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Magnitude and factors associated with musculoskeletal disorder among patients with diabetes attending chronic care at Arba Minch General Hospital, Arba Minch, southern Ethiopia, 2021: a cross-sectional study

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ABSTRACT

Objective This study aimed to assess the prevalence and determinants of musculoskeletal disorders (MSDs) among patients with diabetes in southern Ethiopia.

Design Facility-based cross-sectional study.

Setting Data collected from 1 March 2021 to 30 August 2021 at Arba Minch General Hospital.

Participants Three hundred and sixty-five patients with diabetes attending care at Arba Minch General Hospital.

Main outcome measures The magnitude and determinants of the MSDs.

Results The prevalence of MSDs among patients with diabetes was 23.29% (95% CI 19.00 to 27.76). The likelihood of developing MSDs was 6.8 times higher among women than men (AOR=6.787, 95% CI 2.08 to 22.19). Rural participants were about 2.4 times (AOR=2.38, 95% CI 1.06 to 5.33) more likely to develop MSDs as compared with urban participants. Participants aged >50 years were 5.9 times more likely to develop MSDs as compared with those aged ≤50 years (AOR=5.864, 95% CI 2.663 to 12.914). The odds of developing MSDs was 6.2 times (AOR=6.247, 95% CI 1.158 to 33.702) and 5.5 times (AOR=5.451 95% CI 1.174 to 25.312) higher among participants who attended primary and secondary education as compared with those who attended college and above, respectively. Participants with cardiovascular disease were 3.9 times more likely to develop MSDs as compared with their counterparts (AOR=3.854, 95% CI 1.843 to 8.063).

Conclusions This study showed that age, sex, educational status, place of residence and cardiovascular disease were found to be determinants of MSDs. Thus, clinical and public health interventions working on diabetes mellitus should consider these determinants.

STRENGTH AND LIMITATIONS OF THE STUDY

⇒ We explored musculoskeletal disorders (MSDs), which are an ignored and underestimated problem in patients with diabetes with sound methodology.
⇒ The presence of MSDs was based on medical records and self-reports.
⇒ We used fasting blood sugar to determine glycaemic control because Hemoglobin A1c (HbA1c) is not easily accessible in our setting and resource limitations.
⇒ Vascular complications are not assessed and included in our study due to limited number of vascular evaluations and investigations that can be performed in our hospital.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic condition that predisposes to musculoskeletal complications in the joints, bones, soft tissues and periarticular structures, resulting in morbidity and disability.[1–3] The incidence and the life expectancy of patients with diabetes have both increased, leading to the increased prevalence and clinical importance of musculoskeletal abnormalities in patients with diabetes.[4]

The pathophysiology of most of these musculoskeletal alterations remains unclear.[4] Glycosylation of proteins, microvascular abnormalities, and accumulation of collagen in the skin and periarticular structures result in changes in the connective tissue. These complications are commonly seen in patients with type 1 diabetes, but they are also present in patients with type 2 diabetes. Some of the complications have a known direct association with diabetes, whereas others have a suggested but unproven association.[5]

Many skeletal and muscular system problems arise in DM.[2] Musculoskeletal complications of DM have been generally

Table 1 Sociodemographic characteristics of patients with diabetes attending chronic care at Arba Minch Hospital, southern Ethiopia, 2021

Variables	Frequency	Per cent
Sex of the respondent		
Female	202	55.34
Male	163	44.66
Age of the respondent in years		
< 50 years	191	52.33
≥50 years	174	47.67
Place of residence		
Rural	129	35.34
Urban	236	64.66
Education status		
College graduate or above	80	21.92
Able to read and write	14	3.84
Unable to read and write	105	28.77
Primary education[1–8]	98	26.85
Secondary school[9–12]	68	18.63
Occupation		
Farmer	43	11.78
Government-employed	105	28.77
Housewife	151	41.37
Self-employed	44	12.05
Unemployed	22	6.03
Marital status		
Unmarried	26	7.12
Married	339	92.88

under-recognised and poorly treated compared with other complications and lead to functional disability.[6] The prevalence and incidence of DM are increasing, and the percentage of patients with diabetes with a functional disability will increase as the number of patients with diabetes increases, thereby constituting a major public health problem.

