Original Article

Assessment of the Range of Motion in Adhesive Capsulitis of Shoulder Joints in Type 2 Diabetic Patients

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Abstract

Background: *Adhesive capsulitis is a condition characterized by pain and restricted range of motion (ROM) in the shoulder joint. Type 2 diabetes mellitus has been associated with an increased incidence of adhesive capsulitis, potentially exacerbating shoulder dysfunction. The objective of this study is to assess the ROM in the shoulder joints of patients with adhesive capsulitis and type 2 diabetes mellitus.* ***Materials and Methods:*** *This cross-sectional observational study was carried out in the outpatient department of Physical Medicine and Rehabilitation, Dhaka Medical College and Hospital (DMCH), Dhaka from July 2021 to June 2022. A total of 122 diabetic patients with adhesive capsulitis attending the study place were selected by purposive sampling. Patients with a history of trauma, surgery, neurological conditions affecting shoulder, rheumatoid arthritis, thyroid disorders, pain or disorders of cervical spine, elbow, wrist or hand and rotator cuff rupture and tendon calcification were excluded from the study. The patient's pain was recorded using the visual analogue scale (VAS). Movements of the affected shoulder joint were measured by using a goniometer. The validated Bangla version of Shoulder Pain and Disability Index (SPADI) was used to assess functional status. Variables were expressed as mean ± standard deviation (SD), frequency and percentage.* ***Results:*** *The mean age of the patients was 51.9 ± 8.6 years. In this study 74 patients (61%) had adhesive capsulitis on their right shoulder and the rest 48 (39%) had adhesive capsulitis on their left shoulder. The mean flexion, extension, abduction, internal rotation and external rotation was 99.9±20.2, 39.5±11.7, 94.9±20.3, 34.7±15.0 and 53.7±12.6 respectively. There was a significant positive correlation between blood glucose level and pain score in VAS and SPADI. However, there was no significant correlation between blood glucose level and range of motion of patients. There was no significant correlation between duration of diabetes and pain, range of motion and functional impairment of patients in this study.* ***Conclusion:*** *Adhesive capsulitis in Type 2 diabetic patients is associated with greater limitations in shoulder range of motion. Poor glycemic control might exacerbate the severity of shoulder dysfunction, highlighting the importance of managing blood sugar levels in this patient to prevent further mobility impairment.*

Keywords: Adhesive capsulitis, Type 2 diabetes mellitus, range of motion, shoulder joint.
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Introduction

Diabetes refers to a group of metabolic disorders marked by high blood sugar levels caused by problems with insulin secretion, insulin action, or both[1]. Type 2 diabetes is one of the most prevalent non-communicable diseases globally[2]. Long-term complications of diabetes can include retinopathy, which may result in vision loss; nephropathy, potentially leading to kidney failure; peripheral neuropathy, increasing the risk of foot ulcers and amputations; and autonomic neuropathy, affecting the gastrointestinal, genitourinary, and cardiovascular systems, as well as causing sexual dysfunction[3]. In addition, some musculoskeletal conditions are also reported to be common in people with diabetes mellitus. These include diabetic cheiroarthropathy (DCA), flexor tenosynovitis, Dupuytren's contracture, carpal tunnel syndrome, adhesive capsulitis and calcific periarthritis of the shoulder, reflex sympathetic dystrophy, diabetic osteoarthropathy, diabetic muscle infarction, and diffuse idiopathic skeletal hyperostosis[4].

The most frequent reported shoulder problem in diabetes is indeed frozen shoulder, also referred to as adhesive capsulitis[5,6]. Adhesive shoulder capsulitis describes a pathological process in which the body forms excessive scar tissue or adhesions across the glenohumeral joint, leading to stiffness, pain and dysfunction like loss of passive range of motion (ROM)[7,8]. Adhesive capsulitis can be divided into primary and secondary types. Primary adhesive capsulitis usually develops without a

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known cause and progress slowly. It is often linked to conditions like diabetes, thyroid disorders, medication use, high triglycerides, or cervical spondylosis[9]. Secondary adhesive capsulitis is generally caused by shoulder trauma, injuries like rotator cuff tears, fractures, surgeries, or extended periods of immobilization[10].

Adhesive capsulitis is most seen in individuals aged 40-60 years. It has a prevalence of approximately 2% to 10% in the general population and 11-30% in diabetic patients[11]. In a physical exam, patients with adhesive capsulitis may show a reduced glenohumeral range of motion (ROM) and experience pain during testing. There is typically a marked decrease in both active and passive ROM in two or more directions compared to the unaffected side. The pattern of ROM loss usually begins with external rotation, followed by abduction, internal rotation, and forward flexion[12,13].

