Abstract:

**Background:** The signs and symptoms of adhesive capsulitis, another name for frozen shoulder, include shoulder joint stiffness and pain. Conventional rehabilitation methods concentrate on enhancing shoulder range of motion and minimizing discomfort. It has been suggested that by enhancing scapular kinematics and muscle activation patterns, scapular stabilization exercises can improve functional outcomes.

**Objective:** This study aims to evaluate the functional outcomes of a scapular stabilization exercise program in individuals receiving rehabilitation for frozen shoulder.

**Methods:** Forty people who had been diagnosed with frozen shoulder participated in a randomized controlled trial. One of two groups the scapular stability exercise group (Group A) or the standard rehabilitation group (Group B) was assigned at random to each participant. The eight-week intervention consisted of five thirty-minute sessions, held five times a week. For eight weeks, Group A supplemented their traditional range-of-motion exercises with scapular stabilization exercises. Sessions lasted thirty minutes, consisted of ten repetitions each, and were conducted five days a week. Group B carried on with just traditional workouts. Functional outcomes were assessed using the Numerical Pain Rating Scale (NPRS), Goniometry for range of motion tests, and the Disability Associated with the Arm, Shoulder, and Hand (DASH) questionnaire at the beginning of the experiment. Follow-up assessments were carried out after the eight-week intervention phase.

**Results and Conclusion:** When compared to the control group, the scapular stabilization group showed better results in terms of reduced discomfort and increased mobility. This implies that adding scapular stabilization exercises to the adhesive capsulitis treatment regimen could result in improved therapeutic outcomes. Larger sample sizes and longer follow-up times are required for future study in order to confirm these results and improve adhesive capsulitis patient’s treatment plans.

**Keywords:** Adhesive Capsulitis; NPRS; DASH; Scapular Stabilization; ROM exercises.

**Introduction:**

Adhesive capsulitis, commonly referred to as frozen shoulder, is a widespread musculoskeletal condition marked by shoulder joint pain and limited range of motion. This disorder affects around 2-5% of the
population, with a higher occurrence in people aged 40 to 60 years. There are three phases to the condition's progression: freezing, frozen, and thawing. Each has unique clinical characteristics and presents unique rehabilitation obstacles. The typical presentation of adhesive capsulitis is gradual onset shoulder discomfort and stiffness that is often made worse by movement and activities. Individuals may experience problems reaching across the body, behind the back, or overhead, which could impair their ability to perform everyday tasks. During a physical examination, tenderness over the glenohumeral joint capsule and restricted shoulder range of motion, particularly in external rotation and abduction, may be noted. Diagnostic imaging modalities such as magnetic resonance imaging (MRI), ultrasound, and plain radiography can help identify Adhesive Capsulitis by excluding other potential causes of shoulder discomfort and stiffness, such as glenohumeral arthritis or tears in the rotator cuff. Capsular thickening, elevated signal intensity on T2-weighted imaging, and obliteration of the axillary recess are MRI findings suggestive with Adhesive Capsulitis. With dynamic examination, ultrasound may show diminished capsular distensibility and hypoechoic thickening of the joint capsule. Adhesive capsulitis is a difficult condition marked by increasing shoulder stiffness and pain, significantly impairing function. While the exact pathophysiology of adhesive capsulitis remains unclear, current research suggests it involves a complex interplay of fibrotic, inflammatory, and metabolic processes. The goals of management techniques are to reduce discomfort, increase shoulder mobility, and improve functional outcomes by combining conservative treatments with surgical surgery in cases where conservative measures are not effective.

Several approaches are used to treat adhesive capsulitis, based on the individual patient's functional limitations and symptoms. Conservative techniques like intra-articular injections, oral analgesics, and physical therapy are commonly employed as first-line remedies. With the use of progressive resistance training, range-of-motion exercises, and stretching, physical therapy seeks to increase shoulder strength and mobility. Electrical stimulation, heat, and cold therapy are examples of modalities that can help reduce symptoms. Surgical intervention may be explored as a means of releasing fibrotic adhesions and restoring shoulder mobility in cases that do not respond to conservative therapy. Targeted debridement of adhesions is possible with arthroscopic capsular release, reducing soft tissue damage and healing time following surgery. In extreme situations with significant capsular fibrosis or concurrent shoulder pathology necessitating open surgical access, open capsular release may be necessary. Stretching, pain management, and passive and active range of motion exercises are usually the mainstays of traditional frozen shoulder rehabilitation. These methods, however, frequently ignore the scapula's crucial function in shoulder mechanics. The pathophysiology of frozen shoulders may be influenced by abnormalities in scapular motion, which is crucial for shoulder mobility and stability. Exercises for scapular stabilization are designed to improve scapular kinematics and muscle function, which may have a positive impact on patient outcomes and total shoulder function.

