MEDICAL SCIENCE

Prevalence of frozen shoulder among diabetic patients in Western region of Saudi Arabia

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ABSTRACT

Background: It has been proven that the prevalence of diabetes is increasing worldwide and is seen as a major public problem in the previous 3 decades. It is defined as a metabolic condition marked by high sugar levels due to defects in insulin production, insulin action, or both. There has been little research in this issue in our region that will aid our study to fill this gap. The aim of this study to assess prevalence of frozen shoulder among diabetic patients. *Methods:* This study was a cross-sectional online questionnaire survey. Based on a structured questionnaire that was develop through literature review. The study's population consisted of diabetic patients in Jeddah, Saudi Arabia and the sample size was estimated using the Qualtrics calculator with a confidence level of 95%; a sample size of 384. *Results:* The study included 681 participants 24.4% of them aged 20-30 years. Diabetes was diagnosed in 31.4% of participants 5 years ago, 23.8% in 6-10 years and 12.6% in 11-15 years. Frozen shoulder illness has been detected in 19.8% of patients, 36.9% have difficulties moving their shoulders and 47.7% suffer shoulder pain. There was significant relation between having frozen shoulder and age ($P < 0.05$). *Conclusion:* A significant association between diagnosis with diabetes and frozen shoulder among the studied population. Co-morbidities, severity and the course of the condition's natural-history should all be taken into consideration when making management decisions, which should also be discussed with the patient.

Keywords: Frozen shoulder, diabetes, complications, shoulder, joints

1. INTRODUCTION

Throughout the last 3 decades, the prevalence of mellitus diabetes has grown worldwide and is seen as a major public issue (Yap et al., 2019). Diabetes-mellitus is a class of metabolic disorders characterized by hyperglycemia caused by defects in insulin production, insulin action, or both (Verhulst et al., 2019). DM is divided into two different types: Type 1 diabetes is an

autoimmune illness characterized by pancreatic beta cell destruction and absolute insulin insufficiency, with a high prevalence in children. The most prevalent kind of diabetes is type 2 diabetes, which is caused by increasing peripheral resistance to insulin action. The number of diabetes patients is roughly 90% – 95%. Frozen shoulder (FS) or adhesive capsulitis is a group of symptoms involving the glenohumeral joint that include discomfort, stiffness and/or a functional limitation. It is one of the musculoskeletal problems that can be particularly troublesome in diabetic people (Inayat et al., 2017a). Frozen shoulder happens in the ones without DM. However, has a far higher occurrence in people with DM as compared to the ones without DM. They mentioned that the threat ratio for diabetes in people with frozen shoulder became 5.0 – 5.9 (95% CI = 3.3 – 8.4, P < 0.001) (Shah et al., 2015).

According to previous studies, diabetics have a higher pre-valence of frozen-shoulder than non-diabetics, with a prevalence of 11-30% compared to 2-10% in the non-diabetic population (Hsu & Sheu, 2016; Verma et al., 2017). Another study from Lahore looked at 80 diabetic individuals and discovered that 41.3 percent of them had frozen shoulder (Inayat et al., 2017a). In research of 291 persons with type one-diabetes who had been diagnosed for an average of 29 years, a 10.3% prevalence of frozen-shoulder was found, while a study of 1217 patients with type one-diabetes who had been diagnosed for an average of 31.1 years found a 31% prevalence of frozen-shoulder (Juel et al., 2017a). However, another study found that DM was present in a high proportion of individuals with frozen shoulder, with a frequency of 90.3 percent (Alhashimi, 2018). There has been little research in this issue in our region that will aid our study to fill this gap. This study's goal is to determine Pre-valence of frozen-shoulder among diabetic patients.

2. METHODS

Study design

This study was a cross-sectional online questionnaire survey distributed between May 2021 until Dec 2022, based on a structured questionnaire that was develop through literature review.