Musculoskeletal disease is more common among individuals with DM than in healthy individuals[7] and predominantly affects the hand and shoulder.[1 5 6 8] Its magnitude varies widely. Of the individuals with diabetes, around 42%–62% in India,[3 4] 17.9% in Saudi Arabia,[6] 69.5% in Jordan,[1] 14.4% in Morocco[9] and 56% in Nigeria[10] suffer from one or more musculoskeletal diseases. Also, in studies conducted in central and northern Ethiopia, the prevalence was 16.6%–41.5% and more women were affected than men.[5 11]

Despite the high prevalence of musculoskeletal conditions among patients with diabetes and their associated impact on health-related quality of life and economic costs, there are limited local studies on this subject in Ethiopia. Even though there is a scarcity of data in Ethiopia, the overall prevalence of one or more musculoskeletal diseases is 41.5 % with hands being the most affected (18.5 %).[5] A study in Gondar reported that the prevalence of shoulder and hand musculoskeletal complications was 16.6% and the majority of those affected were women, which accounts for 20.1%.[11]

In addition to the diabetic consequences, musculoskeletal disorders (MSDs) cause finger contracture, pain and loss of function that interfere with finger pricks, insulin injections and other types of diabetes management. Also, in most cases, MSD requires surgery that influences wound healing. All of this can worsen the quality of life of people with diabetes.[12 13]

MSDs are treatable and easily preventable, but their manifestations are unrecognised or overlooked. Thus, clinicians should be aware of the possible MSD in diabetes and assess all individuals with DM for the manifestation of MSD, which helps for timely diagnosis and early treatment. Although there are some studies conducted in central and north Ethiopia, there are limited studies in south Ethiopia.

Therefore, this study aimed to identify:

- The prevalence of MSDs among patients attending a diabetic clinic in Arba Minch Hospital, southern Ethiopia.
- Determinants of MSDs among patients attending a diabetic clinic in Arba Minch Hospital, southern Ethiopia.

MATERIALS AND METHODS

Study design, setting and sampling

A facility-based cross-sectional study was conducted from March to August 2021 in Arba Minch Hospital. Arba Minch town is located 434 km south of Addis Ababa, the capital city of Ethiopia. The hospital provides curative, preventive and rehabilitative services for the population of Gamo, Konso and South Omo zones. A total of 800 patients with type I and type II diabetes is followed in the chronic care unit of the hospital.

The study population

All patients with DM attending a chronic care unit at Arba Minch Hospital, but those aged <18 years, with secondary diabetes like Cushing's syndrome, with a history of hand trauma, epilepsy, chronic liver disease, inflammatory arthritis, family history of Dupuytren's contracture, nervous disorders, congenital musculoskeletal abnormalities, recent fractures or injuries, and surgery of the shoulder and hand were excluded from the study.

Dependent variable

MSDs.

Independent variables

- Sociodemographic: Age, sex, occupation, residence, religion, education.
- Diabetes-related factors: Type of diabetes, duration of DM, glycaemic control, type of therapy.
- Individual-related factors: Chronic illness, body mass index (BMI), exercise, drugs (insulin).

Table 2 Clinical and individual-related characteristics of patients with diabetes attending chronic care at Arba Minch Hospital, southern Ethiopia, 2021

Variables	Frequency	Per cent
Type of DM		
Type 2	334	91.51
Type 1	31	8.49
Type of medication		
Insulin	61	16.8
Oral hypoglycaemic drug	276	76.03
Both	26	7.16
DM complication		
No	336	92.05
Yes	29	7.95
Chronic disease		
No	257	70.41
Yes	108	29.59
Cardiovascular disease		
No	244	74.62
Yes	83	25.38
Physical activity		
No	317	87.09
Yes	47	12.91
Body mass index		
Under	11	3.01
Normal	160	43.84
Over	194	53.15
MSD		
No	280	76.71
Yes	85	23.29

DM, diabetes mellitus; MSD, musculoskeletal disorder.

Patient and public involvement

The patients were not involved in the formulation of research questions, in the design of the study, and interpretation and write-up of the results. The patients were involved in the plans for the results to be disseminated to the community of patients with diabetes. We plan to inform the individual participants about the results during their diabetic clinic follow-up and the published article will be disseminated to the hospital and the diabetic association.

