

Musculoskeletal manifestations in type-2 diabetic patients attending a tertiary care hospital in a North-Eastern city of India—A cross-sectional observational study

Swapan Sarkar¹, Bidhan Goswami², Bitan Sengupta³, Shauli Sengupta⁴,
Bhaskar Bhattacharjee⁴

¹Department of Medicine, Agartala Government Medical College and GBP Hospital, Agartala, Tripura, India, ²Department of Microbiology, Agartala Government Medical College, Agartala, Tripura, India, ³Department of Community Medicine, Agartala Government Medical College and GBP Hospital, Agartala, Tripura, India, ⁴Multidisciplinary Research Unit, Agartala Government Medical College, Agartala, Tripura, India

ABSTRACT

Background: Musculoskeletal manifestations of diabetes are common and not life threatening, but these are an important cause of morbidity, pain and disability among diabetic patients. In 2004, the National Health Interview Survey determined that 58% of diabetic patients would have musculoskeletal functional disability. This study was designed to estimate the proportion of musculoskeletal manifestations among Type 2 diabetic patients attending a tertiary care hospital in Tripura and also to determine the association of various musculoskeletal manifestations with glycaemic status, body mass index and duration of diabetes mellitus. **Methods:** This hospital-based cross-sectional study was carried out in a tertiary care hospital in a northeastern state of India from December 2020 to November 2021. All the diabetic patients attending diabetes nutrition clinic of a tertiary care hospital for a period of one year were considered for this study. Diagnosis of musculoskeletal disorder was made based on history, physical examination, laboratory test and imaging test. Quantitative data were expressed as mean and standard deviation. Descriptive data was expressed in percentages and frequencies using charts and tables. Chi-square test was applied to explore any association between variables. Ethical approval for the study was obtained from the institutional ethics committee. **Results:** Out of four hundred and forty-two diabetic cases and two hundred and thirty-four (52.9%) patients were found with musculoskeletal manifestations, 55% of which belong to 45-59 age group. **Conclusion:** Physicians treating diabetic patients should be encouraged for regular examination for musculoskeletal complaints. Early diagnosis will facilitate appropriate treatment and thus prevents further complications.

Keywords: Diabetes mellitus, DISH, musculoskeletal manifestations, North-East India

Introduction

Diabetes mellitus (DM) is associated with several musculoskeletal manifestations which are generally ignored and poorly treated as compared to other complications such as neuropathy,

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Sarkar S, Goswami B, Sengupta B, Sengupta S, Bhattacharjee B. Musculoskeletal manifestations in type-2 diabetic patients attending a tertiary care hospital in a North-Eastern city of India—A cross-sectional observational study. *J Family Med Prim Care* 2023;12:472-7.

Address for correspondence: Dr. Bidhan Goswami,
Department of Microbiology, Agartala Government Medical
College, Agartala, Tripura, P. O. Kunjavan - 799 006, India.
E-mail: agmcmru@gmail.com

Received: 02-07-2022

Revised: 12-09-2022

Accepted: 07-10-2022

Published: 17-03-2023

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_1350_22

retinopathy and nephropathy. DM affects connective tissues in many ways and cause different alterations in periarticular and skeletal systems.^[1] DM is associated with a great variety of musculoskeletal manifestations and many of which are subclinical and correlated with disease duration and its inadequate control. These complications significantly compromise patient's quality of life. The exact pathophysiology of most of these musculoskeletal disorders remains unclear. Connective tissue abnormality, macrovascular, microvascular complications or combinations of these problems may cause the increased incidence of musculoskeletal disorders in DM.

Joints affected by diabetes among patients having musculoskeletal disorders include peripheral joints and the axial skeleton. A number of pathological conditions of the hands and shoulder are recognized which include carpal tunnel syndrome, adhesive capsulitis, tenosynovitis and restricted joint mobility. Management of these conditions requires early recognition and close liaison between diabetes and musculoskeletal manifestations specialists. In 2004, the National Health Interview Survey estimated that in future 58% of diabetic patients would have functional disability.^[2] In 2019, a study done by Bhat TA *et al.*^[3] concluded that there was a significant correlation between the duration of the diabetic disease and musculoskeletal (MSK) manifestations. They also observed that patients having diabetes for more than 10 years were more likely to develop these manifestations. One of the previous studies reported that patients with type 2 diabetes had greater impairments in mobility and more difficulties in performing basic activities of daily living than nondiabetic persons.^[4] As per study done by Prof. R P Agrawal *et al.*,^[5] musculoskeletal manifestations are very common in diabetics and are associated with poor Glycaemic control, body mass index (BMI), duration of diabetes and age of the patients. Though studies are available regarding musculoskeletal manifestations in diabetic patients, data from our country are scarce especially from this part of the country. Hence, this study was planned to study musculoskeletal manifestations in local diabetic patients.