As there is a high prevalence of diabetes mellitus in our region and its strong correlation with musculoskeletal disorders, the aim of the study is to provide a better understanding of the impact of diabetes on shoulder joint mobility and how it might influence the management of adhesive capsulitis in this population.

Materials and Methods

This cross-sectional observational study was conducted in the outpatient department of Physical Medicine and Rehabilitation at Dhaka Medical College and Hospital (DMCH), Dhaka. Study duration was July 2021 to June 2022. A total of 122 diabetic patients with adhesive capsulitis, who attended the study site, were selected through face-to-face interviews and met the inclusion criteria. The sampling technique was purposive sampling. Patients with a history of trauma, surgery, neurological conditions affecting shoulder, rheumatoid arthritis, thyroid disorders, pain or disorders of cervical spine, elbow, wrist or hand and rotator cuff rupture and tendon calcification were excluded from the study. Ethical approval for the study was obtained from the Ethical Review Board (ERB) of DMCH (ref: DMC/ECC/2021/278). After getting informed consent from each participants a complete physical examination including general examination, examination of shoulder joints and neck was done by the investigator.

Shoulder pain intensity was measured using the Visual Analogue Scale (VAS) (scored on a 10-point visual analogue scale). The shoulder disability was measured using the Bangla version of Shoulder Pain and Disability Index (SPADI)[14]. Active painful joint Range of Motion (ROM) for shoulder flexion, extension, abduction and external and internal rotation were measured using a goniometer. Statistical analysis was done by IBM-SPSS v26.0 for Windows. Statistical inference was based on 95% confidence interval and p-value <0.05 was considered statistically significant. Variables were presented as mean ± standard deviation (SD), frequency (n), and percentage (%).

Results

In this cross-sectional observational study, a total of 122 diabetic patients with adhesive capsulitis were included, with 60 patients (49.2%) being male and 62 patients (50.8%) being female. The average age of the patients was 51.9±8.6 years, with the youngest being 35 years old and the oldest 77 years old. Figure 1 shows that 74 patients (61%) had adhesive capsulitis on their right shoulder and the rest 48 (39%) had adhesive capsulitis on their left shoulder. The mean flexion, extension, abduction, internal rotation and external rotation was 99.9±20.2, 39.5±11.7, 94.9±20.3, 34.7±15.0 and 53.7±12.6 respectively (table I). There was a significant positive correlation between blood glucose level and pain score in Visual Analog Scale (VAS) as rh =0.295, p=0.011 and SPADI as rh =0.277, p=0.017. However, there was no significant correlation between blood glucose level and range of motion of patients as p>0.05. (table II). This study showed no significant correlation between duration of diabetes and pain, range of motion and functional impairment of patients as p>0.05 (table III).

Table-I: Distribution of patients by range of motion (ROM) (n=122)

Range of motion	Mean±SD	Range (min-max)
Flexion	99.9±20.2	40-140
Extension	39.5±11.7	15-60
Abduction	94.9±20.3	40-140
Internal rotation	34.7±15.0	10-70
External rotation	53.7±12.6	20-70

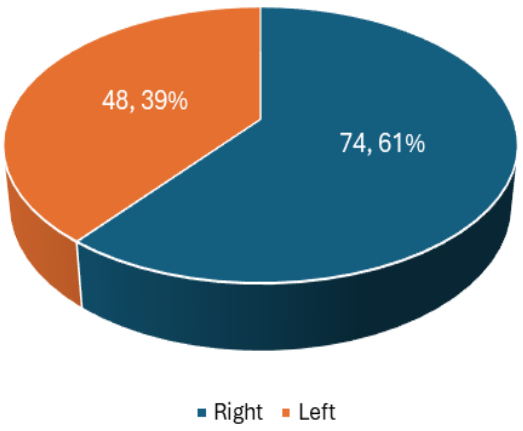

Figure-1: Distribution of patients by side involvement (n=122)

Table-II: Correlation of fasting blood glucose level with pain, range of motion and functional impairment of patients (n=122)

Criteria	r_h	p value
VAS	0.295	0.011[s]
Flexion	-0.216	0.064[ns]
Extension	-0.028	0.814[ns]
Abduction	-0.292	0.012[s]
External rotation	-0.180	0.124[ns]
Internal rotation	-0.034	0.777[ns]
SPADI	0.277	0.017[s]