Sampling

The sample size was calculated using a single population proportion formula, assuming 95% CI, a 5% degree of precision and a 41.5% expected proportion of MSDs among patients with DM.[5] Based on the above assumptions, the sample size calculated was 373. Study participants were selected by employing a systematic random sampling technique.

Data collection procedures

A pretested, interviewer-administered, structured questionnaire and a medical record review were used to collect data on sociodemographic, diabetic and individual-related factors.

Measurement

A standard Short Musculoskeletal Function Assessment (SMFA) Questionnaire[5 14 15] was used to assess MSDs. Summing items 1–34 creates a SMFA Questionnaire, raw scores for the function index, and items 35–46 raw scores for the Bother Index, after corrections and omissions for missing values.[16] The raw score was changed to a standardised score, that ranged from 0 to 100 points using the following formula: ((actual raw score – the lowest possible raw score)/possible range of raw score) *100 (online supplemental annex 1, 2). Higher scores indicate poorer function. In addition, body height and mass were measured using Seca weight scale, and BMI was calculated using the body formula mass/height^2. Two data clerks independently entered the collected data into Epidata software V.3.1, and the investigator checked consistency between the two data sets. The pretest was done in a 5% sample size at Arba Minch General Hospital for validation of the checklist.

The following definitions were used.

- **MSD:** The presence of one or more of the following: carpal tunnel syndrome, Dupuytren's contracture, limited joint mobility, stenosing tenosynovitis, adhesive capsulitis, reflex sympathetic dystrophy, diabetic amyotrophy, diffuse idiopathic skeletal hyperostosis syndrome, Charcot joint or a score greater than and above in short musculoskeletal assessment form.
- **BMI:** BMI was assessed according to the standards that describe insufficient body weight: (when BMI is <18 kg/m^2), normal body weight (when BMI is 18–24.9 kg/m^2), excess weight (when BMI is 25–30 kg/m^2) and obesity (when BMI≥30 kg/m^2).
- **CVD:** The presence of one or more of the following; heart failure, history of stroke/transient ischaemic attack, history of myocardial infarction/ischaemic heart disease, history of peripheral arterial disease.

Data processing

Intensive on-site training was organised for data collectors, including their performance evaluation to ensure data consistency. Before being exported to STATA V.16.00 for analysis, the data were: checked for completeness, edited, coded and entered into Epi Data V.3.1. After cleaning the data for inconsistencies and missing values, descriptive statistics such as mean, frequency and percentage were calculated, and the data were presented as text and tables. Assumptions for χ^2 were checked and there was no violated assumption. A bivariate analysis was performed and all explanatory variables that were associated with the outcome variable at a value of p<0.25 in the bivariate analysis and biologically plausible were included in the multivariable analysis model. Then, a multivariable

analysis was conducted using backward logistic regression (LR) to determine associated factors. The OR, with its 95% CI, was used to decide whether those independent variables included in the multivariable analysis were statistically significant or not.

RESULTS

Sociodemographic characteristics of study participants

A total of 365 participants was included in the study, with a response rate of 97.9%. The mean age was 51.42 (±14.06) years. The majority of the respondents was female (55.34%), aged under 50 years (52.33%), living in an urban area (64.66%) and married (92.88%) (table 1)

Clinical and individual-related characteristics

Of the study participants, 23.29% (95% CI 19.00 to 27.76) had MSDs. Almost all the participants were non-smokers and non-drinkers. A third of the participants had chronic diseases, including cardiovascular disease (CVD), but only a quarter of them had CVD. The majority of the participants were patients with type 2 diabetes (91.51%), on an oral hypoglycaemic drug (76.03%), had not developed a diabetic complication (92.05%), were not involved in physical activities (87.09%) and were overweight (53%) (table 2).