Subject: Participants, recruitment and sampling procedure

The study's population consisted of diabetic patients in Jeddah, Saudi Arabia.

Sample size

The sample size was estimated using the Qualtrics calculator with a confidence level of 95%; a sample size of 384.

Inclusion criteria and Exclusion criteria

For the purpose of this study the inclusion criteria are set to specifically include patients who are diagnosed with diabetes, provided that they are 18 years of age. Hence, the exclusion criteria are modified to exclude those who don't have diabetes, diabetics under the age of 18, patients who are unable to cooperate with clinical examination due to recent trauma or severe cerebrovascular disease, patients with any history of shoulder or back injury, thyroid patients and other diseases such as intramuscular and injection arthritis, rotator cuff disease, calcific tendinitis and post - surgical stiffness.

Analyses and Entry Methods

SPSS 21 was used for data entry and data analysis. Categorical variables including primary variables was described using frequencies. Continuous variables for normally distributed was described using mean and Std. Univariate analysis was conducted for categorical variable using Chi - square test to check for all the possible risk factors. Logistic regression was used to assess the relations in the study. Odds ratio, confidence interval of odds ratio and the p-value was generated for the side effects. The prevalence was given in percentage with 95% confidence level. Test with a P-value & lt; 0.05 was considered significant.

3. RESULTS

Table 1; show sociodemographic characteristics of participants, the study included 681 participants 24.4% of them aged 20-30 years, 21% aged 51-60 years, most of them were Saudi by 93.7%, 50.2% were males and 49.8% females. As regard region nearly two - third (68.9%) from Western Region. 84% of participants reported that they have diabetes. 22.4% from diabetic patients have been diagnosed with frozen shoulder disease with significant association (P= 0.001) as illustrated in table (4). In table (5), there was significant relation between having frozen shoulder and age (P < 0.05) it was most common in patients aged 51-60 by 23%. Also, there was significant relation with gender (P < 0.05) and it was most common among males, 63.7% of patients were males, however, there was no significant relation between frozen shoulder and nationality and region (P > 0.05).

Table 1 Socio-demographic features of participants (n=681)

Parameter		No.	%
Age	Less than 20	61	9.0
	20 - 30	166	24.4
	31 - 40	98	14.4
	41 - 50	115	16.9
	51 - 60	143	21.0
	More than 60	98	14.4
Nationality	Saudi	638	93.7
	Non-Saudi	43	6.3
Gender	Male	342	50.2
	female	339	49.8
Region	Central Region	48	7.0
	Southern area	40	5.9
	Eastern Province	55	8.1
	Northern region	69	10.1
	Western Region	469	68.9
Have diabetes	Yes	572	84.0
	No	109	16.0

Table (2) show that 31.4% of participants have been-diagnosed with diabetes from 5 years ago, 23.8% from 6-10 years and 12.6% from 11-15 years. Nearly half of participants 54.6% have second type diabetes and 29.4% have first type. As regards treatment 43.5% taking insulin, 40.5% taking tablets and 16% don't take any treatment.

Table 2 Duration, type and management of diabetes (n=681)

Parameter		No.	%
Duration of diabetes (Years)	1- 5	214	31.4
	6 -10	162	23.8
	11 -15	86	12.6
	16- 20	53	7.8
	21- 25	23	3.4
	26 -30	17	2.5
	31- 40	13	1.9
	More than 40	4	0.6
	none	109	16.0
Type of diabetes	first type	200	29.4
	second type	372	54.6
	There is no	109	16.0
Type of treatment	Tablets	276	40.5
	Insulin	296	43.5
	none	109	16.0

As shown in Figure 1, 80.2% of participants doesn't diagnose with frozen-shoulder and the Prevalence of frozen-shoulder among participants was 19.8%.

