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Original Research Article

The study of musculoskeletal symptoms in diabetic patients with Nordic questionnaire

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ABSTRACT

Background: A variety of musculoskeletal conditions have been associated with diabetes mellitus which involves multiple joints affecting activities of daily living. It warrants screening of such symptoms in patients with diabetes mellitus in routine health checkup and to address such complaints. Using a simple questionnaire such as Nordic questionnaire which can aid in studying presence or absence of musculoskeletal symptoms in diabetic patients and to know the frequently involved joint.
Methods: Cross sectional data of 156 adults with type 2 diabetes mellitus attending tertiary hospital were examined. The patient's demographic details were collected. Musculoskeletal pain was assessed using Nordic questionnaire. Multiple logistic regressions were used to examine risk associated with musculoskeletal pain.
Results: The study showed that prevalence of musculoskeletal pain was 64.1%. The participants mean age was 50.57 years. The study group contained 48.7 % females and 51.3% males. The mean BMI was 27.56kg/m^2 with mean HBA1c of 9.29%. 26% of the study population had significant discomfort in last 7 days which was interfering with their work. Majority of them (73%) had suffered shoulder pain. Presence Of musculoskeletal symptoms showed association with HbA1c, BMI, and waist circumference. There was no association between joint pains with respect to years of job
Conclusions: Musculoskeletal symptoms are frequent in diabetic patients. Addressing such complaints is important to screen pathology related to joint and surrounding soft tissue on routine check-up, thus preventing future complication which may result in disability by using simple Nordic questionnaire.

Keywords: Diabetes mellitus, Musculoskeletal pain, BMI, Waist circumferance, HbA1c

INTRODUCTION

Prevalence of diabetes has been gradually increasing during last few decades. International diabetes federation says 537 million adults have diabetes. The total number is projected to rise to 643million by 2030.[1] A group of common metabolic disorders with the phenotype of hyperglycemia are referred to as diabetes mellitus. Although prevalence of both type 1 and type 2 DM is increasing worldwide, the prevalence of type 2 DM is rising much more rapidly, due to rising obesity rates, declining activity levels as nations industrialize, and aging of the population. Musculoskeletal disorder can be either secondary to systemic illness or focal pathologic syndromes which includes muscles, tendons, ligaments or joints. These disorders are extremely common in patients who visit to OPD. A variety of musculoskeletal conditions have been associated with diabetes mellitus including several disorders affecting; Hand: Carpel tunnel syndrome, Dupuytren's contracture, Flexor tenosynovitis, Diabetic sclerodactyly, Limited joint mobility. Shoulder: Adhesive capsulitis, Rotator cuff tendinopathy, calcific

tendinopathy, Limited joint mobility. Lower limb: Neuropathic arthropathy, diabetic muscle infarction, Osteoarthritis of knee. Spine: Diffuse idiopathic skeletal hyperostosis. People with type2 Diabetes are more prone to develop a rheumatological and musculoskeletal symptoms and experience both chronic and widespread pain, compared with general population.[2] These musculoskeletal problems are important to recognize because of their impact on quality of life, particularly as many respond to treatment, helping to prevent pain and disability.[3] Previous studies have indicated that the causes of increased musculoskeletal pain in people with diabetes may probably be related to vascular insufficiency, neuropathy, decreased insulin-like growth factor 1, accelerated osteoporosis, obesity, sedentary lifestyle and other factors.[4-8] Nordic musculoskeletal questionnaire can serve as an inexpensive instrument for the identification and assessment of musculoskeletal and rheumatological symptoms in diabetics. This simple, general questionnaire, recognized internationally, detects symptoms in specific body parts which can be applicable in large population and helps in relatively quick identification of symptoms which is commonly used to find out musculoskeletal symptoms in ergonomic or occupational health context. Diabetic patients undergo screening for vascular complications with fundoscopy, serum creatinine, ECG. Musculoskeletal symptoms are seen as a separate entity in these patients on routine practice. In this study we are trying to find out if there is association between musculoskeletal symptoms and diabetes.

