Intensity Of Shoulder Pain In Diabetic Patients With Adhesive Capsulitis: A Visual Analog Scale Study

Md. Abul Kalam Azad[1*], Nadia Rahman[1], Mohammad Golam Nobi[1], Md. Nadim Kamal[1], Md. Imamur Rashid[1], M. A. Shakoor[1]

[1]Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.
**Corresponding Author: Dr. Md. Abul Kalam Azad, Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Email: drazadpmr@gmail.com*

KEYWORDS

Adhesive capsulitis, Visual Analogue Scale (VAS), Pain intensity, Diabetic patients, Bangladesh

ABSTRACT:

Nutritional status plays a critical role in postoperative outcomes for patients undergoing surgery for oral and maxillofacial malignancies. Malnutrition is common in these patients due to tumor-related dysphagia, metabolic alterations, and treatme This study aimed to evaluate the intensity of shoulder pain in diabetic patients diagnosed with adhesive capsulitis using the Visual Analogue Scale (VAS). Adhesive capsulitis, commonly known as frozen shoulder, is a frequent musculoskeletal complication in diabetic patients, often resulting in significant pain and functional impairment. Understanding the severity of pain in this population is crucial for effective clinical management. A descriptive cross-sectional study was conducted at the Department of Physical Medicine & Rehabilitation, Bangabandhu Sheikh Mujib Medical University, Bangladesh, from July 2020 to June 2021. Seventy-five diabetic patients aged 40 to 60 years were enrolled through purposive sampling. Patients with a history of shoulder trauma or other musculoskeletal disorders were excluded to avoid confounding factors. Diagnosis of adhesive capsulitis was based on clinical examination and imaging when necessary. Pain intensity was measured using the VAS, categorizing pain as no pain (0), mild (1–3), moderate (4–6), or severe (7–10). Data were analyzed using SPSS version 26. Among the 75 diabetic patients, 23 (30%) were diagnosed with adhesive capsulitis, with females constituting the majority (65%) of this group. Pain assessment revealed that 43.5% experienced moderate pain, 34.8% severe pain, and 21.7% mild pain, while no patients reported absence of pain. These findings indicate a high prevalence of moderate to severe shoulder pain in diabetic patients with adhesive capsulitis. In conclusion, adhesive capsulitis is a significant cause of shoulder pain among diabetic patients, predominantly affecting middle-aged females. The observed pain severity underscores the importance of early pain assessment and targeted interventions. Utilizing the VAS in clinical settings can facilitate effective pain management strategies, ultimately improving outcomes for this vulnerable population.

INTRODUCTION

Adhesive capsulitis (AC), commonly known as frozen shoulder, is a musculoskeletal disorder characterized by pain, stiffness, and progressive loss of shoulder joint mobility. It significantly impairs patients' quality of life and functional capacity, especially in populations with chronic conditions such as diabetes mellitus (DM) [1,2] The prevalence of musculoskeletal complications, including adhesive capsulitis, is notably higher in diabetic patients compared to the general population, with estimates ranging from 10% to 30% [3,4] This association is attributed to complex metabolic and inflammatory mechanisms that alter connective tissue properties and joint capsule integrity [5,6].

Diabetes mellitus, a global health concern with rising incidence, affects multiple organ systems through microvascular and macrovascular complications [7,8] Chronic hyperglycemia promotes non-enzymatic glycation of collagen fibers and increased collagen crosslinking, leading to stiffness and reduced elasticity of periarticular tissues [9,10] Moreover, inflammatory cytokines such as interleukins (IL-4, IL-13) contribute to fibrotic changes in the shoulder capsule, exacerbating joint contracture and pain [11, 12].

Despite the high burden of adhesive capsulitis in diabetic patients, the intensity of shoulder pain—a key determinant of functional limitation remains underexplored. Pain perception in AC may be influenced by upregulated acid-sensing ion channels in the joint capsule, further complicating management [13]. Accurate assessment of pain severity is critical for tailoring therapeutic interventions and improving outcomes. The Visual Analog Scale (VAS) is a validated, reliable tool widely used to quantify subjective pain experiences in clinical settings [14].