Proper positioning and alignment of the scapula are essential for enhancing shoulder strength, stability, range of motion, and overall functional capability. Recent research has increasingly highlighted the significance of scapular control in shoulder musculoskeletal disorders. In daily activities, the scapula acts as a vital link...
between the upper limb and the axial skeleton. For upper extremity tasks, proximal stability is provided by muscles connected to the scapula. Shoulder dysfunction may result from a neuromuscular performance impairment caused by the scapular musculature's inability to stabilize the scapula. Patients with functional decline and reduced shoulder joint mobility, such as those with rotator cuff injuries, AC, and shoulder impingement syndrome, can benefit from the scapular stabilization exercise. Therefore, in the rehabilitation of patients with shoulder discomfort and issues, rehabilitation exercises that increase the stability of the scapula can be very helpful.

**Need of the Study:**

Adhesive capsulitis, presents a number of challenges for clinical practitioners and significantly lowers patient quality of life, making research into this condition essential. For public health treatments and resource allocation to be effective, an understanding of the disease's epidemiology and burden of disease is essential. Furthermore, developing targeted treatments and achieving better treatment outcomes require an understanding of the underlying pathophysiological mechanisms of adhesive capsulitis. Furthermore, resolving diagnostic obstacles and discovering trustworthy biomarkers can improve early detection and enable prompt care, eventually lowering the long-term morbidity connected to this crippling illness. Exercise therapy may help persons with adhesive capsule syndrome manage their discomfort and regain their range of motion, coordination, and control. This research aims to assess the usefulness of scapular stabilization exercises for treating frozen shoulders.

**Scope of study:**

This study's scope includes a thorough examination of adhesive capsulitis’ epidemiology, pathophysiology, diagnostic techniques, and therapeutic strategies. The objective of this research is to offer significant insights into the management of frozen shoulder by investigating the prevalence and burden of the condition, clarifying the underlying mechanisms that lead to its development, and assessing the available diagnostic techniques and treatment options. This study also aims to provide possible directions for future research, fill in knowledge gaps, and improve clinical care for patients with adhesive capsulitis.

**Methodology:**

**Study Design:** 40 patients were included in the experiment, and each group had 20 volunteers. For eight weeks, Group A the experimental group performed traditional range-of-motion exercises in addition to scapular stabilization exercises (30 minutes, 10 repetitions per day, five days a week). Group B, on the other hand, carried on with just traditional workouts.

**Source of data:**

Prakash Hospital, Yatharth Hospital, and Joint Studio Physiotherapy Clinic are located in Greater Noida.

**Selection Criteria:**

**Inclusion Criteria**

When selecting the sample data for the current study, the following factors were considered.

1. Individuals with frozen shoulders.
2. Individuals should be 30-50-year-olds.
3. Individuals with limited shoulder range of motion.
4. A written and informed consent form for study subjects to participate.

**Exclusion Criteria**
The exclusion of sample information from the current investigation was based on the following considerations.
1. Individuals who have had shoulder surgery.
2. Individuals with prior scapular fractures.
3. Individuals with rotator cuff tears.

**Study Sampling Design, Method and Size:**
The study's participants were chosen using simple random selection in accordance with the inclusion and exclusion criteria. Information gathered in two stages. NPRS, DASH, and goniometry were used to assess both groups' pain and mobility during the first phase. During eight weeks, the subjects engaged in exercise during the second phase.

**Follow Up:**
After 8 weeks, subjects underwent NPRS, DASH and goniometry. The following parameters were employed in the statistical analysis and comparison:

**NPRS (Numerical Pain Rating Scale)**
(r= .79 – .96)
The Numerical Pain Rating Scale (NPRS) is a subjective assessment tool used by individuals to quantify their pain levels on an eleven-point numerical scale. This scale ranges from 0 (indicating no pain) to 10 (representing the highest level of pain) 3.5

**DASH (Disabilities of the Arm, Shoulder and Hand) questionnaire**
The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire is a standardized tool developed to evaluate an individual's capabilities and limitations in daily living and work-related activities. One indicates no problem, two indicates light difficulty, three indicates considerable difficulty, four indicates extreme difficulty, and five indicates incapacity. The DASH assigns a score for each module that goes from 0 to 100; a high score indicates a substantial impairment.

**Goniometry**
A goniometer was used to measure the shoulder's active range of motion (ROM) in flexion, extension, abduction, adduction, internal rotation, and external rotation.

