Original Article

Functional Consequences and Musculoskeletal Complications of Diabetic patients with Frozen Shoulder

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Abstract

Objective: This study aimed to evaluate the functional consequences and associated MSK complications in diabetic patients with frozen shoulder in relation to age, demographic characteristics, and physiotherapy interventions

Study Design: A cross-sectional study was conducted.

Place and duration of study: This cross-sectional study was conducted in hospitals of Abbottabad, from June to November, 2024.

Material and Methods: This cross-sectional study was conducted in hospitals of Abbottabad, from June to November, 2024. Participant was selected using Raosoft, with an estimated of 377 patient, including adults over 20 years old diagnosed with diabetes and frozen shoulder complain, however patients with paralysis or other health complications were excluded. Data was collected through a structured questionnaire (demographic characteristics, SPADI, MSK and physiotherapy sessions). Chi-square test and spearman's correlation were used to determine the association between categorical variables at P value<0.05 statistically significant.

Results: Demographic data reveals that the majority of participants were over 40 years old, with a higher proportion of females, married and housewives. Most participants had 6 to 10 years since diabetic diagnosed. Only 14.25% participants reported a family history of diabetes. More, single/divorce, housewives and type 2 diabetes significantly (P<0.05) increase pain and disability. Co-occurrence of lower back, knee, hips, ankle and wrist increased pain and disability in the studied participants. Patients with severe pain were more likely receiving combined therapies (electro-, manual and exercise).

Conclusion: This study found that frozen shoulder with other MSK disorders significantly impact daily activities and functional independence. The study emphasizes early screening, comprehensive physiotherapy and tailored rehabilitation for diabetic patients with frozen shoulder.

Keywords: Diabetes, Frozen shoulder, musculoskeletal disorder, SPADI, Physiotherapy

1. Introduction

Diabetes mellitus is a chronic metabolic disease that affects millions of people worldwide. It affects several body systems, including the musculoskeletal system, and contributes beyond metabolic imbalance. (1) Pain and a gradual loss of shoulder movement are the hallmarks of frozen shoulder, which reduces a patient's functional ability and general quality of life.(2) Because diabetes affects connective tissues, glycosylation processes, and inflammatory pathways, it has been linked to an increased risk of frozen shoulder.(3) This relationship, which has major implications for therapeutic approaches and patient outcomes, emphasizes the need to investigate how diabetes may exacerbate the presentation, treatment, and recovery pathway of frozen shoulder.(4) Physical therapy, oral anti-inflammatory drugs, intra-articular corticosteroid injections, and, in more extreme situations, manipulation under anesthesia or arthroscopic surgery are among the non-surgical and surgical methods available for treating frozen shoulder. (5) However, because of the previously described biochemical alterations and compromised wound-healing capacity due to impaired tissue regeneration, diabetic individuals frequently show a decreased response to conservative therapy.(6) According to studies, diabetic patients may have limited improvements

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in shoulder mobility after standard therapies and have a delayed recovery.[7]

Diabetes and musculoskeletal disorders like frozen shoulder are linked, causing the need for a thorough study strategy to comprehend and treat the particular difficulties diabetic individuals have managing their illness and recovering from it. The purpose of this study is to assess functional recovery indicators, therapeutic techniques, and prevalence in order to lay the groundwork for bettering patient care and clinical tactics.

2. Materials & Methods

Study design: The study design of this research was Cross-sectional study (June to November, 2024). This study was conducted in hospitals, providing a clinical environment for data collection.

Sample size and technique: A total of 377 was estimated using Raosoft sample calculation with margin error of 5%, confidence level of 95%.The population size was 20,000 and response distribution was 50%.The Sampling technique was convenient sampling.

Selection criteria: Inclusion criteria included diabetic patients with frozen shoulder and above 20 years age. Whereas, paralyze patients, and those with other chronic complication were excluded.

Data collection: After ethical approval (Ref:1055) from ethical committee of Women Institute of learning and Rehabilitation Sciences, verbally and written informed consent was obtained from all participants. Questionnaire comprised of 6 sections; demographic characteristics, diabetes, Nordic musculoskeletal disorder questionnaire (N-MSK-Q) [8], Shoulder pain and disability index (SPADI) [9], and on-going physical therapies.

Data analysis procedure

Data was analyzed using SPSS computer software. Descriptive statistic of the data included frequency distributions and cross-tabulations. For inferential statistics, as being categorical groups, chi-square and Spearman/Pearson correlation were used for difference and association strength. The P value below 0.05 was considered significant.