This study aims to evaluate the intensity of shoulder pain in diabetic patients diagnosed with adhesive capsulitis using the Visual Analog Scale, providing insights into the clinical impact of AC in this vulnerable population. Understanding pain patterns will facilitate early diagnosis, targeted treatment, and ultimately enhance quality of life for diabetic patients suffering from this debilitating condition

METHODOLOGY

This descriptive cross-sectional study was conducted at the Department of Physical Medicine & Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BMU), Dhaka, Bangladesh from July 2020 to June 2021. The study aimed to assess the intensity of shoulder pain in diabetic patients diagnosed with adhesive capsulitis using the Visual Analogue Scale (VAS). The study included 75 patients diagnosed with diabetes mellitus, aged between 40 and 60 years, attending the outpatient department of Physical Medicine & Rehabilitation, BMU. Patients with a history of shoulder trauma, surgery, inflammatory arthritis, or other musculoskeletal disorders affecting the shoulder were excluded to avoid confounding factors. A purposive sampling technique was employed to select eligible patients who met the inclusion criteria. Among the 75 diabetic patients enrolled, those diagnosed with adhesive capsulitis were identified for pain intensity assessment. Diagnosis was based on clinical examination demonstrating restricted active and passive shoulder movements along with shoulder pain lasting more than three months. Imaging studies, such as X-ray or MRI, were performed when necessary to exclude other shoulder pathologies. Demographic data including age and gender were collected. Pain intensity in patients diagnosed with adhesive capsulitis was measured using the Visual Analogue Scale (VAS), which ranges from 0 (no pain) to 10 (worst possible pain). Patients marked their pain level on a 10-cm line, which was then categorized as no pain (0), mild pain (1–3), moderate pain (4–6), and severe pain (7–10).

Data were entered and analyzed using SPSS version 26. Descriptive statistics including frequencies and percentages were calculated for categorical variables such as age, gender, and pain intensity. The findings were presented in tables and figures to depict the distribution of adhesive capsulitis and associated pain severity among diabetic patients.

RESULTS

Table 1 shows the demographic characteristics of the 75 diabetic patients. Most participants were aged between 46 and 55 years (69.3%), with smaller proportions in the 40-45 years (12%) and 56-60 years (18.7%) groups. Females comprised the majority (64%) compared to males (36%). This demographic distribution reflects a predominantly middle-aged, female study population.

Table 1. Frequency and Percentage Distribution of Study Participants According to Age Groups and Gender (n = 75)

Parameters	Number	Percentage
Age		
40-45 years	9	12

46-50 years	28	37.3
51-55 years	24	32
56-60 years	14	18.7
Gender		
Female	48	64
Male	27	36

