength is that, to our knowledge, it is the first study to determine the prevalence of MMDMs at the community level in India. All clinical assessments were done by the primary investigator who has a background of 2 years of fellowship training for DM which helped to avoid subjective bias. The limitations of the study are that the detection of the musculoskeletal problems was done by clinical assessment and no radiographic or other investigational methods were used as it was not practically feasible in a community-based house-to-house study; hence, MMDMs like Gout and DISH could not be assessed. Since only self-reported diabetes could be included, persons who had undetected DM were missed. The prevalence of habits like tobacco smoking and alcohol was found to be low, probably because most of the participants were women and may also be attributed to social desirability bias.

Conclusion

From the above observations, it is clear that more than 40% of diabetics in the community suffer from MMDMs. This highlights the need for regular musculoskeletal system assessment in patients with DM which needs to be made mandatory in clinical practice to prevent further complications and to improve quality of life. Among the risk factors that are associated with MMDMs, some factors like BMI and physical activity are modifiable risk factors, and focussing on correcting the same is of much importance. Community-based screening for complications of diabetes should also address musculoskeletal manifestations of diabetes for improved outcomes.

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Authors' contribution

Kelita George: Concept and design of study, Acquisition of data, Analysis and interpretation of data, Drafting the article. Sobha George: Design of study, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published. Nisha Bhavani: Revising it critically for important intellectual content, Final approval of the version to be published. Renjitha Bhaskaran: Analysis and interpretation of data.

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Conflicts of interest

There are no conflicts of interest.

Data availability statement

The authors of this manuscript are willing to share the data supporting the results of this manuscript upon request.

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Appendix

Other tables and figures.

Results of univariable analysis to test for association between diabetes related musculoskeletal manifestations and its determinants.

Variable	MMDM		Crude odds ratio 95% CI	*P*
	Present *n*=269	Absent *n*=331		
Age				
≤60 years	115 (41.7%)	161 (58.3%)	1.27 (0.92-1.75)	0.150
>60 years	154 (47.5%)	170 (52.5%)		
Sex				
Male	104 (45.2%)	126 (54.8%)	1.03 (0.737-1.43)	0.881
Female	165 (44.6%)	205 (55.4%)		
Socio-economic status				
APL	180 (49%)	187 (51%)	1.56 (1.11-2.18)	0.009
BPL	89 (38.2%)	144 (61.8%)		
BMI				
Overweight/obese	230 (49.7%)	233 (50.3%)	2.48 (1.64-3.75)	<0.001
Underweight/	39 (28.5%)	98 (71.5%)		
Normal				
Comorbidity				
Yes	155 (44.8%)	191 (55%)	0.99 (0.720-1.38)	0.984
No	141 (44.9%)	140 (55.1%)		
Area of Residence				
Urban	100 (43.7%)	129 (56.3%)	0.927 (0.66-1.29)	0.652
Rural	169 (45.6%)	202 (54.3%)		
Marital Status				
Currently married	226 (44.1%)	286 (55.9%)	0.83 (0.53-1.30)	0.410
Others	43 (48.9%)	45 (51.1%)		
Education				
Higher secondary/graduate	133 (43.6%)	172 (56.4%)	0.90 (0.65-1.25)	0.539
Upto high school	136 (46.1%)	159 (53.9%)		
Occupation				
Employed	96 (40.3%)	142 (59.7%)	0.739	0.702
Unemployed	173 (47.8%)	189 (52.2%)	(0.530-1.03)	
Duration of diabetes				
>10 years	127 (50.2%)	126 (49.8%)	1.46 (1.05-2.02)	0.024
≤10 years	142 (40.9%)	205 (59.1%)		
Control of diabetes (*n*=515)				
Unsatisfactory control	161 (44.5%)	201 (55.5%)	0.975 (0.67-1.43)	0.897
Ideal/Satisfactory control	69 (45.1%)	84 (54.9%)		
Place of treatment				
Private institution	160 (48.8%)	168 (51.2%)	1.42 (1.03-1.97)	0.033
Government institution	109 (40.1%)	163 (59.9%)		
Alcohol consumption				
Yes	24 (47.1%)	27 (52.9%)	1.10 (0.62-1.96)	0.738
No	245 (44.6%)	304 (55.4%)		
Tobacco usage				
Yes	28 (49.1%)	29 (50.9%)	1.21 (0.71-2.09)	0.494
No	241 (44.4%)	302 (55.6%)		
Physical activity				
Unsatisfactory (<150 mins/week)	252 (46.6%)	289 (53.4%)	2.15 (1.20-3.88)	0.009
Satisfactory (>150 mins/week)	17 (28.8%)	42 (71.2)		