**Duration of study:** 8 weeks

**Methodology/Plan of Work:**
The study involved forty individuals, split into two groups of twenty each. Exercises for scapular stabilization and range of motion were conducted by Group A. Group B exclusively engaged in traditional range-of-motion exercises. Before the protocol was implemented, each participant signed an informed consent form. Next, goniometry, the NPRS, and the DASH questionnaires were used to assess the patients' mobility, pain, and
limitations in their leisure activities. Following an evaluation of the patients' discomfort, mobility, and limitations during leisure activities, an exercise program was designed for them. Following eight weeks, the patients' mobility, pain, and limitations in their leisure activities were evaluated using goniometry, the NPRS, and the DASH questionnaire, respectively. Mobility, pain, and limitations in leisure activities were compared between the two groups prior to and during the intervention, where appropriate. Pain is assessed using the Numeric Pain Rating Scale (NPRS), mobility is evaluated with goniometry, and limitations in leisure activities are measured using the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire.

Data Analysis:
A graphic was created using the collected data. Statistical methods were used to analyze the data from both baseline and post-intervention assessments. Pairwise t-tests or Wilcoxon signed-rank tests were conducted to compare values within the same group (pre- and post-intervention). For comparisons between groups, independent t-tests or Mann-Whitney U tests were utilized. Software called SPSS was used for data analysis.

Result:
On examination of results, it was seen that in Group A the mean DASH score decreased significantly from 46.1 before treatment to 18.7 after treatment. This improvement suggests a substantial reduction in disability and better functional outcomes following the intervention.

Similarly, in Group B the mean DASH score in the control group decreased from 45.7 to 24.2. While this group also showed improvement, the reduction in DASH scores was not as pronounced as in the experimental group.

<table>
<thead>
<tr>
<th>GROUP A</th>
<th>GROUP A</th>
<th>GROUP B</th>
<th>GROUP B</th>
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<tbody>
<tr>
<td>PRE DASH SCORE</td>
<td>POST DASH SCORE</td>
<td>PRE DASH SCORE</td>
<td>POST DASH SCORE</td>
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<tr>
<td>Mean: 46.1</td>
<td>18.7</td>
<td>45.7</td>
<td>24.2</td>
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<td>Standard Deviation: 3.62</td>
<td>4.75</td>
<td>4.16</td>
<td>4.9</td>
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Comparison between Mean and Standard Deviation of Dash Score of Group B

<table>
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<tr>
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<th>GROUP A PRE NPRS</th>
<th>GROUP A POST NPRS</th>
<th>GROUP B PRE NPRS</th>
<th>GROUP B POST NPRS</th>
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<tbody>
<tr>
<td><strong>Mean:</strong></td>
<td>8.1</td>
<td>2.35</td>
<td>7.75</td>
<td>4.9</td>
</tr>
<tr>
<td><strong>Standard Deviation:</strong></td>
<td>0.88</td>
<td>0.88</td>
<td>0.79</td>
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Comparison Between Mean and Standard Deviation of NPRS Score of Group A
Comparison between Mean and Standard Deviation of NPRS Score of Group B

Interpretation of above charts show that Pre-treatment NPRS of the experimental group A started with a slightly higher average NPRS score (8.1) compared to the control group B (7.75). Post-treatment NPRS, both groups showed a significant decrease in NPRS scores, with the experimental group averaging 2.35 and the control group averaging 4.4. The experimental group showed a higher standard deviation of improvement (2.15) compared to the control group (1.32), suggesting greater variability in treatment response within the experimental group.
Comparison Between Mean and Standard Deviation of Dash Score of Experimental and Controlled Group

Thus, in comparison to the control group, the experimental group showed a more notable improvement in NPRS and DASH scores, suggesting that the treatment intervention was more successful in lowering disability and enhancing functional outcomes. Based on the DASH ratings, it appears that the scapular stabilization exercise intervention was effective in lessening the impacts of musculoskeletal disorders.

Conclusion:

To sum up, our research adds to the increasing amount of data demonstrating the effectiveness of scapular stabilization exercises in improved functional results, lowering discomfort, and increasing mobility in people with [insert ailment]. These results emphasize the need of treating scapular stability as a fundamental element of shoulder rehabilitation plans and draw attention to the potential advantages of customized exercise regimens in terms of improving patient outcomes. Healthcare professionals can better fulfil the rehabilitative needs of patients with shoulder dysfunction and promote optimal musculoskeletal health and function by using scapular stabilization exercises into their therapeutic practice. Further study endeavors focused on improving exercise regimens, pinpointing the most effective treatment approaches, and clarifying fundamental mechanisms will propel our comprehension of the function of scapular stabilization workouts in shoulder recuperation and maintaining musculoskeletal health.

References:

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