

## The comparison of frequency of the upper limb musculoskeletal disorders among patients with diabetes type II with normal cases

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### Abstract

**Background and aim:** Musculoskeletal disease, that is recognized in diabetes and diabetes mellitus (DM) has shown a higher prevalence of chronic musculoskeletal complications. This study aimed at assessing the frequency of upper limb musculoskeletal disorders among patients with diabetes type II with normal cases in Mashhad, Iran.

**Methods:** A cross-section of 100 patients with upper limb musculoskeletal disorders were enrolled in this study. The patients were examined by a unique physician considering carpal tunnel syndrome disorder, trigger finger, adhesive capsulitis, and Dupuytren's contracture at Ghaem hospital, Mashhad, Iran in 2015. All collected data were recorded by using SPSS version 21 and were analyzed through independent-samples t-test for comparing changes, and Chi-square.

**Results:** In this study, the mean age was  $51.7 \pm 8.7$  years old. Gender frequency was 114 (57%) male, and 86 (43%) female. There was no significant difference between groups in cases of gender frequency and mean of age ( $p > 0.05$ ). In evaluation of association between the two groups, there was significant difference for adhesive capsulitis, ( $p = 0.04$ ). Chi-square test showed significant association for age and adhesive capsulitis between the two groups, ( $p = 0.040$ ); but no other diabetes-related disorders, ( $p < 0.05$ ).

**Conclusion:** The results of this study showed that in patients with diabetes mellitus and musculoskeletal complications such as upper limb musculoskeletal abnormalities, it will lead to an increase in skeletal muscle effects in DM patients. It is recommended that musculoskeletal examination is done periodically in DM patients for identification of these disorders and necessary actions are carried out for prevention of the disorders as soon as possible.

**Keywords:** Diabetes type II, Musculoskeletal disorders, Upper limb

### 1. Introduction

Diabetes mellitus (DM), as an outstanding metabolic problem, is considered as an epidemic in the modern world and the majority of its morbidity and mortality is related to micro and macro vascular complications (1-3). The inability of insulin to control the blood glucose level leads to a chronic condition known as "Diabetes Mellitus" or hyperglycemia (4). Based on existing figures, more than 360 million people will have diabetes mellitus by 2030 (5-7). It is expected that the Middle East will undergo one of the world's greatest increases in the absolute burden of diabetes in the impending decades (8). Current tendencies show that the prevalence of type 2 DM ranges from 4.6% to 40% in the Middle East, 1.2% to 14.6% in Asia, and from 1.3% to 14.5% in Iran (9, 10). Today prevalence of

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MD is 6% of the population in the age group of 20-75 years about 2,565,500 in Iran; anticipation is increasing and is expected to reach 5,114,900 in 2025 (11). The increasing incidence of musculoskeletal disease, which is a common cause of disability in diabetes sufferers has been documented. It predominantly affects the upper limbs, particularly the shoulders and hands. Its relationship with other complications of diabetes and glycemic control is yet undefined (12, 13). Several personal, occupational and psychosocial factors related to upper-extremity musculoskeletal disorders have been identified through epidemiologic studies (14). These factors are attendant in the presence of DM and so, increase the occurrence of shoulder and hand problems in the diabetic population. For most of these musculoskeletal disorders, the exact pathophysiology remains obscure. However, connective tissue disorders, neuropathy or vasculopathy could have a synergistic effect on the increased prevalence of musculoskeletal disorders in diabetes mellitus (15). Osteomuscular changes in diabetic patients have been described as follows: muscular infarction; shoulder capsulitis; calcific periarthritis shoulder; carpal tunnel syndrome; stiff hand syndrome; Dupuytren's contracture; trigger finger; diffuse idiopathic skeletal hyperostosis (DISH); and Charcot's arthropathy (16, 17). Youseef et al reported the prevalence rates of MSK manifestations in patients with types 1 and 2 DM as follows: carpal tunnel syndrome (5%), sclerodactyly (3%), Charcot joint (4%), limited joint mobility (6%), stenosing tenosynovitis (5%), shoulder capsulitis (10%), diffuse idiopathic skeletal hyperostosis (3%) and Dupuytren's contracture (1%) (18). In another study, Garcilzo et al. demonstrated that osteoarthritis is the most general rheumatic form of musculoskeletal disorder in patients with DM (19). Zamani et al., in their article, show carpal tunnel syndrome (49.8%), osteoarthritis (11.9%), sclerodactyly (27.2%), idiopathic skeletal hyperostosis (14.1 %), trigger finger (11.9) and adhesive capsulitis (11.9) in patients with types 1 and 2 DM in Iran (20). Evidence on musculoskeletal disorders for DM among the Iranian population is limited at present. On the other hand, most studies published in Iran have shown a statistically significant increase in musculoskeletal disorder in DM patients. But there are no collective data, and no systematic review has been performed yet. This study was aimed to assess the frequency of the upper limb musculoskeletal disorders among patients with diabetes type II with normal cases in Mashhad, Iran.

