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Physiotherapy treatments on the shoulder range of motion of people with frozen shoulder

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Abstract

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Frozen shoulder is an inflammatory condition. The main symptoms are stiffness, pain, and dysfunction in the joint of shoulder. Frozen shoulder condition has three stages: freezing, frozen, and thawing. In the population, 2%-5% have a Frozen shoulder. Oral medicine, physiotherapy, hydrodilatation, steroid injection, and surgery treatment are used for the frozen shoulder condition.

This bachelor's thesis focused on articles released after 2019 on frozen shoulder conditions. After searching the database, six articles were finalised to be evaluated in this thesis. These selected studies target to combine physiotherapy effects on shoulder range of motion. They used regular physiotherapy exercises with mobilization techniques, manipulation techniques, and stretching exercises. Combining physiotherapy treatments effectively reduces pain and increases shoulder function and the range of motion of frozen shoulder patients.

The results of all the considered studies showed that there is an impact from physiotherapy exercises which can help to improve shoulder range of motion in frozen shoulder patients.

In conclusion, physiotherapy treatment affects the shoulder range of motion of frozen shoulder patients.

Keywords: Range of motion, Frozen shoulder, Physical therapy

Contents

1 Introduction

Frozen shoulder, known as adhesive capsulitis, is an inflammatory condition leading to stiffness, pain, and dysfunction in the shoulder (Angelo, Taqi, and Fabiano 2023.) Frozen shoulder pain impacts daily activities, and it is getting reduction of the quality of life. Frozen shoulder condition that is different from arthritis. This condition affects to reducing the mobility of the shoulder joint (D'Orsi, Via, Frizziero, and Oliva 2012.)

Frozen shoulder condition has three stages: freezing, frozen, and thawing. It involves an initial stage of freezing that takes 2 to 9 months and is accompanied by a gradual onset of severe shoulder pain that intensifies at night. Frozen stage, which is 4 to 12 months with reduced pain and slowly reduced shoulder joint movement range. The final stage is a tawing stage, where shoulder mobility goes down in a 12 to 42 months period. (Dias, Cutts, and Massoud 2005.) Frozen shoulder generally resolves in one year or three, but in some critical cases, it continues to present with mild symptoms with pain. (Maund et al. 2012.)

In the population, 2%-5% recorded frozen shoulder condition, and most patients are between ages 40 – 60. Many reported cases involve females it's over about 20% – 30%. Patients with frozen shoulder have witnessed its incidence in their opposite limbs (Binder et al. 1984). 20% -30% reported of history of minor trauma. Pathology of the frozen shoulder has been linked to different conditions, like diabetes, thyroid disease, autoimmune disease, and breast cancer. Bowman, Jeffcoat, Pattrick, and Doherty 1988.)

Frozen shoulder is a clinical diagnosis made based on a physical examination and medical history is often a diagnosis of exclusion. Usually, frozen shoulder patients present with shoulder pain followed due to loss of active and passive range of motion due to fibrosis of the joint capsule. 90.6% of patients reported that shoulder pain developed before loss of motion. Offen, external rotation the

is first motion affected according to the clinical examination, with a consistent general reduce of range of motion as the disease progresses. Pain at the end range is usually worse when the joint capsule is stretched. Passive range of motion is lost with persistent, painful end range of motion, suggesting a mechanical rather than pain-related limitation to movement. (Le, Lee, Nazarian, and Rodriguez 2016.)

Various physiotherapy methods are used to manage frozen shoulder. Mobilisations, stretching exercises, therapeutic exercises, and soft tissue mobilisation, are normally used interventions to treat frozen shoulder patients. (Chan, Pua, and How 2017) The shoulder joint consists of ligaments, muscles, and joint capsules well supplied with mechanoreceptors the joints. The shoulder joint of capsular lesions can result in reduced sensitivity of the receptors, which can result in loss of proprioceptive and neurologic feedback response. (Ager et al 2019.)

The purpose of this thesis is to find out the impact of physiotherapy on a frozen shoulder range of motion.

2 Background

2.1 Shoulder Joint

The shoulder biomechanics is highly complex. The shoulder joint is composed of four joints, these are glenohumeral, acromioclavicular, scapulothoracic, and sternoclavicular. In the human body, the glenohumeral joint is the most mobile and it has 6 degrees of freedom. Translation of humeral head on the glenoid might improve mobility and it can also lead to impingements and instability. Shoulder joint stability is based on soft tissue stabilisers, dynamic stabilisers, and bone morphology. (Goetti et al. 2020.)