Material and Methods

Study design

This was a hospital-based cross-sectional study.

Study setting

It was carried out among diabetic patients who attended Diabetes Nutrition clinic of Agartala Government Medical College and Govind Ballabh Pant Hospital.

Study duration and sample size

This research study was carried out from December 2020 to November 2021 among 640 diabetic patients.

Data collection

In this study, musculoskeletal complications were considered if the patients had any of the following conditions:

1. peri-arthritis, osteoarthritis (OA), gout,
2. swollen Joints and stiffness,
3. patients with collagen vascular disorder, rheumatoid arthritis,
4. the spine, such as back and neck pain, spondylitis, and
5. multiple body areas or systems, such as regional and widespread pain disorders and activities' limitation.

Exclusion criteria

The following patients were kept in exclusion criteria:

1. patients with chronic kidney disease,
2. patients with acute severe illness,
3. pregnant women,
4. patients with a history of trauma-related musculoskeletal morbidities,
5. patients with known endocrine disorders like hypothyroidism, and
6. patients not ready to give written consent.

After considering exclusion criteria, 442 patients were included in this study. A detailed history and clinical examination was undertaken in each patient with an emphasis on musculoskeletal examination after obtaining a written informed consent. A structured interview schedule was used to collect data from the participants. Information was collected on parameters like age, gender, family history of disease, etc. Physical examination was focused on hand, shoulder, leg, foot and different joint abnormalities. All the patients underwent routine investigations like complete blood count, urine analysis, fasting and postprandial plasma glucose, HbA1c, serum uric acid, urea, creatinine and lipid profile. X-rays of the hand, shoulder, spine, and other involved joints were done. All the biochemical tests were performed by utilizing facilities available at Multidisciplinary Research Unit of Agartala Government Medical College and GBP Hospital. Other than these, anti-cyclic citrullinated peptide (CCP), C reactive protein (CRP), antinuclear antibody (ANA), and rheumatoid arthritis (RA) tests were also done for selected subjects with symptoms suggestive of inflammatory origin. CBC was performed in haematoanalyser (XN-1000). Other biochemical tests were done in Autoanalyser XL-640 equipment. Anthropometric measurements taken were standing height in metres, weight-in kg, and hip and waist circumference in centimetres. BMI was measured by using OMRON body fat analyzer machine. Dupuytren's disease was diagnosed in patients with palpable thickening of the palmar fascia, with flexor deformity of the second, third, fourth, or fifth fingers. Flexor tenosynovitis was diagnosed by feeling a nodule with a locking phenomenon during the extension or flexion of any fingers. Past history of any surgery for any of these disorders was also considered.

Data analysis

Data was entered and analyzed on a computer using the Statistical Package for the Social Sciences software.^[6] Quantitative data were expressed as mean and standard deviation. Descriptive data were expressed in percentages and frequencies using charts, figures,

and tables. For categorical data Chi-square test and for continuous data *t*-test was applied.

Ethical issues

Ethical approval for the study was obtained from the institutional ethics committee (IEC) of Agartala Govt. Medical College vide letter no. F.4 (5-234)/AGMC/Academic/IEC Meeting/2020/785, Dated, 18.01.2021. Guidelines for reporting: Simple screening questions like pain, limitation of activities, Stiffness and swelling in and around joints, muscles, and back were used to identify musculoskeletal problems.^[7] Diagnosis of musculoskeletal disorder was made based on history, physical examination, laboratory test, and imaging test. Serum uric acid levels up to 7.0 mg/dl in case of adult men and also in case of post-menopausal women were taken as normal.^[8] When unilateral shoulder pain was present for over 3 months and the range of external rotation and active and passive shoulder movements in all planes was less than 50% of normal, then it was diagnosed as frozen shoulder.^[9] The presence of more than two bridges between contiguous vertebrae was taken for the diagnosis of diffuse idiopathic skeletal hyperostosis (DISH).

Result

Total four hundred forty-two diabetic cases were analyzed. Out of them, 282 (66%) cases were below 60 years. Female diabetic subjects (53.4%) were more than the males in this study. Out of total cases, 234 (52.9%) patients were found to have musculoskeletal manifestations, 55% of which come under

45–59 age group. In total, 64.9% of the patients had diabetes for more than 5 years. The status of other factors like ethnicity, BMI and glycaemic control (HbA1C was >9) is depicted in Table 1.