METHODS

This is a cross sectional study conducted in KR hospital Mysore on all the diabetic patients who are aged 18 or older attending OPD and also who were admitted. Sample size calculated using the formula

$$n = z2\,\sigma 2/d2$$

In above formulae with 95% confidence interval and 5% level of significance of (Standard Deviation) = 35.95 and absolute allowable error of 7%, the sample size was calculated as 156. Patients who were interested in participating in study and who met the inclusion criteria were given Nordic questionnaire to seek basic information like demographic details, Anthropometry, Years of job. Diabetic patients with preexisting physical disability and History of physical trauma were excluded from study. Data collected from July 1st to October 31st 2022. Demographic details such as age, gender, type of job, duration of job were obtained. Height, weight, BMI were measured. The standardized Nordic questionnaire was used to assess the presence of musculoskeletal pain in 9 major body regions (neck, shoulder, upper back, lower back, elbow, wrist, thighs, knees and ankles) in the 7 days and 12 months before the study.[9] Presence of musculoskeletal pain in at least one body region was categorized as (Yes Pain: 1) and no pain in anybody region was categorized as 0 (No pain: 0). The dichotomous variables (yes pain: 1, no pain: 0) was used to estimate point prevalence. Ethical protocols of the declaration of Helsinki (1967) including the ethical principles of informed consent, voluntary participation and withdrawal, privacy and confidentiality, were followed.

Data analysis and statistics

Descriptive statistical techniques in the form of tables, charts and percentages were used to present the prevalence and patterns of musculoskeletal pain in the last 12months. Inferential statistics of Chi-square (χ^2) test for independence was used in finding association between the participants characteristics such as age, sex, duration of work, BMI, waist circumference, HbA1c levels and presence of musculoskeletal pain (1=yes; 0=no). Multivariate logistic regression method was used in determining the contribution of each of age, sex, BMI, waist circumference, HbA1c, years of job to the presence of musculoskeletal pain. Statistical Package for Social Science version 20 was used to analyze the data and significance was set at 5%.

RESULTS

Characteristics of the study population

Total of 156 adults with type 2 diabetes mellitus. The age of participants were ranging between 41 and 60 years with mean age of 50.57 years were examined.

Table 1: Personal characteristics of study participants.

Parameters	N	%
Age groups		
Less than 45	11	7.05
45 to 55	113	72.45
Above 45	32	20.5
Gender		
Females	76	48.7
Males	80	51.2
Height	156	154.8
Weight	156	66
BMI		
Healthy	44	28.2
Obese	45	28.8
Over weight	67	42.9
HbA1C		
<9	63	40.4
9 to 12	84	53.8
>12	9	5.8
Years of job		
<5	2	1.3
5 to 15	89	57.1
>15	65	41.7
Waist circumference		
Males <80	30	19.2
Females <90	36	23.1
Females ≥90	44	28.2

Study contained almost same proportion of males (51.2%) and females (48.7%). On an average the participants had mean BMI of 27.56kg/m^2. Mean waist circumference was 90.77cms, mean HbA1c was 9.29%.

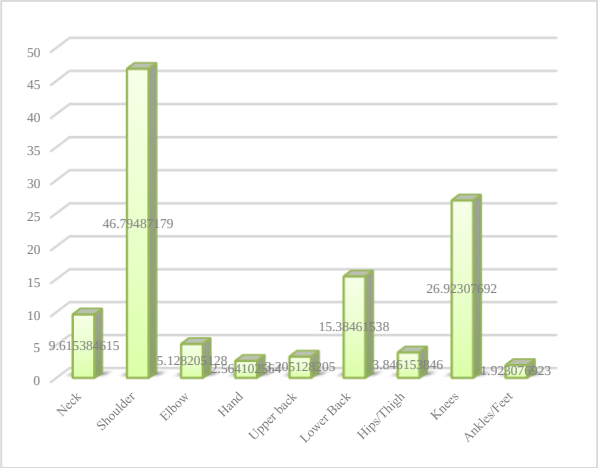

Figure 1: Prevalence of joints involved in diabetes.