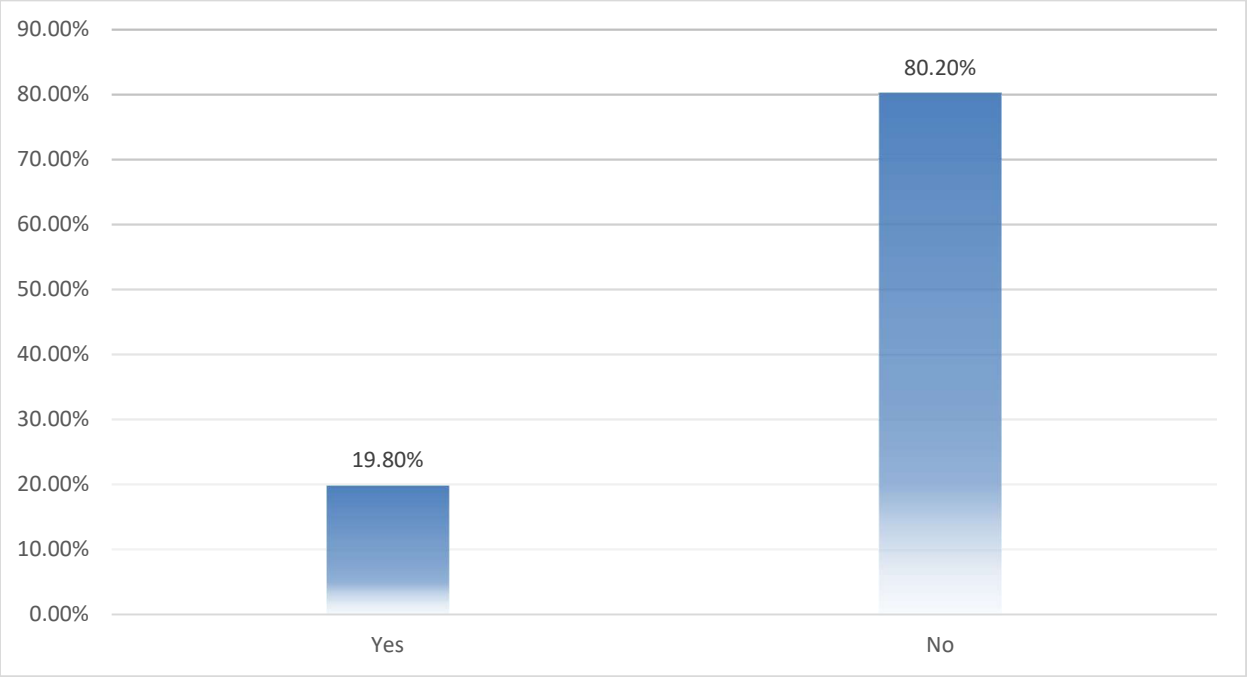

Figure 1 Prevalence of frozen-shoulder among participants (n=681)

Table (3), show that 19.8% of cases Have been diagnosed with frozen shoulder disease, 36.9% have difficulty with shoulder movement, 47.7% have experienced pain in the shoulder, only 17.3% had a shoulder injury, 21.1% have thyroid disease and the majority 89.4% don't have other conditions such as arthritis of the shoulder, rotator-cuff disease, shoulder tendinitis or shoulder stiffness after surgery.

Table 3 Prevalence of frozen-shoulder among participants (n=681)

Parameter	Yes	No
History of diagnosis with frozen shoulder disease	135 19.8%	546 80.2%
Difficulty with shoulder movement	251 36.9%	430 63.1%
Pain in the shoulder	325 47.7%	356 52.3%
Shoulder injury	118 17.3%	563 82.7%
History of thyroid disease	144 21.1%	537 78.9%
History of conditions such as arthritis of the-shoulder, rotator-cuff disease, shoulder tendinitis or shoulder stiffness after surgery	72 10.6%	609 89.4%

22.4% from diabetic patients have been diagnosed with frozen shoulder disease with significant association (P= 0.001) as illustrated in table (4).