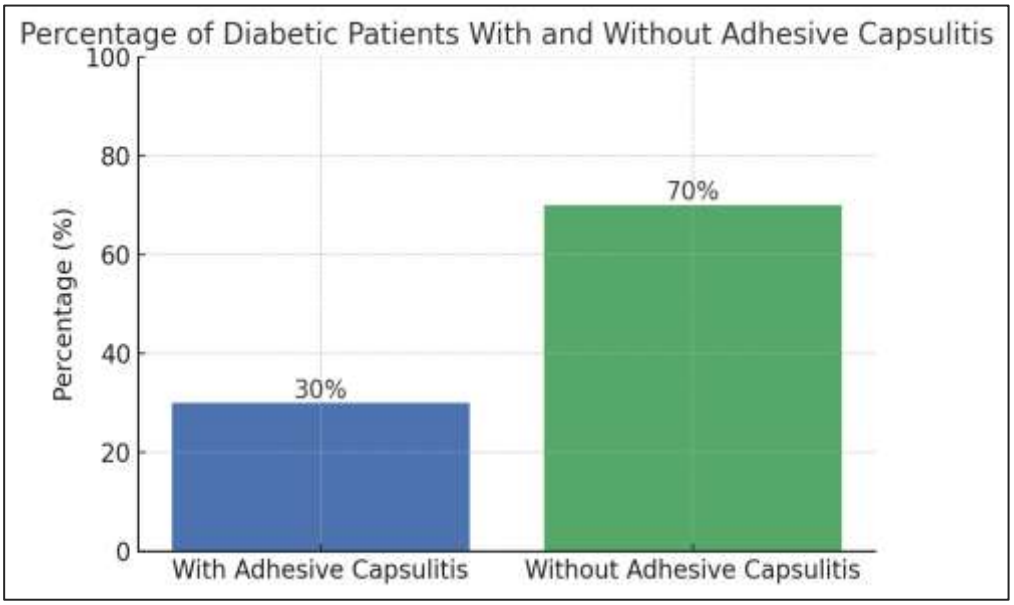

Figure I: percentage of diabetic patients diagnosed with adhesive capsulitis compared to those without the condition (n = 75)

Figure 1 illustrates the distribution of adhesive capsulitis among the diabetic patients in the study. Out of the total 75 patients, 30% (n = 23) were diagnosed with adhesive capsulitis, while the remaining 70% (n = 52) did not exhibit this condition. This indicates that nearly one-third of the diabetic population studied suffered from adhesive capsulitis, highlighting the clinical relevance of this musculoskeletal complication in diabetic patients.

Table 2 presents the gender distribution among patients diagnosed with adhesive capsulitis within the study sample. Of the 23 patients with adhesive capsulitis, a majority were female (60%), while males comprised 30% of the group. This suggests that adhesive capsulitis is more prevalent among female diabetic patients in this study.

Table 2. Number and Percentage of Patients with Adhesive Capsulitis According to Gender in the Study Sample (n = 23).

Gender	Number of Patients with Adhesive Capsulitis	Percentage (%) within AC group
Female	15	60
Male	8	30

Table 3 summarizes the intensity of shoulder pain experienced by patients with adhesive capsulitis, as measured by the Visual Analogue Scale (VAS). Among the 23 patients, none reported an absence of pain. Approximately 22% experienced mild pain, while the largest proportion (43.5%) reported moderate pain intensity. Notably, over one-third of patients (34.8%) suffered from severe pain.

Table3. Number and Percentage of Patients with Adhesive Capsulitis According to Pain Intensity Measured by Visual Analogue Scale (VAS) Scores (n = 23)

Visual analogue score	No. of patients	Percentage

0 (No pain)	0	0
1-3 (Mild pain)	5	21.7
4-6 (moderate pain)	10	43.5
7-10 (severe pain)	8	34.8

DISCUSSION

This study aimed to evaluate the intensity of shoulder pain in diabetic patients diagnosed with adhesive capsulitis (AC), a common and debilitating musculoskeletal complication frequently observed in this population. Our findings reveal a considerable prevalence of moderate to severe pain levels among patients with AC, underscoring the significant clinical impact of this condition in diabetic individuals.

The reported prevalence of adhesive capsulitis among diabetic patients in this study aligns with prior research. Ara Doly (2018) demonstrated a high prevalence of frozen shoulder among diabetic patients, corroborating our observation that nearly one-third of the diabetic cohort was affected by AC [15]. Similarly, Uddin et al. (2014) highlighted the greater tendency for diabetic individuals to develop frozen shoulder compared to non-diabetics, emphasizing the pathological link between diabetes and shoulder morbidity [16].

Musculoskeletal complications, particularly adhesive capsulitis, have been documented as common in diabetic populations attending tertiary care centers in Bangladesh [17, 18]. The underlying mechanisms have been linked to metabolic alterations inherent to diabetes, including chronic hyperglycemia, which induces glycation end products (AGEs) that modify collagen and connective tissue structure, resulting in stiffness and fibrosis [19, 20]. These biochemical changes compromise tendon and capsule elasticity, predisposing patients to the development of adhesive capsulitis [21, 22].

Our study further confirms the predominance of moderate to severe pain in AC patients, which may be attributed to these pathological tissue changes and associated inflammatory processes. Vlassara et al. (2002) described how glycotoxins elevate inflammatory mediators in diabetes, potentially exacerbating musculoskeletal pain and fibrosis [23]. De la Serna et al. (2021) provided a comprehensive overview of frozen shoulder's complex pathophysiology, including the role of inflammation and fibrosis, which likely contribute to the heightened pain severity observed in our diabetic patients [24].