Prevalence and pattern of musculoskeletal pain

The overall prevalence of musculoskeletal pain was 64.1%, similar in men and women. Most occurrence of musculoskeletal pain was found in shoulder, knee and low back and it was least in hip, elbow and ankle. The prevalence of shoulder symptom was 46.79%. There was significance association between shoulder pain with BMI (p<0.005), HbA1c (p=0.001) and waist circumference (p<0.005). 26.9% experienced knee pain and majority of them had BMI more than 30kg/m^2. Low back pain were reported by 15.38% of them, all of them having waist circumference more than 100 cm.

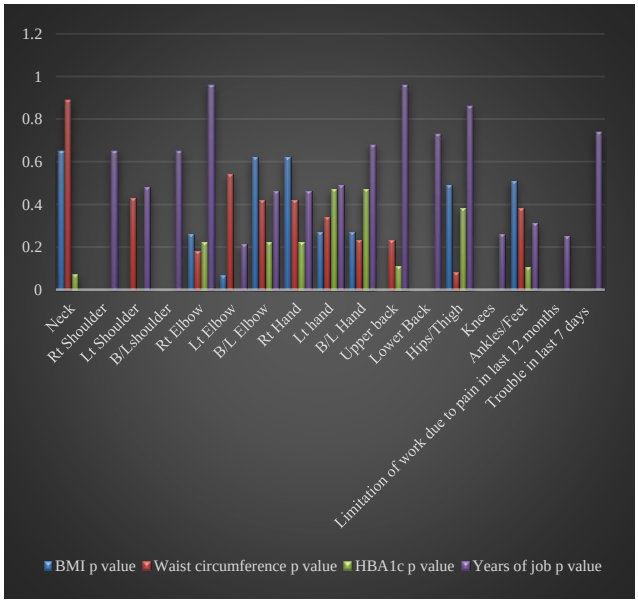

Figure 2: Correlation of individual joint pain with BMI, Waist circumference, HBA1c, Years of job.

Risk factors for musculoskeletal pain

Chi-square test ($\chi 2$) of independence indicated a significant association between musculoskeletal pain status and BMI ($\chi 2$ =88.87, p=0.001), and waist circumference ($\chi 2$=68.82, p=0.001), and HbA1c ($\chi 2$ =86.9, p=0.001), significant correlation with limitation of work due to pain in last 12 months.

Table 2: Correlation between musculoskeletal pains in individual joints with BMI, Waist circumference, HbA1c, Years of job.

Parameters	BMI		Waist circumference		HBA1c		Years of job	
	$\chi 2$	P value	$\chi 2$	P value	$\chi 2$	P value	$\chi 2$	P value
Neck	0.84	0.65	0.6	0.89	5.13	0.07	23.23	0.001
Rt Shoulder	11.99	0.002	9.96	0.019	25.5	0.001	0.86	0.65
Lt Shoulder	7.7	0.021	2.72	0.43	18.98	0.001	1.46	0.48
B/L shoulder	11.99	0.002	11.64	0.009	25.51	0.001	0.86	0.65
Rt Elbow	2.69	0.26	4.84	0.18	2.99	0.22	0.07	0.96
Lt Elbow	5.45	0.065	2.12	0.54	6.06	0.048	3.09	0.21
B/L Elbow	0.94	0.62	2.8	0.42	2.99	0.22	1.52	0.46
Rt Hand	0.94	0.62	2.8	0.42	2.99	0.22	1.52	0.46
Lt hand	2.56	0.27	3.35	0.34	1.48	0.47	1.4	0.49
B/L Hand	2.56	0.27	4.22	0.23	1.48	0.47	0.75	0.68
Upper back	12.74	0.002	4.23	0.23	4.42	0.109	0.07	0.96
Lower Back	69.96	0.001	24.4	0.001	21.87	0.001	0.62	0.73
Hips/Thigh	1.39	0.49	6.59	0.08	1.91	0.38	0.28	0.86
Knees	141.76	0.001	54.7	0.001	54.1	0.001	2.62	0.26
Ankles/Feet	1.31	0.51	3.02	0.38	4.51	0.105	2.3	0.31
Limitation of work due to pain in last 12 months	70.6	0.001	51.88	0.001	129.3	0.001	2.76	0.25
Trouble in last 7 days	76.96	0.001	31.83	0.001	26.7	0.001	0.58	0.74

