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Comprehensive Analysis of Frozen Shoulder Management

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ABSTRACT

Background: Frozen shoulder (FS) is a painful and debilitating condition characterized by progressive stiffness and restricted shoulder movement. It primarily affects middle-aged individuals, with a higher prevalence in women and those with metabolic disorders such as diabetes and hypertension. While FS is self-limiting, lasting 1–3 years, timely medical management with physiotherapy and interventions can accelerate recovery. This study evaluates the demographic profile, comorbidities, and treatment outcomes of FS patients managed at a pain clinic over four years.

Methods: This retrospective cross-sectional study included patients with frozen shoulder during the painful phase, treated at Nepal Pain Care and Research Center (Oct 2020–Oct 2024). Conservative treatment included analgesics (NASIDs and Paracetamol), Duloxetine, and physiotherapy. Non-responders underwent ultrasound-guided hydrodistension with 5% dextrose, lignocaine, methylprednisolone, and suprascapular block. Outcomes were assessed based on pain reduction, shoulder mobility, and daily function.

Results: All 112 patients with frozen shoulder were initially treated with conservative management. Out of these, 100 patients (89.3%) showed significant improvement. However, 12 patients (10.7%) did not respond well to conservative treatment and were therefore ultrasound-guided hydrodistension was done. Among them, 10 patients (83.3%) experienced noticeable improvement, while 2 patients (16.7%) reported reduced pain but no improvement in their range of motion.

Conclusions: Conservative treatments proved effective in most cases (89.3%), while ultrasound-guided hydrodistension was beneficial for resistant cases (83.3%).

Keywords: Frozen shoulder; physiotherapy; hydrodistension.

INTRODUCTION

Frozen shoulder or adhesive capsulitis, is a condition marked by gradual pain, stiffness, and restricted movement in the shoulder joint. It is caused by inflammation and fibrosis of the glenohumeral joint capsule which leads to adhesions that restricting the mobility. It is self-limiting most of the time but it can significantly affect daily activities and hampers the quality of life.

[1]The prevalence is 2% to 5%, but it can rise up to 38% in with comorbidity, mainly diabetes and thyroid disorder. It commonly affects people aged 40-60 years, women being more susceptible.[2]

Frozen shoulder is categorized into primary (idiopathic) and secondary (associated with diabetes, thyroid disorder, trauma etc.). [3,4] Frozen shoulder has 3 phases: the painful (freezing) phase with constant pain, the adhesive (frozen) phase with predominantly stiffness, and the recovery (thawing) phase where mobility gradually returns. [5]

Diagnosis relies on clinical evaluation, sometimes supported by imaging. [6,7] Treatment focuses on pain relief and restoring movement, using physiotherapy, medications, corticosteroid injections, or, in severe cases, surgical options. [8] This study evaluates recovery rates in frozen shoulder patients undergoing conservative or interventional treatments and examines its relationship with age group, gender, and comorbid conditions.

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METHODS

This retrospective, cross-sectional descriptive study was conducted at the Nepal Pain Care and Research Center in Kathmandu. Ethical clearance was obtained from the Nepal Health Research Council (NHRC no - 1584).

The study included patients of all ages and both genders who were diagnosed with frozen shoulder during the painful (freezing) phase characterized by persistent shoulder pain between October 2020 and October 2024. Patients with incomplete records or those who were lost to follow-up were excluded. Each patient was considered a single sampling unit, and data were collected using a structured form from electronic medical records. Collected information included the patients' age, gender, associated medical conditions (such as diabetes, hypertension, COPD, thyroid issues, or inflammatory arthritis), treatment they received , and their treatment outcomes.

According to the clinic's standard protocol, conservative treatment consisted of medications and physiotherapy. Analgesics was provided with either Aceclofenac 100 mg twice daily or Celecoxib 90 mg once daily for 7 days, along with co-analgesics Duloxetine 20 mg daily for 2 months. Patients were also advised to perform shoulder mobilization exercises twice daily for 8 weeks. If conservative management didn't bring adequate relief and or range of movement of shoulder joint, patients underwent an ultrasound-guided hydrodistension of the shoulder joint. This involved injecting 25-35 ml of fluid (15-25ml 5% dextrose and 10ml of 1% lignocaine), combined with 40 mg of methylprednisolone into the joint capsule.In all cases, a USG-guided suprascapular block with 3ml of 1% lignocaine and was administered before hydrodistension.

Evaluation of the effectiveness of treatment based on three key outcomes: reduction in shoulder pain, improvement in mobility, and the ability to perform daily activities. To categorize improvement, we used predefined cutoff values: for pain, a reduction of at least 2 or more points on the Numeric rating score (NRS) was considered clinically decrease in pain. For mobility, an improvement of at least 30° in shoulder flexion or abduction was considered significant. Based on these thresholds, treatment outcomes were classified as either "improvement" or "no improvement". Patients who did not meet these criteria were classified under the "no improvement" category.