3. Results

As indicated in table 1, the participants mostly consists of individuals over 40 years old (81.45%), females (58.60%), married (90.05%), occupationally housewives (29.57%) and belonging to moderate socioeconomic status (79.30%). Statistically, gender, marital status and occupation were significant ($P<0.05$) associated with the age difference of diabetic participants.

Table 1: Demographics (Age, Gender, Marital status, Occupation, Socioeconomic status, Hospital) frequency (%) of frozen shoulder patients .

Demographic characteristics		≤40 years	> 40 years	Total
Gender*	Male	28 (7.53)	126 (33.87)	154 (41.40)
	Female	61 (16.40)	157 (42.20)	218 (58.60)
Marital status**	Single/Divorce	30 (8.06)	7 (1.88)	37 (9.95)
	Married	59 (15.86)	276 (74.19)	335 (90.05)
Occupation*	House wife	25 (6.72)	85 (22.85)	110 (29.57)
	Creative/technical	13 (3.49)	72 (19.35)	85 (22.85)
	Educational sector	22 (5.91)	62 (16.67)	84 (22.58)
	Corporate/business	11 (2.96)	38 (10.22)	49 (13.17)
	Health sector	18 (4.84)	26 (6.99)	44 (11.83)
Socioeconomic status[ns]	Weak	8 (2.15)	17 (4.57)	25 (6.72)
	Moderate	70 (18.82)	225 (60.48)	295 (79.30)
	Strong	11 (2.96)	41 (11.02)	52 (13.98)

*=p<0.05, **=p<0.01, ns=p>0.05

Table2 demonstrates the diabetic history of frozen shoulder patients. Results showed that majority exhibited Type 2 diabetes (81.99%). Regarding to the duration of diabetes, 28.23% have had diabetes for 1–5 years, 38.71% had 6–10 years, and 33.06% for more than 10 years. Additionally, a significant proportion of individuals (85.75%) have no family history of diabetes. Statistically, diabetic types were non-significant with age, but duration of diabetic and family history was significant (P<0.05) associated with the age difference.

Table 2: Diabetic history frequency (%) of frozen shoulder patients

Diabetic History		≥40 year	>40 year	Frequency (%)
Diabetes^{ns}	Type 1	18 (4.84)	49 (13.17)	67 (18.01)
	Type 2	71 (19.09)	234 (62.90)	305 (81.99)
Duration**	1-5 yrs	64 (17.20)	41 (11.02)	105 (28.23)
	6-10 yrs	21 (5.65)	123 (33.06)	144 (38.71)
	>10 yrs	4 (1.08)	119 (31.99)	123 (33.06)
Family history*	No	69 (18.55)	250 (67.20)	319 (85.75)
	Yes	20 (5.38)	33 (8.87)	53 (14.25)

*=p<0.05, **=p<0.01, ns=p>0.05

Table 3 shows correlation of patients demographic characteristics and SPADI. Age was highly significant positive moderate correlated (ρ = 0.303, P<0.01) with SPADI pain and highly significant positive weak correlated (ρ = 0.243, P<0.01) with disability, indicating that with increase in age in diabetes type (Type 2) patients the pain and disability slightly increases. Diabetes type showed highly significant positive weak correlation (ρ = 0.250, P<0.01) with disability, and highly significant positive moderate correlation (ρ = 0.346, P<0.01) with pain. Marital status and occupation status was weakly and negatively statistically significant (ρ = 0.1, P<0.05) with pain and disability, indicating single/divorce and mostly housewives and technical staff were noticed with higher pain and disability.

Variables	SPADI	
	Pain	Disability
Age	.303**	.243**
Gender	-0.001^{ns}	0.061^{ns}
Marital Status	-.170**	-.180**
Occupation	-.127*	-.175**
Socioeconomic status	-0.05^{ns}	-.182**
Diabetes type	.346**	.250**

Table 3: Correlation of demographic variables with pain and disability (SPADI)

*=p<0.05, **=p<0.01, ns=p>0.05

The MSK and SPADI factors correlation is shown in table 4. Wrist, lower back, hips, knee and ankle was positively and moderately, and statistically significant (ρ = 0.2-0.3, P<0.05) associated with pain and disability, indicating that additional MSK disorder in these part of body increase pain and disability noticeable. Also, with co-occurrence of elbow also positively but weakly, and statistically

significant ($\rho = 0.1$, $P<0.05$) associated with pain and disability.