DISCUSSION

The purpose of the study was to find out the prevalence of musculoskeletal pain in diabetic patients coming to KR hospital, Mysuru. The study found that prevalence of musculoskeletal pain in study population was 64.1% and proportionately similar between males and females which is higher as compared to study conducted by Muluneh et al which was 24%, as majority of the study population had uncontrolled sugar and high BMI. Prevalence was similar to Adedapo et al which had a prevalence of musculoskeletal pain of 72.7%. The primary joints involved were shoulder, knee and lumbosacral joint. Study conducted by Carvalho-e-Silva et al showed involvement of shoulder, knee and hip pain similar to this study.[10-12] Abaraogu et al showed individulas with T2DM are 29 times at risk of chronic musculoskeletal pain of the upper back and knee compared to healthy cohorts. In this study there was no control group.[13] The prevalence of upper limb involvement among diabetes in the study conducted by Ramchurn et al had mean HbA1c (9.1%) was significantly on higher side in patients with combined shoulder and hand problems which was comparable to this study where majority of patients had HbA1c of more than 9 (56%).[14] Study conducted by Kumar et al in Indian population showed significant involvement of rhematological manifestation in diabetic patients (53.33%) where high BMI and HbA1c levels were associated with higher odds of having rheumatological manifestation of diabetic study subject which is similar to this study.[15]

Advanced glycation end products (AGEs) accumulation and their crosslinking of collagen may contribute to the development of such complications, including adhesive capsulitis, tendon degeneration in the rotator cuff, and diabetes related hand disorders.[16] The accumulation of AGEs could also potentially affect tendon strength and repair and play a role in micro vascular complications and inflammation.[17] The most consistent and strongest association between musculoskeletal pain and diabetes were observed among those suffering from shoulder pain, which supports previous studies.[13] Although the exact causes of the link between neck/shoulder pain and type 2 diabetes are unclear, obesity may play a role because it has both biomechanical and biochemical (metabolic) effects on the musculoskeletal system that frequently result in pain. Because they may bear less weight (head only), the neck and shoulder anatomic sites are different from the other sites examined in our study and may therefore be less impacted by the biomechanical effects of obesity. However, it would be expected that the neck and shoulder would be impacted by the metabolic effects of obesity, which include ectopic fat deposition in muscle and may cause muscle weakness and pain.

This is similar to the other anatomical pain sites investigated here.[12] Diabetes mellitus causes alterations in peri-articular system, skeletal systems and connective tissues in a variety of ways. Numerous subclinical musculoskeletal symptoms of diabetes mellitus are linked to the disease's duration and ineffective management, and they are all related to these factors.[18] Although less regarded than vascular problems, these issues are frequently encountered and they seriously impair the patient's quality of life.[19] Degenerative changes affect tendons and ligaments as they age. These changes include a reduction in the number of tendon cells per unit of surface area, slenderization of the tenocytes, and a decrease in protein synthesis in the organelles, notably in the rough endoplasmic reticulum.[20] Numerous personal, professional, and psychosocial characteristics connected to musculoskeletal illnesses have been found through epidemiologic research.[21] However, neuropathy,disorders of connective tissue or vasculopathy may have a synergistic influence on the increased incidence of musculoskeletal disorders in DM, even if the precise pathophysiology of the majority of these musculoskeletal illnesses is yet unknown.[22]

Limitations

As study was not a case control study, attributable risk for musculosketal pain cannot be determined. Since it’s a hospital-based study, the prevalence of musculoskeletal pain as a symptom maybe exaggerated. The questionnaire did not allow identification of any specific cause of pain and also did not collect medication history which may affect pain. Follow-up investigation like radiograph was not done to find out pathology behind pain

CONCLUSION

Musculoskeletal symptoms are frequent in diabetic patients. Addressing such complaints is important to screen pathology related to joint and surrounding soft tissue on routine check-up, thus preventing future complication which may result in disability by using simple Nordic questionnaire.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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