The follow-up data from patient records, including a period of up to six months after the initial management. Confidentiality of the patient information was maintained during the collection of the data. All data were entered into SPSS version 21, descriptive analysis was done and data presented as proportions, frequencies, and percentages.

RESULTS

Over a four-year period, a total of 126 patients presented to the pain clinic were initially enrolled in the study. Of these, 6 patients did not meet the inclusion criteria, and 8 were lost to follow-up. Therefore, 112 patients were included in the final analysis.

All 112 patients with frozen shoulder were initially treated with conservative management. Out of these, 100 patients (89.3%) showed significant improvement. However, 12 patients (10.7%) did not respond well to conservative treatment and were therefore given ultrasound-guided hydrodistension. Among them, 10 patients (83.3%) experienced noticeable improvement, while 2 patients (16.7%) reported reduced pain but no improvement in their range of motion.

A significant majority of frozen shoulder patients were female, accounting for 79((70.5%) compared to 33 (29.5%) of males. The most commonly affected age group was 40-60 years 55(49.1%), followed by 20-40 years 50 (44.6%), while those above 60 years were the least affected 7(6.3%), figure 1 and 2.

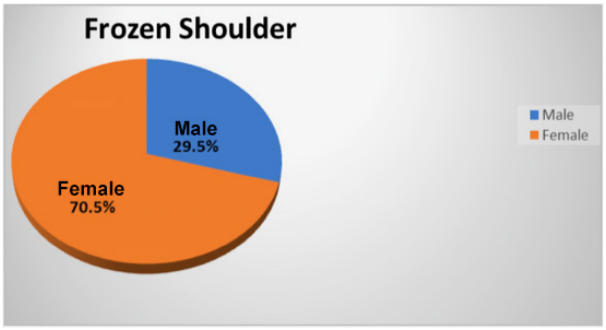

Figure 1. Occurrence of frozen shoulder according to gender wise distribution.

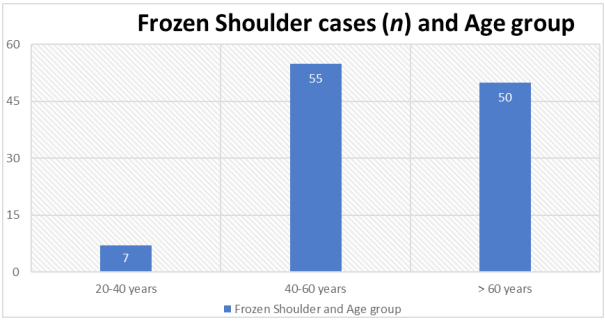

Figure 2. Case numbers according to age group.

A majority of frozen shoulder patients (68.8%) had at least one comorbidity. Among these, diabetes was the most common, affecting 18.8% of patients, followed by hypertension at 16.1%. Additionally, 12.5% of patients had both hypertension and diabetes, as shown in Tables 1 and 2.

Table 1. Comorbidities and frozen shoulder.

	Frequency	Percentage
Presence	77	68.8
Absence	35	31.2
Total	112	100

Table 2. Occurrence of frozen shoulder with different comorbidities.

Comorbidities	Frequency	Percentage
Diabetes	21	18.7
Hypertension	18	16.1
Hypothyroid	9	8
Inflammatory arthropathy	3	2.7
COPD	2	1.8
Diabetes + Hypertension	14	12.5
Diabetes + Hypothyroid	2	1.8
Hypertension +Hypothyroid	6	5.4
Diabetes+ Hypertension + Hypothyroid	2	1.8
Total	**77**	**68.8**

DISCUSSION

This study provides valuable insights into the demographic profile, comorbidities, and treatment outcomes of frozen shoulder patients managed at a pain clinic over a four-year period. Our findings align with previous research, highlighting the higher prevalence of frozen shoulder among females (70.5%) compared to males (29.5%). The majority of cases were observed in individuals aged 40-60 years (49.1%), which supports the well-documented association of frozen shoulder with middle age.