2.2 Frozen shoulder

Frozen shoulder condition is painful, and this shoulder joint pain runs over more than 3 months. The inflammatory condition causing glenohumeral joint capsule fibrosis is caused by developed stiffness and signification restriction of shoulder mobility. Patients may experience sudden symptoms a slow recovery phase, and normally stiff on shoulder joint. The recovery takes up to 2 to 3 years. (Hubbard, Hildebrand, Battafarano, and Battafarano 2018.)

2.3 The pathophysiology of frozen shoulder

The pathology of frozen shoulder is still not fully discovered, but recent evidence suggests that the condition is from a combination of inflammatory and fibrotic processes. Macroscopic manifestations of a frozen shoulder include contraction and decrease of the synovial layer of the capsule, inflammation, thickening of the rotator cuff and coracohumeral ligament, decreased capsule volume, and adhesion of the axial recess walls to themselves and the humerus. Histological analysis reveals a fibrotic process defined by fibroblasts immersed in a type I and III collagen matrix. The presence of myofibroblasts was correlated with the development of capsular contracture. hypothesis suggests that collagen metabolism dysregulation may result in abnormal

metalloproteinases and tissue inhibitor expression in affected tissues. In inflammatory cytokines, neonervation, and neoangiogenesis in capsules, elevated expression of intracellular adhesion molecule-1 a transmembrane protein associated with the inflammatory response has been in frozen shoulder patients. (Picasso et al. 2023.)

2.4 Treatments for frozen shoulder

Common conservative medical treatments are oral medicine, physiotherapy, steroid injection, hydrodilatation, and surgery. Initial conservative treatment is successful in up to 90% of the patients. Oral medicine like NSAIDs (nonsteroidal anti-inflammatory drugs) is used for the condition but has no positive effect, but oral glucocorticoids show early benefits on the condition. Given steroid injections for rapid pain relief in the freezing phase, physiotherapy is commonly used as an initial treatment. Various physiotherapy treatment methods are used for frozen shoulder conditions. Other treatment methods and exercises restore shoulder mobility. Hydrodistension is the injection of a large volume of saline, steroid, local anesthetic, and contrast agent into the shoulder joint, with immediate pain and improvement of shoulder range of motion. (Cho, Bae, and Kim 2019.)

Home exercises and traditional physiotherapy are used to treat frozen shoulder conditions. (Hsu, Anakwenze, Warrender, and Abboud 2011.) Physiotherapy treatment helped reduce the pain and back to return functional mobility and leading to an increased range of motion in the shoulder joint (Page and Labbe 2010.) Before starting the exercise, applying heat or ice modality helps to improve muscle extensibility (Järvinen, Järvinen, Kääriäinen, Kalimo, and Järvinen 2005.) Also strengthening exercises helps to maintain muscle strength. Strengthening exercises can include isometric exercises to resistant band exercises with a weight machine or free weight. (Chan et al. 2017.)

3 Aim and Method

3.1 Aim

This bachelor’s thesis aim is to find out the effects of physiotherapy on the shoulder range of motion of people who have frozen shoulder.

3.2 Method

This bachelor’s thesis focused on articles released after 2019 on frozen shoulders. The most recent research publications were used. The study used searches on databases PubMed, and PEDro. English-language publications were used to minimise errors and searches.