Nordic MSK	SPADI	
	Pain	Disability
Neck	0.036^{ns}	0.062^{ns}
Shoulder	-	-
Elbow	0.158*	0.205**
Wrist	0.253**	0.221**
Upper back	0.128^{ns}	0.279**
Lower Back	0.370**	0.345**
Hip	0.295**	0.254**
Knee	0.301**	0.328**
Ankle	0.264**	0.264**

Table 4: Correlation of MSK with pain and disability (SPADI)

*=p<0.05, **=p<0.01, ns=p>0.05

Table 5 indicates that majority of participants with increase in pain and disability were moderately significant ($P<0.05$) undertaking all three therapies i.e. electrotherapy + manual therapy + exercise therapy (48.12%). These results were followed by electrotherapy + exercise therapy (26.61%) and manual therapy + exercise therapy (10.22%). The numbers of sessions were statistically non-significantly ($P>0.05$) associated with pain and disability.

Table 5: Physiotherapy session frequency (%) of frozen shoulder patients

Physiotherapy sessions			SPADI	
			Pain	Disability
Therapy freq (%)	Electrotherapy + Manual therapy	12(3.23)	0.286**	0.151**
	Electrotherapy + Exercise therapy	99(26.61)		
	Manual therapy + Exercise therapy	38(10.22)		
	Electrotherapy + Manual therapy + Exercise therapy	179(48.12)		
Sessions freq (%)	1-10	255(68.55)	0.043^{ns}	0.033^{ns}
	11-20	95(25.54)		
	above 20	22(5.91)		

**=p<0.01, ns=p>0.05

4. Discussion

Shoulder pain is one of the most common complaints of patients with diabetes that causes motion limitation, functional disability and decreased quality of life. There is higher prevalence of shoulder disorders in patients with diabetes, with adhesive capsulitis (AC) and rotator cuff (RC) tendinopathy being the most common disabling shoulder disorders.[10,11]

The demographic profile of the sample group is predominantly individuals over 40 years old, mostly female, married, and housewives. The incidence of adhesive capsulitis of shoulder among diabetic patients female is more than male. Al Mamun.[12] found that housewives and elderly people mostly suffer from disease. However, study conducted by Suleman et al.[13] results were in conflict with the present study, as they had noticeably more male compared to females with diabetes and shoulder pain.

In the present study most participants had no family history of diabetes, and with 6 to 10 years disease durations. The study results showed that around 81% of patients had type 2 diabetes, supporting the present study findings, Dyer et al.[14] reported that people who have been newly diagnosed with frozen shoulder are more likely to be diagnosed with type 2 diabetes.

The co-occurance of MSK with frozen shoulder diabetic patients showed to increase pain and disability. The MSK disorder body parts that were significantly associated with pain and disability included lower back, knee, hips and wrist. Shariat et al.[15] reported that lower back pain along with shoulder and neck severity is significantly associated with higher BMI. Dighriri et al.[16] reported that with shoulder, and along with neck also lower back pain could also occur. More additional factors that increase risk of pain includes history of trauma, depressive and psychosomatic symptoms.

A total of 48.12% study participants were receiving all combined therapies (Electrotherapy, Manual therapy, Exercise therapy). Koumantakis et al.[17] reported that therapeutic exercise, manual therapy and electrotherapy exhibited significant improvement in patients with shoulder pain and disability. And more, between 8th and 12th sessions, there had been no significant improvement in shoulder pain and disability. The shoulder followed by lower back showed higher severity of pain and disability. Such individuals that usually work with bended shoulder or back experience mostly shoulder and upper back pain.[18] Supporting the present study, the findings of Nazish et al.[19] stated that housewives are more prone to shoulder pain and given counseling for postural correction and awareness sessions could prevent MSK disorders not only in housewives but as well as the working women.

Conclusion:

Frozen shoulder in diabetic patients is more prevalent among individuals over 40 years of age, females, married participants and housewives. Pain and disability increased moderately with advancing age, more than 5 years duration of diabetes, and the presence of additional musculoskeletal disorders. Combined physiotherapy approaches were commonly reported among participants with higher pain and disability,

Patients and clinicians should prioritize early screening and adopt comprehensive physiotherapy-based rehabilitation plans. A multidisciplinary intervention program including awareness and community-based rehabilitation projects initiatives focusing on diabetes-related musculoskeletal complications is required.

Strengths & Limitations

This study provides novel insights into functional outcomes of musculoskeletal complications in diabetic patients with frozen shoulder in Pakistan. Relative large sample size strengthens the findings; however, convenience sampling potentially may have introduced selection bias. This may limit the representativeness of the sample and the generalizability of results. The study was conducted in selected hospitals in Khyber Pakhtunkhwa city, Abbottabad, which may limit external validity. The cross-sectional design prevents causal inference.

Disclosure /Conflict of interest:

Authors declare no conflict of interest.

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