Abudula X et al[9] also found that adhesive capsulitis, predominantly affects middle-aged individuals, with a higher incidence in women. Studies indicate that the condition is most common between the ages of 40 and 60, with a peak incidence around 55 years. The exact reasons for female papulation have high prevalence of FS not fully understood, but hormonal changes during menopause are believed to be a contributing factor.[10] In our study also we found most common comorbidity being a diabetes followed by hypertension. A significant proportion (68.8%) of patients had at least one comorbidity, with diabetes mellitus being the most common (18.8%), followed by hypertension (16.1%). These findings corroborate existing literature that suggests metabolic disorders, particularly diabetes and thyroid dysfunction, increase the risk of developing frozen shoulder. The coexistence of diabetes and hypertension was noted in 12.5% of cases. Zreik NH et al[11] found that 10-30% of people with diabetes develop frozen shoulder. High blood sugar leads to the formation of advanced glycation end-products, which contribute to chronic low-grade inflammation. This inflammation triggers fibrosis (thickening) of the shoulder joint capsule, making movement difficult. [12] Similarly, hypertension also plays a role by causing chronic inflammation, changes in connective tissue metabolism, microvascular dysfunction, and alterations in tissue mechanics, all of which contribute to shoulder stiffness. [13]

In terms of treatment modalities, conservative management (combination of oral duloxetine for 1-3 months and physiotherapy) remained the primary modality, with 93.8% of patients receiving medications and physical therapy. Among these, 95.2% showed significant improvement. While duloxetine is not universally considered the first-line pharmacological agent for adhesive capsulitis, there are good evidence supporting its role in managing chronic musculoskeletal pain, including chronic painful shoulder conditions. In addition to duloxetine, nonsteroidal anti-inflammatory drugs (acelofeanac, Celecoxib) and paracetamol were commonly used for pain relief, particularly during the early (freezing) phase. Physical therapy, including range-of-motion exercises and manual therapy, was a core component of conservative management across all cases.

These results are consistent with research by Levine W.N. et al. [14] and Vastamaki H. et al. [15], who also reported around a 90% success rate with similar treatments. Frozen shoulder naturally improves over time, typically taking 1 to 3 years to fully resolve. However, our findings, like previous studies, indicate that a combination of physiotherapy and medication can speed up recovery, helping patients regain function and reduce pain within 6 months to a year[16]. This highlights the value of conservative treatment in providing faster relief and better mobility

In our study, 6.2% of patients underwent interventional treatment, primarily through ultrasound-guided hydrodistension, with an impressive 85.7% improvement rate. Although the number of patients receiving this treatment was relatively small, the outcomes were promising, suggesting that this approach can be an effective option for managing frozen shoulder. Our posterior hydrodistension technique aligns with the method used by Dimitri-Pinheiro et al. [17] , who combined normal saline, lidocaine, bupivacaine, and triamcinolone. Their study reported excellent long-term results for adhesive capsulitis. Initial years of study , we used normal saline, lignocaine, and methylprednisolone, but later used 5% dextrose instead of NS as studies favored towards 5% dextrose.

The value of early interventional management is supported by research from Challoumas D et al.[18], who conducted a systematic review and meta-analysis comparing various frozen shoulder treatments. They found that intra-articular corticosteroid injections within the first year of symptom onset led to better outcomes, especially when combined with a structured home exercise program. Our findings align with this approach, as patients who received interventions in our study followed up with physiotherapy for 1–2 months, reinforcing the importance of post-procedure rehabilitation to maintain and enhance mobility. Similarly, Huang YH et al.[19] compared patients receiving a combination of hydrodilatation, corticosteroid injections, and physiotherapy with those undergoing physiotherapy alone. Their results showed that the combined approach was more effective, with benefits lasting at least six months. This supports our observation that interventional treatments, when paired with physiotherapy, can accelerate recovery and provide sustained relief. While conservative management remains a highly effective primary option, our findings, along with existing literature, suggest that targeted interventions can offer significant benefits, especially for patients with persistent or severe symptoms.

The use of 40 mg methylprednisolone in our hydrodistension protocol is well supported by current evidence. Multiple studies and meta-analyses have shown that intra-articular corticosteroid injections can significantly reduce pain and improve shoulder mobility in patients with frozen shoulder, especially during the early, painful phase. These benefits are most noticeable within the first 12 to 24 weeks and are often greater than those seen with physical therapy alone. Furthermore, combining corticosteroids with hydrodistension appears to enhance outcomes by addressing both inflammation and capsular tightness. The chosen dose of 40 mg falls within the commonly used and studied range in the literature.[20-21]

Being a retrospective analysis, it relies on existing electronic records, which may introduce information bias. Additionally, the follow-up duration was limited to six months, and longer-term outcomes were not assessed.

CONCLUSIONS

This study concludes that frozen shoulder is particularly common among middle-aged women and is closely associated with metabolic conditions. Most patients responded very well to conservative treatments like NSAIDs, duloxetine, and physiotherapy, with 89.3% showing significant improvement. In cases that were resistant to initial treatment, ultrasound-guided hydrodistension also found to be effective, with an 83.3% success rate.

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