The glycaemic control of the study participants was poor, with a mean±SD of 157.33±35.73 mg/dL and only 20.7% (87) of the study participants had good glycaemic control (fasting blood sugar <126 mg/dL). The average duration of DM was 5.62±5.08 years, which was low. The particpants' mean total cholesterol, high-density lipoprotein and triglyceride levels were 179.91 (± 4.59), 42.77 (± 0.023) and 209.05 (± 4.35), respectively. Also, the mean duration of a patient with DM and the level of average fasting blood glucose were 5.62 (± 0.27) years and 157.33 (± 1.87) years, respectively (table 3).

Factors associated with MSDs

Binary logistic regression was done to identify which variables are associated with MSDs in patients with diabetes. The variables sex, residency, occupation, levels of education, age, and waist to hip circumferences were significantly associated with MSDs in patients with DM. Independent variables with p≤0.25, significant in previous studies, and based on the context, were included in the multivariable analysis. The variables sex, age, residence, educational status and cardiovascular diseases (CVD) were significantly associated in multivariable regression analysis (p=0.05) (table 4).

The likelihood of developing MSDs was 6.8 times higher among women than men (AOR=6.787, 95% CI 2.08 to 22.19). Rural participants were about 2.4 times (AOR=2.38, 95% CI 1.06 to 5.33) more likely to develop MSDs as compared with urban ones. Participants aged >50 years were 5.9 times more likely to develop MSDs as compared with those aged ≤50 years (AOR=5.864, 95% CI 2.663 to 12.914). The odds of developing MSDs were 6.2 times (AOR=6.247, 95% CI 1.158 to 33.702) and 5.5 times (AOR=5.451, 95% CI 1.174 to 25.312) higher among participants who attended primary and secondary school, respectively, than among those who attended college and above. Participants with CVD were 3.9 times more likely to develop MSDs compared with their counterparts (AOR=3.854, 95% CI 1.843 to 8.063) (table 4).

DISCUSSION

MSDs in DM have been ignored and poorly treated as compared with acute and microscopic complications of DM.[11]

Our study reveals the following important findings:

1. Hypertension is the the most common concomitant disease (24.38%), which is in line with a study done in Tikur Anbessa Hospital[5]

Table 3 Clinical and individual-related characteristics of patients with diabetes attending chronic care at Arba Minch Hospital, southern Ethiopia, 2021

						95% CI	
Variable	Min	Max	Mean	SE	SD	Lower	Upper
Total cholesterol	53	531	179.91	4.59	86.17	170.89	188.93
High-density lipoprotein	30	58	42.77	0.23	4.35	42.32	43.23
Triglyceride level	11	546	209.05	4.35	81.75	200.49	217.61
Age	18	99	51.42	0.74	14.06	49.98	52.87
DM duration	0.2	23.0	5.62	0.27	5.08	5.10	6.14
Weight	7.0	123.0	68.43	0.64	12.18	67.18	69.69
Height	1.4	101.0	2.29	0.34	6.43	1.63	2.96
Waist circumference	53	126	87.30	0.45	8.42	86.41	88.19
Hip circumference	63	120	93.21	0.39	7.28	92.44	93.97
Fasting blood glucose	84.67	275.00	157.33	1.87	35.73	153.65	161.01

DM, diabetes mellitus.

Table 4 Factors associated with musculoskeletal disorders among patients with diabetes attending chronic care at Arba Minch Hospital, southern Ethiopia, 2021

Musculoskeletal disorders				
Variables	**No n^{o} (%)**	**Yes n^{o} (%)**	**COR (95% CI)**	**AOR (95% CI)**
Sex				
Female	139 (68.81)	63 (31.19)	2.905 (1.69 to 4.98)	7.08 to 22.19)
Male	141 (86.50)	22 (13.50)	1	1
Age in years				
<50 years	163 (85.34)	28 (14.66)	1	1
≥50 years	117 (67.24)	57 (32.76)	2.84 (1.70 to 4.73)	5.86 (2.66 to 12.91)
Residency				
Rural	93 (72.09)	36 (27.91)	1.48 (0.89 to 2.43)	2.38 (1.06 to 5.33)
Urban	187 (79.24)	49 (20.76)	1	1
Education				
Unable to read and write	11 (78.57)	3 (21.43)	2.46(.56 to 10.68)	0.47(.022 to 10.09)
Able to read and write	70 (66.67)	35 (33.33)	4.5 (1.95 to 10.38)	4.21 (0.71 to 24.87)
Primary education	73 (74.49)	25 (25.51)	3.08 (1.30 to 7.28)	6.25 (1.16 to 3.70)
Secondary school	54 (79.41)	14 (20.59)	2.33 (0.91 to 5.96)	5.45 (1.17 to 5.31)
College and above	72 (90.00)	8 (10.00)	1	1
Cardiovascular disease				
No	198 (81.15)	46 (18.85)	1	1
Yes	52 (62.65)	31 (37.35)	2.57 (1.48 to 4.44)	3.85 (1.84 to 8.06)