Gender-wise, our findings resonate with earlier reports suggesting a higher prevalence of adhesive capsulitis in females with diabetes [25]. This gender disparity may be influenced by hormonal and metabolic factors affecting connective tissue integrity [26]. Additionally, Park et al. (2020) identified a positive association between elevated fasting glucose levels and the risk of adhesive capsulitis, even in normoglycemic populations, indicating a nuanced role of glucose metabolism in shoulder pathology [27].
The Visual Analogue Scale (VAS) proved to be an effective tool for quantifying pain intensity in this cohort, supporting its continued use in clinical assessment of musculoskeletal complications in diabetic patients [17]. Recognizing the severity of pain and its impact on functional limitation is essential for early intervention and rehabilitation planning.

Adhesive capsulitis represents a significant source of morbidity in diabetic patients, with pain intensity ranging predominantly from moderate to severe. The metabolic and inflammatory milieu of diabetes likely exacerbates tissue fibrosis and pain, necessitating targeted clinical strategies for timely diagnosis and management to improve patient outcomes.

CONCLUSION

Adhesive capsulitis is a common and painful musculoskeletal complication among diabetic patients, predominantly affecting middle-aged individuals and females. This study highlights that the majority of diabetic patients with adhesive capsulitis experience moderate to severe shoulder pain, significantly impacting their quality of life. Early recognition and assessment of pain intensity using tools like the Visual Analogue Scale are crucial for guiding appropriate management strategies. Addressing the

underlying metabolic and inflammatory factors in diabetes may help reduce the burden of adhesive capsulitis and improve functional outcomes in this vulnerable population.

Acknowledgments: I would like to sincerely acknowledge all contributors who played a vital role in the completion of this study.

Conflict of Interest: There are no conflicts of interest among the authors.

Source of Funding: None.

REFERENCES:

1. Laslett, L.L.; Burnet, S.P.; Jones, J.A.; Redmond, C.L.; McNeil, J.D. Musculoskeletal morbidity: The growing burden of shoulder pain and disability and poor quality of life in diabetic outpatients. Clin. Exp. Rheumatol. 2007, 25, 422–4292.
2. Zreik NH, Malik RA, Charalambous CP. Adhesive capsulitis of the shoulder and diabetes: A meta-analysis of prevalence. Muscles Ligaments Tendons J. 2016;6(1):26–34.
3. Smith LL. Musculoskeletal manifestations of diabetes mellitus. Br J Sports Med. 2003 Feb 1;37(1):30–5
4. Kiani, J.; Goharifar, H.; Moghimbeigi, A.; Azizkhani, H. Prevalence and risk factors of five most common upper extremity disorders in diabetics. J. Res. Health Sci. 2014, 14, 92–95.
5. Cade, W.T. Diabetes-related microvascular and macrovascular diseases in the physical therapy setting. Phys. Ther. 2008, 88, 1322–1335
6. Lebiedz-Odrobina, D.; Kay, J. Rheumatic manifestations of diabetes mellitus. Rheum. Dis. Clin. N. Am. 2010, 36, 681–699
7. World Health Organization; International Diabetes Federation. Definition and Diagnosis of Diabetes Mellitus and Intermediate Hyperglycemia: Report of a WHO/IDF Consultation; WHO: Geneva, Switzerland, 2006; Available online: https://www.who.int/publications/i/item/definition-and-diagnosis-of-diabetes-mellitus-and-intermediate-hyperglycaemia (accessed on 16 November 2016).
8. World Health Organization; International Diabetes Federation. Global Report on Diabetes; WHO: Geneva, Switzerland, 2016
9. Schnider, S.L.; Kohn, R.R. Effects of age and diabetes mellitus on the solubility of collagen from human skin, tracheal cartilage and dura mater. Exp. Gerontol. 1982, 17, 185–194
10. Snedeker, J.G.; Gautieri, A. The role of collagen crosslinks in ageing and diabetes—The good, the bad, and the ugly. Muscles Ligaments Tendons J. 2014, 4, 303–308.
11. Rodeo, S.A.; Hannafin, J.A.; Tom, J.; Warren, R.F.; Wickiewicz, T.L. Immunolocalization of cytokines and their receptors in adhesive capsulitis of the shoulder. J. Orthop. Res. 1997, 15, 427–436
12. Kaviratne, M.; Hesse, M.; Leusink, M.; Cheever, A.W.; Davies, S.J.; McKerrow, J.H.; Wakefield, L.M.; Letterio, J.J.; Wynn, T.A. IL-13 activates a mechanism of tissue fibrosis that is completely TGF-beta independent. J. Immunol. 2004, 173, 4020–4029.
13. Cho, C.-H.; Lho, Y.M.; Ha, E.; Hwang, I.; Song, K.S.; Min, B.W.; Bae, K.C.; Kim, D.H. Up-regulation of acid-sensing ion channels in the capsule of the joint in frozen shoulder. Bone Jt. J. 2015, 97, 824–829
14. Molsted, S.; Tribler, J.; Snorgaard, O. Musculoskeletal pain in patients with type 2 diabetes. Diabetes Res. Clin. Pract. 2012, 96, 135–140.
15. Ara Doly E. Prevalence of Frozen Shoulder among Diabetes Mellitus Patients: a cross cut survey. Orthop Rheumatol Open Access J. 2018;9(2):9–11
16. Uddin MM, Khan AA, Haig AJ, Uddin MK. Presentation of frozen shoulder among diabetic and non-diabetic patients. J Clin Orthop Trauma. 2014;5(4):193–8
17. Khan MSZ, Ahamed M, Hosain M, Doza AKMA, Pattern of Musculoskeletal Disorders among Diabetic Patients Attending a Tertiary Care Hospital in Dhaka. Ibrahim Med Coll J. 2018;2(2):65–6
18. Irin KN. Characteristics of Adhesive Capsulitis Among the diabetic patients. Bangladesh J Physiother. 2013;2007–8
19. Januszewski, A.; Alderson, N.; Metz, T.; Thorpe, S.; Baynes, J. Role of lipids in chemical modification of proteins and development of complications in diabetes. Biochem. Soc. Trans. 2003, 31, 1413–1416
20. DeGroot, J. The AGE of the matrix: Chemistry, consequence and cure. Curr. Opin. Pharmacol. 2004, 4, 301–305
21. Burner, T.; Gohr, C.; Mitton-Fitzgerald, E.; Rosenthal, A.K. Hyperglycemia reduces proteoglycan levels in tendons. Connect. Tissue Res. 2012, 53, 535–541

22. Thomas, S.J.; Sarver, J.J.; Yannascoli, S.M.; Tucker, J.J.; Kelly, J.D.; Ahima, R.S.; Barbe, M.F.; Soslowsky, L.J. Effect of isolated hyperglycemia on native mechanical and biologic shoulder joint properties in a rat model. J. Orthop. Res. 2014, 32, 1464–1470
23. Vlassara, H.; Cai, W.; Crandall, J.; Goldberg, T.; Oberstein, R.; Dardaine, V.; Peppa, M.; Rayfield, E.J. Inflammatory mediators are induced by dietary glycotoxins, a major risk factor for diabetic angiopathy. Proc. Natl. Acad. Sci. USA 2002, 99, 15596–15601
24. De la Serna, D.; Navarro-Ledesma, S.; Alayón, F.; López, E.; Pruimboom, L. A Comprehensive View of Frozen Shoulder: A Mystery Syndrome. Front. Med. 2021, 8, 663703
25. Ahmad S, Sohail Rafi M, Ahmed Siddiqui I, Hamidi K, Mujahid Faruq N, Ahmad S, et al. The Frequency of Adhesive Capsulitis in Diabetes Mellitus Patients. Pakistan J Rehabil. 2012;11(2):49–55
26. Kelley, M.J.; McClure, P.W.; Leggin, B.G. Frozen shoulder: Evidence and a proposed model guiding rehabilitation. J. Orthop. Sports Phys. Ther. 2009, 39, 135–148
27. Park, H.B.; Gwark, J.Y.; Kam, M.; Jung, J. Association between fasting glucose levels and adhesive capsulitis in a normoglycemic population: A case-control study. J. Shoulder Elb. Surg. 2020, 29, 2240–2247