In table (5), there was significant relation between having frozen shoulder and age ($P < 0.05$) it was most common in patients aged 51-60 by 23%. Also, there was significant relation with gender ($P < 0.05$) and it was most common among males, 63.7% of patients were males, however, there was no significant relation between frozen shoulder and nationality and region ($P > 0.05$).

Table 4 Association between diabetes and frozen shoulder among participants (n=681)

Parameter		Presence of diabetes		Total (N=681)	P value
		Yes	No		
Diagnosis with frozen shoulder disease	Yes	128	7	135	0.001
		22.4%	6.4%	19.8%	
	No	444	102	546	
		77.6%	93.6%	80.2%	

Table 5 Association between diagnosis of frozen shoulder and sociodemographic characteristics of participants (n=681)

		Diagnosis with frozen shoulder disease		Total (N=681)	P value
		Yes	No		
Age	Less than 20	4	57	61	0.002
		3.0%	10.4%	9.0%	
	20 - 30	23	143	166	
		17.0%	26.2%	24.4%	
	31 - 40	19	79	98	
		14.1%	14.5%	14.4%	
	41 - 50	29	86	115	
		21.5%	15.8%	16.9%	
	51 - 60	31	112	143	
		23.0%	20.5%	21.0%	
	More than 60	29	69	98	
		21.5%	12.6%	14.4%	
Nationality	Saudi	126	512	638	0.851
		93.3%	93.8%	93.7%	
	Non-Saudi	9	34	43	
		6.7%	6.2%	6.3%	
Gender	Male	86	256	342	0.001
		63.7%	46.9%	50.2%	
	female	49	290	339	
		36.3%	53.1%	49.8%	
Region	Central Region	7	41	48	0.606
		5.2%	7.5%	7.0%	
	Southern area	9	31	40	
		6.7%	5.7%	5.9%	
	Eastern Province	8	47	55	
		5.9%	8.6%	8.1%	
	The northern area	12	57	69	
		8.9%	10.4%	10.1%	
	Western Region	99	370	469	
		73.3%	67.8%	68.9%	

4. DISCUSSION

Frozen shoulder, also known as adhesive-capsulitis, is a painful condition that can cause prolonged disability (Bagheri et al., 2016). Stiffness of the capsule surrounding the glenohumeral joint reduces both active and passive range of motion (ROM), particularly external rotation (Bunker, 2011). It is characterized by the gradual having no discernible radiographic abnormalities, the shoulder

joint is developing limited mobility. Patients generally complain of severe shoulder pain with an inability to sleep on the affected side as the disease progresses (Inayat et al., 2017b). It is a chronic condition with a slow progression and the complete recovery may take 3 years. Frozen shoulder is commonly, but incorrectly, said to be a self-limiting condition (meaning that, in time, the condition will resolve without intervention) (Nagy et al., 2013).

It is commonly known that adhesive-capsulitis and diabetes-mellitus are related. Diabetes patients have a 2-4 times greater-prevalence of adhesive-capsulitis than the overall population (Kay & Slater, 1981). FS has been described as one of the most disabling musculoskeletal manifestations of DM. Patients with diabetes are at a higher-risk of FS with an incidence of 10% - 20% (Bunker, 1997). This is a cross-sectional online questionnaire survey conducted among 681 of participants in Jeddah, Saudi Arabia. The study aims to assess the prevalence of frozen-shoulder among diabetic patients. Results from our study showed that 84% of cases have diabetes and 19.8% have been diagnosed with frozen-shoulder-disease.