Chart 1 implies the distribution of different types of musculoskeletal manifestations among the study subjects based on gender. The association between the age group of patients and various musculoskeletal complications is assessed in Table 2. DISH (35%) was predominantly found in the local diabetic population followed by OA (13.24%), frozen shoulder (12.39%), trigger finger (11.53%), and Dupuytren's contracture (DC) (10.68%).

In this study, HbA1C level was found to be associated with different musculoskeletal complications. The striking part of the present study was that the occurrence of musculoskeletal manifestations was more with the HbA1c concentration between 7 and 9%, which is depicted in Table 3.

Table 4 shows a statistically significant strong association of the duration of diabetes with various rheumatological complications, namely, rheumatoid arthritis, X- ray on knee and X-ray on shoulder among the study participants.

Discussion

DM is associated with a wide variety of musculoskeletal complications. These complications significantly compromise the patient's quality of life. These complications are generally neglected and poorly managed as compared to other complications such as kidney disease, cardiovascular disease, skin disease, etc., Nowadays, both incidence and life expectancy of diabetic patients have increased remarkably, resulting in increased prevalence and clinical importance of musculoskeletal manifestations in diabetic patients.

In this study, the incidence of MSK manifestations was analyzed among 442 diabetic patients attending a tertiary teaching hospital of Tripura between December, 2020 and November, 2021. In our study, we found that 52.9% of diabetic patients from this northeastern state have musculoskeletal manifestations. However, in an Indian study done by Deshmukh DP *et al.*,^[10] it was found that 42% of diabetic patients had MSK manifestation. Another study conducted by Majjad *et al.*^[11] in 2018 found that the prevalence of MSK complications in DM patients is 34.4%.

In this study, the most common MSK complication was DISH (35%). Sarkar *et al.*^[12] found the prevalence of DISH among diabetic patients as 28% in their study, which is in accordance with our present study result. However, Mathew *et al.*^[13] found prevalence of DISH 14.52% in their study. According to present study result, DISH also appeared frequently at an age group of 45–59 yrs in diabetic patients. This is may be due to the ossification and calcification of soft tissues like entheses and joint capsules.

Table 1: Characteristics of study population

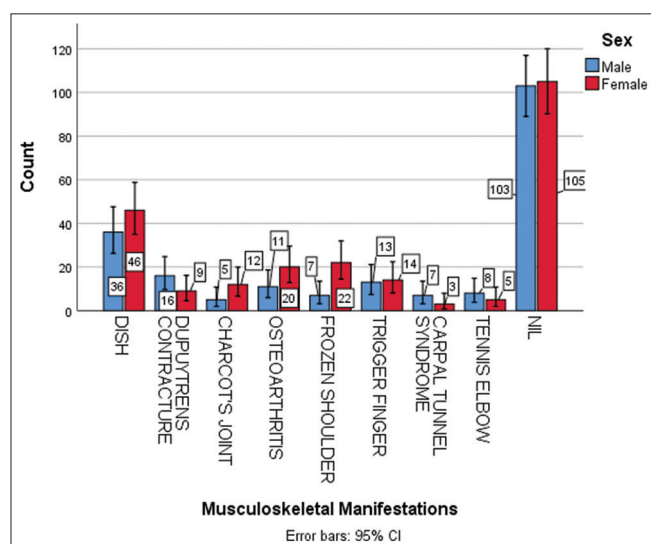
Parameters	n(%) (n=442)
Age group	
15-29 Years	5 (1.1%)
30-44 Years	61 (13.8%)
45-59 Years	216 (48.9%)
60-74 Years	156 (35.3%)
>75 Years	4 (0.9%)
Gender	
Male	206 (46.6%)
Female	236 (53.4%)
BMI	
Underweight	57 (12.9%)
Normal	165 (37.3%)
Overweight	147 (33.3%)
Obese	73 (16.5%)
Duration of diabetes	
<5 Years	155 (35.1%)
5-10 Years	151 (34.2%)
>10 Years	136 (30.8%)
Ethnic or Nonethnic	
Ethnic	219 (49.2%)
Nonethnic	223 (50.8%)
HbA1c level	
<7%	117 (26.5%)
7-9%	251 (56.8%)
>9%	74 (16.7%)

Table 2: Distribution of types of musculoskeletal manifestations in different age groups