AOR (95% CI), adjusted OR at 95% CI; COR (95% CI), crude OR at 95% CI.

2. The overall average fasting blood sugar value was 157.38 mg/dL, which is high and shows poor glycaemic control.
3. The prevalence of MSDs was 23.29%.
4. A statistically significant association was observed between clinically manifesting MSDs and female sex, increasing age, residency, education and CVDs.

DM affects connective tissues in many ways, which leads to different alterations in skeletal and articular systems. It is associated with many musculoskeletal manifestations, most of which are not clinical and correlated with disease duration and inadequate control.[17] These complications are often found, and, although less valued than the vascular ones, they significantly compromise the patients' quality of life.[2] Epidemiological studies have identified several personal, occupational and psychosocial factors related to MSDs.[17] The exact pathophysiology of most of these MSDs remains unclear. However, connective tissue disorders, neuropathy or vasculopathy may have a synergistic effect on the increased incidence of MSDs in patients with diabetes.[17]

Many studies have evaluated musculoskeletal manifestations in patients with diabetes, but most assessed only an individual component, especially musculoskeletal involvement of the upper extremity while few studies have evaluated the entire musculoskeletal system, including the limbs and back. In this study, the magnitude of MSD in people with DM was 23.29%. This is higher than in the studies in Saudi Arabia[6] but lower than in studies conducted in Jordan, Nigeria, Morocco and central Ethiopia.[1 3 5 9 10] This difference is probably due to differences in mean diabetes duration, glycaemic control and geographical difference.[4 5 18] The lower prevalence of MSDs in our study can be explained by better glycaemic control and patient care and decreased manual work in developing countries over time.

MSD conditions were more common in type 2 DM subjects than in type 1 subjects (23.35 vs 22.58) which is in line with studies in Morocco, Egypt and Ethiopia.[9 11 19] It is believed that this may be explained by the propensity of subjects with type 2 diabetes to develop MSD as a result of obesity, reduced physical activity, older age, dyslipidaemia and hyperuricemia.[10]

Participants aged >50 years were 5.9 times more likely to develop MSDs as compared with those aged ≤50 years, which is in line with studies conducted in India and Iran.[4 9] The fact that as age increases, the number of tendon cells decreases, protein synthesis in the organelles, connective tissue elasticity decreases, and joints and tendon sheaths become stiffer, which predisposes older people to MSDs.[3] Women were involved for a long time, doing heavy manual work at home. This is supported by our findings that the likelihood of developing MSDs was 6.8 times higher among women than men. This is similar to studies conducted in India, Iran and central Ethiopia.[4 5 18]

Rural participants were about 2.4 times more likely to develop MSDs as compared with urban ones. This may be attributed to more manual labour work for rural residents than urban residents since occupations that involved manual labour increased the risk of hand complications in our patients.[20 21]

The odds of developing MSDs were 6.2 and 5.5 times higher among participants who attended primary and secondary education as compared with those who attended college and above, respectively. This may be because literacy affects health-seeking behaviour[22 23] since healthcare-seeking behaviour affects glycaemic control and adherence to diabetic management modalities, which are important in planning diabetes care and management that minimises complications. Poor and delayed healthcare-seeking behaviour leads to delayed diagnosis and treatment, and poor health outcomes.[24 25] A study also indicated that education and income are factors for diabetic knowledge, which is important in health service utilisation, diabetes management and avoidance of complications.[26] Participants with CVD were 3.9 times more likely to develop MSDs compared with their counterparts. This is similar to other studies that showed that MSDs are associated with CVD. This may be attributable to the micro complications and macro complications of DM which are associated with MSDs.[13 27]