Spearman rank correlation;
s=significant; ns=non-significant

Table-III: Correlation of duration of diabetes with pain, range of motion and functional impairment of patients (n=122)

Criteria	r_h	p value
VAS	0.053	0.562[ns]
Flexion	0.118	0.194[ns]
Extension	0.093	0.309[ns]
Abduction	0.060	0.509[ns]
External rotation	-0.065	0.474[ns]
Internal rotation	-0.002	0.983[ns]
SPADI	0.029	0.752[ns]

Spearman rank correlation; ns=non-significant

Discussion

Frozen shoulder is a disabling but self-limiting condition that typically progresses through three stages, eventually leading to resolution. It is frequently associated with other systemic conditions, most commonly diabetes mellitus[15]. The present cross-sectional study assessed the functional status in diabetic patients with adhesive capsulitis. The mean age of the patients was 51.9 ± 8.6 years in this study. A similar age distribution was also supported in other studies[16,17]. Our study found that 74 patients (60.7%) had adhesive capsulitis in their right shoulder, while 48 patients (39.3%) had it in their left shoulder. Ahmad, et al[18] performed a cross-sectional study of 81 diabetic patients and showed that twenty-one (21) patients were having right, forty-five (45) were left and fifteen (15) were having bilateral shoulder involvement.

The mean flexion, extension, abduction, internal rotation and external rotation was 99.9±20.2, 39.5±11.7, 94.9±20.3, 34.7±15.0 and 53.7±12.6 respectively. Lin, et al[19] reported that the mean external and internal rotation of the patients were 59.4±20.4 and 29.4±17.0 respectively which was much than normal population (89.4±15.3 and 66.3±15.9 respectively). Cole, et al[6] found that the range of shoulder movement was significantly reduced in patients with diabetes. Limitation of shoulder range of motion (ROM) was found in all the ranges in another study[20]. Among the diabetic patients, 42.6% had a duration of pain for 1 to 2 years. The mean pain score of the patients in visual analog scale (VAS) was 7.0±1.3 which ranged from 4.0-9.0. Hmigthanmawii, et al[20] measured the pain in patients suffering from adhesive capsulitis of shoulder and found that pain was present in all the stages of adhesive capsulitis ranging from 3.8 to 8.0. The exact pathophysiology of adhesive capsulitis is still not fully understood. The most widely accepted theory proposes that inflammation begins within the joint capsule and synovial fluid, leading to reactive fibrosis and adhesions in the synovial lining. The initial inflammation causes pain, while the subsequent fibrosis and adhesions within the capsule restrict the range of motion[21].

The median duration of diabetes was 24 months. The present study found no significant correlation between duration of diabetes and pain, range of motion and functional impairment of patients. The mean Shoulder Pain and Disability Index (SPADI) of the patients was 62.5±16.1 where minimum SPADI was 22.3 and maximum SPADI was 97.7. Similar to other upper limb musculoskeletal disorders, adhesive capsulitis is commonly seen in individuals with type 2 diabetes, which is associated with abnormal collagen deposition. The advanced glycation end products (AGEs) produced in diabetes are believed to contribute to abnormal collagen cross-linking, resulting in fibrosis[22]. This might be the cause of loss of range of motion and stiffness which further leads to an increased SPADI score. In another study by Shah, et al[23] showed that diabetes patients showed significantly higher pain and disabilities (SPADI & DASH) than non-diabetic patients.

In most cases, adhesive capsulitis is a self-limiting condition, with many patients experiencing significant spontaneous recovery within 18 to 30 months. Treatment primarily aims at relieving symptoms and improving the range of motion. There are limited studies that guide treatment management which include NSAIDs, physical therapy, oral or Intra-articular steroid injection, hydrodilatation, manipulation under anesthesia, arthroscopic or capsular release[24,25].

Limitation

This study was conducted in a single institution with a short period and small sample size.

Conclusion

Adhesive capsulitis in Type 2 diabetic patients is associated with greater limitations in shoulder range

of motion. Poor glycemic control might exacerbate the severity of shoulder dysfunction, highlighting the importance of managing blood sugar levels in this patient to prevent further mobility impairment. Future studies with larger sample sizes and conducted across multiple institutions would provide more robust data, allowing for generalization of the findings and a deeper understanding of the impact of adhesive capsulitis in the diabetic population.

Conflict of Interest

The authors declared that they have no conflicts of interest.

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