Frozen-shoulder is five times more common in individuals with diabetes than in individuals without diabetes (Zreik et al., 2016). Generally, FS affects people with diabetes at a rate of 11 precent–30 precent, comparing to 2%–10% of individuals without diabetes (Uddin et al., 2014). In accordance with this our study found that 22.4% of diabetic patients have been diagnosed with frozen shoulder disease. In a meta-analysis carried by them reported that the prevalence of frozen-shoulder in people with diabetes has been estimated to be 13.4% (Zreik et al., 2016). In contrast to this, another study reported high prevalence rate; the results show that Diabetes patients with 60; 59 precent diagnosed cases of frozen-shoulder had a 76-percentage lifetime prevalence-rate (Juel et al., 2017b). Also, in Pakistan, a descriptive-paper among 80 patients with diabetes found that the prevalence of FS was found out to be 41.3%, as 33 patients complained of pain during movement of the shoulder and had consistent radiologic findings (Inayat et al., 2017b). A higher prevalence in this study of the Pakistani population, especially in women, can be attributed to poor socioeconomic status, late diagnosis, unawareness and/or inadequate clinical management of FS (Inayat et al., 2017b).

In India, another research involving (5732) patients was-published, Frozen-shoulder was present in total (20%) patients (Banseria, 2018). Study done by (Ray et al., 2011) reported that prevalence of frozen-shoulder was 18% in diabetic patients which were well-matched with our results. In this investigation, also noted a prevalence-rate of 17.9 precent (Doly, 2017). (Ramchurn et al., 2009) study, indicated a pre-valence of 25 present, which may be greater due to the study's limited sample-size and more advanced diagnostic methods for instances that are just subclinical. In Bangladesh, a short term crosscut a survey was made to determine the pre-valence of frozen-shoulders among people with diabetes-mellitus and the diabetic patients were 14.4% (Doly, 2017). In Iraq, an observational study included 216 patients with diabetes mellitus (DM) reported that among (FS) Pt, occurred 11.5 percent of total of the time (Alhashimi, 2018). However, an observational study was done in 300 patients with type 2 DM conducted found that (32.3%) of patients had adhesive capsulitis (Parappil, 2018).

FS is extremely uncommon among young people and it is most seen in individuals aged 40 to 60 years. According to a longitudinal study, female patients have a 1.6 times higher risk of developing this condition (Hand et al., 2008). In accordance with this our study found that there was significant relation between having frozen shoulder and age ($P < 0.05$) it was most common in patients aged 51-60 by 23%. Also, there was significant relation with gender ($P < 0.05$), but it was most common among males, 63.7% of patients were males. Another study found that the patients rarely show prior to turning forty and the start of frozen-shoulder often occurs between the ages of 40 and 70. However, 58 percent of individuals with frozen-shoulder are female (Cho et al., 2015). In Pakistan, another study reported that the prevalence of FS was 2.66 times more in females than in males with p - value (0.002) however, age distribution had no significant relationship with the development of FS (Inayat et al., 2017b).

Results from another study conducted in India show that Age of pt was positively correlated with Frozen-Shoulder among Diabetic's using Multiple-Regression Analysis (Banseria, 2018). However, in Bangladesh, another study reported that there was no statistical association was found between frozen shoulder and gender ($p=0.488 > 0.05$) (Doly, 2017). Another study carried out in Iraq found that females were more commonly afflicted than males at a 3:2 ratio (126:90). Regarding age, the most common rate of occurrence was between 60-70 years old at 33.3% and lowest in the age group above 80 years at 1.4% (Alhashimi, 2018). Moreover, results from another study show that a statistically significant association between occurrence of adhesive-capsulitis and increasing age, it was found that the pre-valence of adhesive-capsulitis in diabetics increases with increasing age but, no statistically-significant association was found between gender and adhesive-capsulitis (p value = 0.178) (Parappil, 2018).

5. CONCLUSION

There was a strong association between diabetes-diagnosis and frozen-shoulder in the population examined. The severity, Co-morbidities and the natural-history of the condition should all be taken into consideration when making management decisions, which should also be discussed with the patient.

Ethical approval

The research proposal was approved by the Regional Research and Ethics committee of Majmaah university, with letter number (MUREC-DEC.26/COM-2022/22-1).

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This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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