Age Group	DISH	DC	Charcots joint	OA	Frozen shoulder	Trigger finger	Carpal tunnel syndrome	Tennis elbow	Nil	Total	Chi ² value	P
15-29 Yrs	0	0	0	0	1	3	0	0	1	5	65.116	0.00
30-44 Yrs	4	5	4	7	0	1	1	1	38	61		
45-59 Yrs	51	13	8	15	20	9	7	7	86	216		
60-74 Yrs	27	7	5	9	8	14	2	5	79	156		
>75 Yrs	0	0	0	0	0	0	0	0	4	4		
Total	82	25	17	31	29	27	10	13	208	442		

Table 3: Glycosylated haemoglobin and various musculoskeletal manifestations among study subjects

HbA1c	DISH	DC	Charcots joint	OA	Frozen shoulder	Trigger finger	Carpal tunnel syndrome	Tennis elbow	Nil	Total	Chi ² Value	P
<7%	30	6	0	5	5	11	1	3	56	117	37.65	0.002
7-9%	43	13	15	13	19	11	9	8	120	251		
>9%	9	6	2	13	5	5	0	2	32	74		
Total	82	25	17	31	29	27	10	13	208	442		

**Chart 1: Distributions of different musculoskeletal manifestations**

In our study, the second most common manifestation was OA (13.24%). OA was more common among patients with poor glycaemic control, and the difference was statically significant. Previous studies have reported OA as one of the most common musculoskeletal manifestations among diabetic patients. The study conducted by Mathew AJ *et al.* in India found the prevalence of OA is 20.4%. This study concluded that OA is significantly linked to glycaemic control. However, Sarkar *et al.* did not find any association between glycaemic control and OA prevalence among patients with diabetes.

Frozen shoulder was reported by many studies as expected complication of DM. The prevalence of frozen shoulder reported in previous literature was between 11 and 30% in diabetic patients and 2 and 10% in nondiabetics.^[14] In our study, 12.39% diabetic subjects were found with frozen shoulder, which is in accordance with the above studies.

According to our study it was also found that DISH, OA, and frozen shoulder were more frequent in females, whereas tennis elbow and DC were more common among the male gender. The previous study suggests that women's susceptibility to OA may be related to hormonal levels.^[15] Hormone levels fluctuate with menstruation cycles and change during menopause. Increased hormone levels during certain stages of the menstrual cycle may increase joint laxity, which is associated with joint instability and injury.^[16] Trigger finger was also seen in our study where the incidence of trigger finger was 11.53%. Many previous studies have found an increasing incidence of trigger finger among diabetic patients. Different studies reported that the incidence of trigger finger among the general population is between 1.7 and 2.6% compared to 10 and 20% in the diabetic population.^[17] One of the previous research papers indicated that the trigger finger is related to the incidence of cardiovascular disease (CVD) in patients with type 2 diabetes.^[18] Diagnosis of trigger finger is relatively easy and noninvasive.

According to the present study result, 20% of study participants had rheumatoid arthritis, and 59% of them were females only. Lu *et al.*^[19] demonstrated that the risk of developing RA was significantly higher in female but not in male participants among subjects with T2DM. However, in that study, most of the participants were females (77.4%), while in our study, 53.4% were female.

Limitation

The present study has few limitations, and the short span of observation was one of those. Other than this, the design of this study was hospital-based which might not reflect the accurate occurrence of musculoskeletal manifestations in this region. Due to Covid-19 pandemic situation from the last two years, attendance of diabetic patients in OPD was comparatively low, and some cases might not come to the hospital due to accessibility, financial constrain or for any other personal reason.

Table 4: Duration of diabetes and different musculoskeletal complications in diabetes mellitus

Duration of diabetes	Rheumatoid arthritis		X-ray in knee		X-ray in shoulder		Total	P	Total	P				
	Positive	Negative	Positive in one knee	Negative	Positive in one shoulder	Negative								
	Total	Total	Positive in both knee	Negative	Positive in both the shoulders	Negative								
< 5 Yrs	26	129	155	0.038	7	45	103	155	0.001	5	35	115	155	0.016
5-10 Yrs	25	126	151		6	27	118	156		17	20	114	151	
>10 Yrs	37	99	136		19	34	83	136		7	29	100	136	
Total	88	354	442		32	106	304	442		29	84	329	442	

Significance for public health: It is very crucial for physicians to be aware of musculoskeletal manifestations among the diabetic patients to prevent disability and chronic pain as 52.9% diabetic patients from a northeastern state of India have been found with musculoskeletal disorders.

Conclusion

Physicians treating diabetic patients should be encouraged for regular enquiry about musculoskeletal complaints in patient's history. Early diagnosis will facilitate the appropriate treatment and thus prevents further complications.