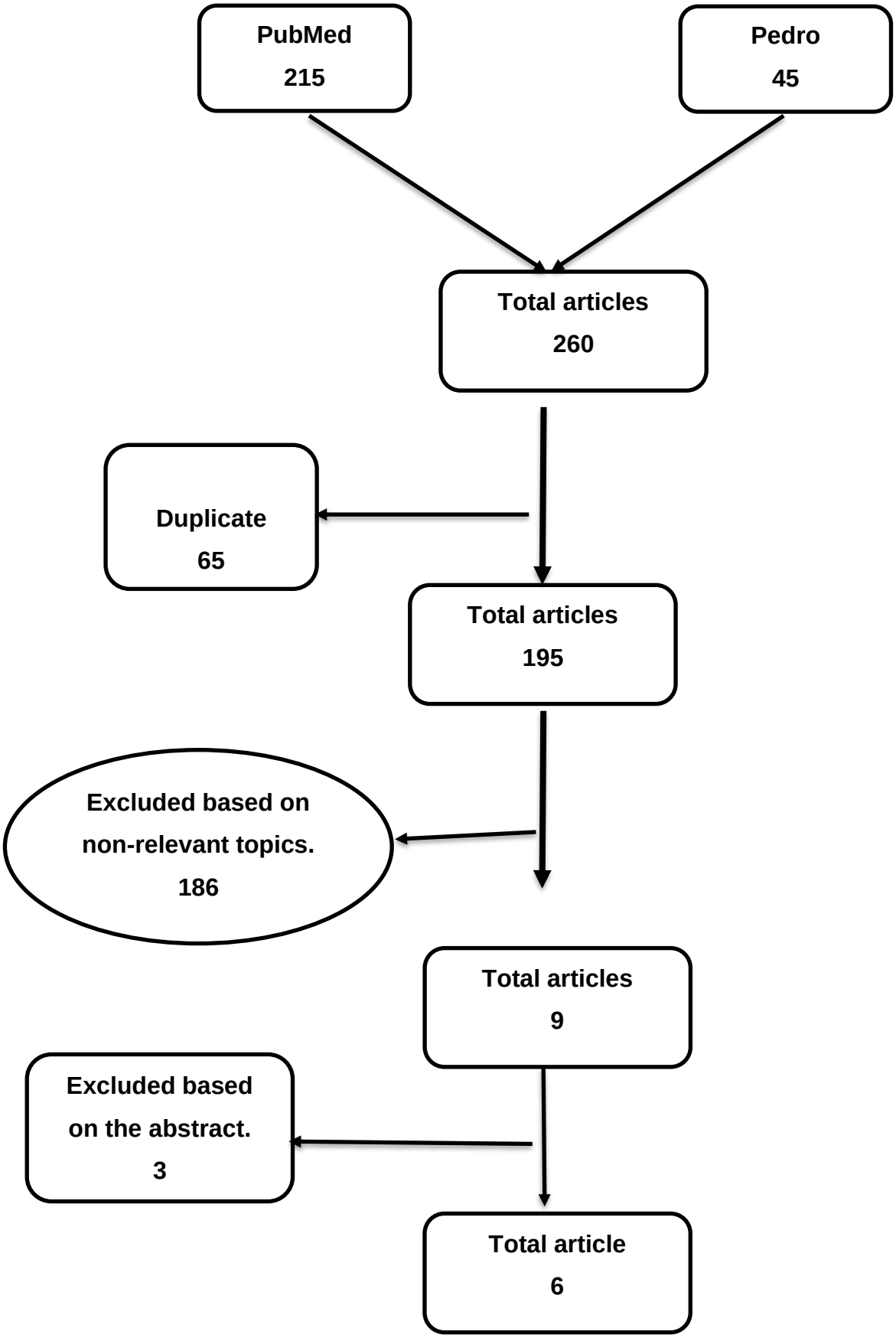
The following search words were used mainly "adhesive capsulitis" OR "frozen shoulder" AND "physical therapy" OR physiotherapy AND "range of motion”.

This search word used different methods on each database. PubMed used two methods “frozen shoulder" OR "adhesive Capsulitis" AND "physical therapy" AND "range of motion” and “adhesive capsulitis" OR "frozen shoulder" AND physiotherapy AND "range of motion”. For PEDro use four methods, adhesive capsulitis AND physiotherapy AND range of motion, adhesive capsulitis AND physical therapy AND range of motion, frozen shoulder AND physiotherapy AND range of motion, and frozen shoulder AND physical therapy AND range of motion.

Table 1: Inclusion and Exclusion criteria used in the thesis.

	Inclusion criteria	**Exclusion criteria**
Publication Date	Research articles published after the year 2019.	Research articles published before the year 2019
Language	Research articles published in English	Research articles published not English
Method	Relevant studies based on the topic	Irrelevant studies based on the topic
Contents	Range of Motion, Physical therapy, Adhesive capsulitis, Frozen shoulder, Physiotherapy	Articles not related to Range of Motion, Physical therapy, Adhesive capsulitis, Frozen shoulder, Physiotherapy.

Figure 1. Study flow chart.



After searching the database, 260 publications were selected for this thesis. Out of these 260 publications, 65 publications were removed due to duplicates. A total of 195 articles were selected for screening. Of these 195 publications, 186 were removed after reading the headline. Based on the abstract, 3 articles from 9 studies were excluded. Only six articles remaining to be evaluated were considered acceptable.

4 Results

Six articles were finalised to be evaluated in this thesis. The articles are between the years of 2019 and 2024.

Table 2: Results Summary

Authors and the Year	Purpose of the study	Methods	Participants	Intervention	Results and Conclusion
Wang, Yu, Zhang, Wu, Li, and Chen 2023	Evaluate the effectiveness of neuromuscular exercise over regular strengthening exercise, reduce pain, and improve range of motion in frozen shoulder patients.	Randomised control trial	Forty participants were frozen shoulder patients from a regional hospital	Forty frozen shoulder patients were recruited from December 2021 to May 2022. Assigned to NME plus regular physiotherapy or regular physiotherapy with strengthening exercises and assessment conducted at baseline	No significant differences in demographics between groups, but neuromuscular exercise combined with regular physiotherapy such as stretching, joint mobilisation, and the impact of the active range of motion in frozen shoulder patients. is more