The most important predictor of MSD complications in people living with diabetes is blood glucose control.[28] In this study, there was no association between blood glucose control and MSDs. It may be because we only measured the mean fasting blood glucose and not the HbA1c level. This may also be explained by the fact that cumulative hyperglycaemia is required to produce changes, while a single cross-sectional fasting blood glucose estimate only represents the glycaemic control over the previous 3 months. This is consistent with the findings of studies in Tikur Anbesa, Addis Abeba and Iran[5 18] but it contradicts the findings of studies in northern India,[4 29] and the UK, which found a strong association between MSDs and poor blood glucose control.[28]

Limitation of the study

We used fasting blood sugar for determination of glycaemic control because HbA1c is not easily accessible in our setting and because of resource limitations. HbA1c is a better indicator of glycaemic control in patients with diabetes than fasting blood sugar. Cumulative hyperglycaemia is required to produce musculoskeletal and soft tissue changes. Even a single HbA1c level does not correlate with tissue levels of advanced glycosylation end products which are important pathological changes for the development of musculoskeletal disease. Vascular complications are another important predisposing factor for MSDs, but we did not include them in our study because there is only a limited number of vascular evaluations and investigations that can be performed in our hospital. Musculoskeletal diseases had a clear association with microvascular complications. Both musculoskeletal diseases and microvascular complications usually occur in patients with poorly controlled and long-term diabetes. The assessment of MSDs was based on medical records and self-reports. We failed to do some confirmatory workups.

CONCLUSION

The prevalence of MSDs among patients with diabetes was 23.29%, and it showed that age, sex, educational status, place of residence and CVD were found to be determinants of MSDs. Thus, clinical and public health interventions working on DM should consider these determinants.

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Contributors GA contributed to the design and implementation of the research, acquisition, analysis, and interpretation of data for the study and to the writing of the manuscript. GA is responsible for the overall content as the guarantor. TH contributed to the implementation and supervision of the research, and critically revised the manuscript TFG contributed to the design and implementation of the research, to the analysis of the results and to the revision of the manuscript. AG, RT, TS, EK, FD, KA, WW, AB contributed to the implementation of the research, to the analysis of the results and to the revision of the manuscript. All authors read and approved the final manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the Institutional Review Board of College of Medicine and Health Sciences, Arba Minch University (letter number IRB/1040/20). Participants gave informed consent to participate in the study before taking part.