Abbreviation

DISH = Diffuse idiopathic skeletal hyperostosis

MSK = Musculoskeletal

DM = Diabetes mellitus

HbA1c = Glycosylated haemoglobin

Acknowledgements

The authors are indebted and thankful to the Department of Health Research (DHR), Govt. of India. Authors are also grateful to all the technical staff of Multidisciplinary Research Unit, AGMC for their participation and successful completion of this study.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Department of Health Research (DHR), Ministry of Health & Family Welfare, Govt. of India, New Delhi through Multidisciplinary Research Unit, Agartala Govt. Medical College.

Conflicts of interest

There are no conflicts of interest.

References

1. Jobin P, Dhurvey P, Nair A, Arora N, Chittawar S, Kawre KK. Prevalence of musculoskeletal manifestations in patients with type 2 diabetes mellitus in a tertiary care hospital. *Indian J Res* 2018;7.
2. Egede LE. Diabetes, major depression, and functional disability among U.S. adults. *Diabetes Care* 2004;27:421-8.
3. Bhat TA, Jalalie U, Kashyap S. An observational study on

- musculoskeletal manifestations in type 2 Diabetes mellitus in rural population of Himachal Pradesh, India. *Int J Res Med Sci* 2019;7:4237-42.
4. Gregg EW, Mangione CM, Cauley JA, Thompson TJ, Schwartz AV, Ensrud KE, *et al.* Diabetes and incidence of functional disability in older women. *Diabetes Care* 2002;25:61-7.
 5. Agrawal RP, Gothwal S, Tantia P, Agrawal R, Rijhwani P, Sirohi P, *et al.* Prevalence of rheumatological manifestations in diabetic population from North-West India. *J Assoc Physicians India* 2014;62:788-92.
 6. IBM Corp. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.; 2017.
 7. Handa R, Rheumatic musculoskeletal complaints in diabetes--adding another dimension to a multidimensional disease! *J Assoc Physicians India* 2014;62:781-2.
 8. Basavanna D, Harshavardhan L, Puttaswamy. Musculoskeletal manifestations in diabetic patients at a tertiary center. *Int J Med Res Rev* 2016;4:2019-23.
 9. Mezian K, Coffey R, Chang KV. Frozen shoulder. [Updated 2021 Sep 1]. In StatPearls. Treasure Island (FL): StatPearls Publishing; 2022. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482162/>.
 10. Deshmukh DP, Akarte AG. Musculoskeletal manifestations in type 2 diabetes mellitus. *Int J Res Med Sci* 2017;5:398-402.
 11. Majjad A, Errahali Y, Toufik H, Djossou JH, Ghassem MA, Kasouati J, *et al.* Musculoskeletal disorders in patients with diabetes mellitus: A cross-sectional study. *Int J Rheumatol* 2018;2018:3839872.
 12. Sarkar P, Pain S, Sarkar RN, Ghosal R, Mandal SK, Banerjee R. Rheumatological manifestations in diabetes mellitus. *J Indian Med Assoc* 2008;106:593-5.
 13. Mathew AJ, Nair JB, Pillai SS. Rheumatic musculoskeletal manifestations in type 2 diabetes mellitus patients in South India. *Int J Rheum Dis* 2011;14:55-60.
 14. Smith LL, Burnet SP, McNeil JD. Musculoskeletal manifestations of diabetes mellitus. *Br J Sports Med* 2003;37:30-5.
 15. Shen P-C, Chang P-C, Jou I-M, Chen C-H, Lee F-H, Hsieh J-L. Hand tendinopathy risk factors in Taiwan: A population-based cohort study. *Medicine* 2019;98:e13795.
 16. Jin X, Wang BH, Wang X, Antony B, Zhu Z, Han W, *et al.* Associations between endogenous sex hormones and MRI structural changes in patients with symptomatic knee osteoarthritis. *Osteoarthritis Cartilage* 2017;25:1100-6.
 17. Chidi-Ogbolu N, Baar K. Effect of estrogen on musculoskeletal performance and injury risk. *Front Physiol* 2019;9:1834.
 18. Mineoka Y, Ishii M, Hashimoto Y, Yuge H, Toyoda M, Nakamura N, *et al.* Trigger finger is associated with risk of incident cardiovascular disease in individuals with type 2 diabetes: A retrospective cohort study. *BMJ Open Diabetes Res Care* 2021;9:e002070.
 19. Lu M-C, Yan S-T, Yin W-Y, Koo M, Lai N-S. Risk of rheumatoid arthritis in patients with type 2 diabetes: A nationwide population-based case-control study. *PLoS One* 2014;9:e101528.