## **2. Material and Methods**

### ***2.1. Design, participants and selection criteria***

In a cross-sectional analytical study among people referred for diabetes checkup at the Persian Diabetes Center, 100 patients were examined by a single physician considering carpal tunnel syndrome disorder, trigger finger, adhesive capsulitis, and Dupuytren's contracture at Ghaem hospital, Mashhad, Iran in 2015. Patients were block-randomized and evenly separated into diabetic patients and healthy individuals as study and the control groups, respectively. All the subjects in both groups were screened by the appropriate laboratory, and examination tests and were assessed in terms of age, gender, and occupation. Inclusion criteria were type 2 diabetic patients who referred to the Persian Diabetes Center. Exclusion criteria were having a history of other metabolic diseases, surgery, trauma and fractures of the upper limb. Sample size was calculated as 100 in accordance with the study of Douloumpakas (21), and by considering 99% of accuracy coefficient and 90% of test power. The sampling method we used was block-randomized and it was carried out through interview, physical examination, and by experiment.

### ***2.2. Data collection***

All included subjects were examined by a unique physician by considering carpal tunnel syndrome disorder, trigger finger, adhesive capsulitis, and Dupuytren's contracture. Informed consent was read and signed by all cases. Carpal tunnel syndrome was diagnosed based on clinical symptoms such as pain and sensory disturbances in the thumb, index finger, middle and the outer half of the ring finger. Phalen's test was positive and it was confirmed by electromyography (EMG) and nerve conduction velocity (NCV). To identify the adhesive capsulitis, diagnostic key was the restriction on passive movements of the shoulder joint in all directions, especially rotational movements. Dupuytren's contracture and trigger finger were the diagnostic clinical symptoms by exposure to physical stressors that were quantized for each object by a team of experienced ergonomic analysts. If there was doubt in diagnosis of these symptoms, patients were referred to a rheumatologist at the clinic in Ghaem hospital.

### ***2.3. Data analysis***

All collected data were recorded by using IBM© SPSS© Statistics version 21 (IBM© Corp., Armonk, NY, USA). To assess descriptive statistics, indices such as frequency and relative frequency were used, and to illustrate the data, charts and tables, t-student test, and Chi-square test were used.

### ***2.4. Ethics of research***

Committee of Mashhad University of Medical Sciences (MUMS) approval was obtained.

### 3. Results

#### 3.1. Demographic data

The mean age was 51.7±8.7 years old and the maximum and minimum were 71 and 30 years old, respectively. Most cases (50%) were in the 50 to 59 years age group. Gender frequency was 114 (57%) male and 86 (43%) female; in the DM group, 75 (75%) cases were male and 25 (25%) were female, however, in the control group, 39 (39%) cases were male and 61 (61%) participants were female. There was no significant difference between groups in the case of gender frequency and mean of age ( $p>0.05$ ).

#### 3.2. Diabetes-related disorders

Carpal tunnel syndrome, trigger finger, adhesive capsulitis, and Dupuytren's contracture were evaluated between groups; 12 cases in the DM group and 4 cases in the control group showed carpal tunnel syndrome, the difference was shown as significant by Chi-square, ( $p=0.03$ ). Trigger finger was observed totally in eight persons; 5 cases in the DM group and 3 in the control group. No significant difference was observed between groups, ( $p=0.36$ ). Also, both groups were examined for Dupuytren's contracture disorder; only one case (2%) in the DM group and two (98%) cases were observed in the control group suffering from Dupuytren's contracture; Fisher's Exact Test showed that there was no significant difference, ( $p=0.5$ ). Adhesive capsulitis was seen in 17 cases; 13 persons in the DM group and 4 individuals in the control group. In evaluation of association between the two groups, there was significant difference for adhesive capsulitis, ( $p=0.02$ ) (Table 1).

**Table 1.** Comparison of musculoskeletal disorders between DM and control groups.

Disorder	Groups				p-value
	Diabetes mellitus		Control		
	Yes	No	Yes	No	
Carpal tunnel syndrome	12	88	4	96	0.033
Trigger finger	5	95	3	97	0.36
Dupuytren's contracture	1	99	2	98	0.5
Adhesive capsulitis	13	87	4	96	0.04

**Table 2.** The association between jobs in three situations (light, moderate and heavy) and carpal tunnel syndrome, Trigger finger, Dupuytren's contracture, and Adhesive capsulitis

Disorder	Outcome measure	Groups		p-value
		Control	Diabetes mellitus	
Carpal tunnel syndrome	Light	No	31	0.03
		Yes	0	
	Moderate	No	49	
		Yes	2	
	Heavy	No	16	
		Yes	2	
Trigger finger	Light	No	30	0.36
		Yes	1	
	Moderate	No	49	
		Yes	2	
	Heavy	No	18	
		Yes	18	
Dupuytren's contracture	Light	No	29	0.5
		Yes	2	
	Moderate	No	51	
		Yes	0	
	Heavy	No	18	
		Yes	18	
Adhesive capsulitis	Light	No	29	0.02
		Yes	2	
	Moderate	No	49	
		Yes	2	
	Heavy	No	18	
		Yes	0	

### **3.3. Frequency of disorders in terms of age, gender, and job**

According to the Chi-square test, there was no significant difference between control and DM groups for gender and diabetes-related disorders such as carpal tunnel syndrome trigger finger, and Dupuytren's contracture ( $p>0.05$ ). However, there was significant difference between the two groups in terms of gender and adhesive capsulitis, ( $p=0.040$ ). Based on Chi-square test findings, significant association was observed for age and adhesive capsulitis between the two groups, ( $p=0.040$ ); but no other diabetes-related disorders. We assessed the association between jobs in three situations (light, moderate and heavy) and carpal tunnel syndrome, trigger finger, Dupuytren's contracture, and adhesive capsulitis; only significant association was found between age and both carpal tunnel syndrome and Adhesive capsulitis (Table 2).