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REFERENCES

1 Mustafa KN, Khader YS, Bsoul AK, *et al*. Musculoskeletal disorders of the hand in type 2 diabetes mellitus: prevalence and its associated factors. *Int J Rheum Dis* 2016;19:730–5.
2 Merashli M, Chowdhury TA, Jawad ASM. Musculoskeletal manifestations of diabetes mellitus. *QJM* 2015;108:853–7.
3 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.
4 Agrawal RP, Gothwal S, Tantia P, *et al*. Prevalence of Rheumatological manifestations in diabetic population from north-west India. *J Assoc Physicians India* 2014;62:788–92.
5 Wamisho BL, Feleke Y. Epidemiology and clinical profile of common musculoskeletal diseases in patients with diabetes mellitus at Tikur Anbessa specialized hospital in Addis Ababa, Ethiopia. *East Cent Afr J Surg* 2017;22:49–62.
6 Attar SM. Musculoskeletal manifestations in diabetic patients at a tertiary center. *Libyan J Med* 2012;7. doi:10.3402/ljm.v7i0.19162. [Epub ahead of print: 29 10 2012].
7 Ravindran Rajendran S, Bhansali A, Walia R, *et al*. Prevalence and pattern of hand soft-tissue changes in type 2 diabetes mellitus. *Diabetes Metab* 2011;37:312–7.
8 Bhat TA, Dhar SA, Dar TA. The musculoskeletal manifestations of type 2 diabetes mellitus in a Kashmiri population. *Int J Health Sci* 2016;10:55–66.
9 Majjad A, Errahali Y, Toufik H, *et al*. Musculoskeletal disorders in patients with diabetes mellitus: a cross-sectional study. *Int J Rheumatol* 2018;2018:1–6.
10 Olaosebikan H, Azenabor A, Akintayo R, *et al*. Spectrum of musculoskeletal disorders in Nigerians with types 2 diabetes mellitus: prevalence and predictors. *Reumatismo* 2019;71:209–17.
11 Fasika S, Abebe SM, Kebede AG. The prevalence of shoulder and hand complications and associated factors among diabetic patients at University of Gondar teaching referral hospital in Northwest Ethiopia. *J Diab Res Clin Met* 2013;2:8–14.
12 Rota E, Morelli N. Entrapment neuropathies in diabetes mellitus. *World J Diabetes* 2016;7:342.
13 Sözen T, Başaran Nursel Çalık, Tınazlı M, *et al*. Musculoskeletal problems in diabetes mellitus. *Eur J Rheumatol* 2018;5:258–65.
14 Williams N. The short musculoskeletal function assessment (SMFA) questionnaire. *Occup Med* 2016;66:757.
15 Wang Y, He Z, Lei L, *et al*. Reliability and validity of the Chinese version of the short musculoskeletal function assessment questionnaire in patients with skeletal muscle injury of the upper or lower extremities. *BMC Musculoskelet Disord* 2015;16:1–10.
16 Swiontkowski MF, Engelberg R, Martin DP, *et al*. Short musculoskeletal function assessment questionnaire: validity, reliability, and responsiveness. *Orthopedic Trauma Directions* 2005;3:29–34.
17 Singla R, Dutta D, Sharma M. *Musculoskeletal complications of diabetes mellitus*. The Diabetes Textbook: Springer, 2019: 873–81.
18 Kiani J, Goharifar H, Moghimbeigi A, *et al*. Prevalence and risk factors of five most common upper extremity disorders in diabetics. *J Res Health Sci* 2014;14:93–6.
19 Youssef AA, Shabana AA, Senna MK. Study of musculoskeletal disorders in a cohort of Egyptian diabetic patients and its relation to glycemic control. *Tanta Medical Journal* 2016;44:151.
20 Dale AM, Gardner BT, Zeringue A, *et al*. Self-Reported physical work exposures and incident carpal tunnel syndrome. *Am J Ind Med* 2014;57:1246–54.
21 Harris-Adamson C, Eisen EA, Kapellusch J, *et al*. Biomechanical risk factors for carpal tunnel syndrome: a pooled study of 2474 workers. *Occup Environ Med* 2015;72:33–41.
22 Latunji OO, Akinyemi OO. Factors influencing health-seeking behaviour among civil servants in Ibadan, Nigeria. *Ann Ib Postgrad Med* 2018;16:52–60.
23 Hussain R, Rashidian A, Hafeez A, *et al*. Factors influencing healthcare seeking behaviour at primary healthcare level, in Pakistan. *J Ayub Med Coll Abbottabad* 2019;31:201–6.
24 Shariful Islam SM, Lechner A, Ferrari U, *et al*. Healthcare use and expenditure for diabetes in Bangladesh. *BMJ Glob Health* 2017;2:e000033.
25 Islam SMS, Uddin R, Zaman SB, *et al*. Healthcare seeking behavior and glycemic control in patients with type 2 diabetes attending a tertiary hospital. *Int J Diabetes Dev Ctries* 2021;41:280–7.
26 Siddique MKB, Islam SMS, Banik PC, *et al*. Diabetes knowledge and utilization of healthcare services among patients with type 2 diabetes mellitus in Dhaka, Bangladesh. *BMC Health Serv Res* 2017;17:586.
27 Pandey A, Usman K, Reddy H, *et al*. Prevalence of hand disorders in type 2 diabetes mellitus and its correlation with microvascular complications. *Ann Med Health Sci Res* 2013;3:349–54.
28 Zreik NH, Malik RA, Charalambous CP. Adhesive capsulitis of the shoulder and diabetes: a meta-analysis of prevalence. *Muscles Ligaments Tendons J* 2016;6:26.
29 Kiani J, Goharifar H, Moghimbeigi A, Javad K, Hamid G, Abbas M, *et al*. Prevalence and risk factors of five most common upper extremity disorders in diabetics. *J Res Health Sci* 2014;14:92-5.