## **4. Discussion**

According to the present study, we reported that the prevalence of DM is higher in males than females in intervention groups. But another study reported that DM is higher in females than in males (22). Experts reported that women in Iran generally spend most of their time at home and do less physical activities. In some studies conducted in developed countries, there is an inverse relationship between prevalence of DM and gender (23); however, our results have shown there is no significant difference between prevalence of DM and gender. Present results showed a higher prevalence of adhesive capsulitis in diabetic patients than other musculoskeletal complications in the diabetic population, by 13 cases. Prevalence of adhesive capsulitis of the shoulder is five times greater in the diabetic population than it is in the general population, being identified in 10% to 29% of the diabetic population. It appears that in type 1 and type 2 DM, it can be bilateral and is more common in elderly people (24, 25). Zabihyeganeh and colleagues (2013) studied the frequency of upper limb musculoskeletal manifestations among 188 patients with type 2 diabetes (26); inconsistently, they reported Dupuytren's contracture as the highest prevalent disorder, and similarly Alzokm (2015) showed Dupuytren's contracture as the most frequent disorder (27). These two conflicting findings may be due to difference in chosen sample size between different studies. The most significant confounding factor is consumption of alcohol as it can lead to Dupuytren's contracture independent of its effect on the liver (28). Iranians are prohibited from drinking alcohol due to religious beliefs, and this could be the reason for its low incidence in a population such Iran. Therefore, there is need for more studies from Muslim majority regions in order to further confirm or negate these results. Various studies have reported different results about risk factors for rheumatic complications in diabetic patients; in many studies, direct association was reported between duration of disease and age (older) with rheumatologic complications. However, in this study a significant correlation was seen between adhesive capsulitis and age and gender. Tighe et al. (2008) reported that the incidence of adhesive capsulitis was two to four times higher in diabetics than in the general population in the US, and the prevalence of diabetes in patients with adhesive capsulitis was shown at 38.6% (29); correspondingly, we found similar results. In patients with type 1 or type 2 DM, the prevalence of trigger finger ranges from 5% to 36%, compared with 2% in the general population (30). We consistently found this close ratio of 5 vs. 3. The trigger finger development has been shown that it is associated with longer disease duration (31, 32). We found 12% of patients suffering with carpal tunnel syndrome; Chammas (1995) and Papanas (2010) reported that it ranges from 11% to 25%. These two latest studies are in alignment with our findings (33, 34), however, they showed that it was more common in women. The most common musculoskeletal complications were carpal tunnel syndrome, trigger finger, adhesive capsulitis, and Dupuytren's contracture among DM patients. Ordinary arthropathy endocrine disease is largely ignored or inappropriate for other complications of diabetes such as retinopathy, nephropathy or neuropathy treatment. Diabetes pathophysiological mechanisms have not been completely identified. The upper limbs, especially hand and shoulder, are most commonly involved. Identification and treatment of diabetes-related limb disorders are important to improving the life quality of patients. Furthermore, understanding the associations between them may better and easier enable the diagnosis of DM not yet recognized in patients, and as such, lead to the institution of proper therapy that can prevent the development of the complications found in diabetes. Based on reviewing the scientific literature, there is no published study examining the association between microvascular complications and rheumatologic disorders in Iran. In fact, this study revealed evidence for importance of knowledge of rheumatologic complications related to diabetes among patients with diabetes.

Current studies this year, show prevalence of DM increasing in urban regions of Iran. It is suggested public health agencies be directed towards these regions with attention on elementary prevention through lifestyle intervention. As the relatively young Iranian population ages in the future, there will likely be an increase in the prevalence of DM and other chronic diseases related to DM. Therefore, it is important to regularly monitor coronary risk factors in Iran, as well as to direct effectual public health interventions towards high-risk groups such as housewives and young girls who, in the future will become housewives. The Iranian government should focus, for the most part on

this issue, by capitalizing and creating more adaptable and accessible jobs, and by somehow improving the standard of living in the rural areas, that can lead to decreasing the musculoskeletal complications in DM patients and a better quality of life.

### **5. Conclusions**

The results of this study showed that diabetes mellitus and musculoskeletal complications such as upper limb musculoskeletal abnormalities will lead to increase in skeletal muscle effects in DM patients. It is recommended that musculoskeletal examination is done periodically in DM patients for identification of this disorder as soon as possible and necessary actions carried out for prevention of this disorder.

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### **Conflict of Interest:**

There is no conflict of interest to be declared.

### **Authors' contributions:**

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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