				and 8 weeks post-intervention	effective for pain relief and improved range of motion in individuals with frozen shoulder. Combine physiotherapy treatment with higher effective function of the shoulder joint.
Kuanar,Sonalika, Nayak, and Pattanayak 2022	Evaluate shoulder joint range of motion, assess the efficacy of stretching and strengthening exercise, and determine the correlation between post-test range of motion and selected demographic variables.	Randomised control trial	The study randomly allocated 30 frozen shoulder patients into two groups: an intervention group and a control group.	This study, a randomised controlled trial, involved 30 patients from the Physiotherapy and Orthopaedics OPDs of Kalinga Institute of Medical Sciences, Pradyumna Bal Memorial Hospital, Bhubaneswar, Data collection tools included	The study compared frozen shoulder treatment and control groups, revealing a significant difference in performance between the experimental group, which included older participants, males, and graduates, and better shoulder and range of motion tests. According to the results stretching

				socio-demographic, Oxford Shoulder Score, and Goniometer Range. The Pre-test assessed the range of motion in frozen shoulder patients, followed by post-test and analysis	and strengthening exercises improve shoulder joint range of motion and significant experimental group compared to control group.
Walling,Kalita, and Dutta 2020	Investigating the effectiveness of Kaltenborn posterior glide and coracohumeral ligament positional stretching for frozen shoulder patients' range of motion in the shoulder joint.	Randomised control trial	Involved 30 patients with frozen shoulder patients.	30 patients with frozen shoulder were recruited, and this group was divided into two groups, 15 patients were treated with regular physiotherapy treatment combined with Kaltenborn posterior glide and coracohumeral Ligament Positional	The study found both groups had significantly improved the range of motion in the shoulder joint and shoulder function, but according to the VAS scale results, pain did not reduce major.

				Stretching, and other group B was treated with regular physiotherapy and shoulder pendular exercise.	
Bilal, Khalid, Anwar, Arshad, and Ahmed 2021	Evaluate the effect of thoracic manipulation on frozen shoulder pain, range of movement, and shoulder joint function.	Randomised control trial	For this study, participants were 32 frozen shoulder patients from a rehabilitation department of HHIRS Mansehara recruited between March 2020 and August 2020.	The group was divided into Groups A (control group) and B (experiment group) randomly. Group A received regular physiotherapy treatments. The experiment group was reserved for usual physiotherapy exercises with thoracic manipulation.	Both Groups showed significant improvement a range of motion and VAS scores after intervention. Combine conventional physiotherapy exercise with thoracic manipulation effect to improve active range of motion and decrease shoulder pain.

Razzaq, Nadeem, Akhtar, Ghazanfar, Aslam, and Nawaz 2022	The Study investigates the impact of muscle energy technique and mulligan mobilization on a range of motion, pain, and disability in frozen shoulder patients.	Randomised control trial	Involved aged 30-70-years patients with stage 2 frozen shoulder from July to December 2018.	The study combined the Mulligan technique and muscle energy techniques in two groups, with physiotherapy treatments. Post–intervention range of motion, pain, and disability.	Out of 70 patients assessed, both techniques showed significant improvement, but Mulligan mobilisation showed. significantly more improvement in the current study. Mulligan technique and muscle energy techniques were effective for the shoulder joint range of motion.
Inglese et al. 2024	The study aimed to the effectiveness of standardised shoulder manipulation with brachial plexus block, improved range of motion, reduced pain,	Randomised control trial	For this study, participants 110 stage 3 frozen shoulder patients were enrolled between July 2020 and July 2022.	Patents under two assessments, before and 4 months after treatment. Measurements were collected based on the numerical rating scale, shoulder joint test, and	The results presented numerically and positively significantly recorded in reduction of pain and improved capability range of motion was statistically substantially increased for each movement high

	and improved shoulder function.			pain of range of motion in the shoulder and joint function.	increases were observed in the extra rotation range of motion

Forty frozen shoulder patients from the regional hospital participated in this study from between December 2021 to May 2022. This group was divided into an experimental group and a control group. The experimental group received regular physiotherapy and neuromuscular exercise, and the control group reserved regular physiotherapy exercises and strengthening exercises. This treatment plan was done for 8 weeks. In this study, they used a VAS (Visual analog scale) scale to measure pain, and a HUBER360 machine was used to evaluate the active range motion in the shoulder joint. After intervention According to VAS scale results major differences showed in pain after intervention. HUBER360 machine measurements, there was a significant improvement shoulder joint of range of motion. This study's results showed that combined physiotherapy intervention reduces pain and increases the range of motion in shoulder joints in patients with frozen shoulder. (Wang et al. 2023.)

In a study 30 frozen shoulder patients participated. According to a study where 30 frozen shoulder patients participated, 40% of them were 51-60 of age and the remainder were 40 -50 years. In both groups, the majority were right-side affected and most of them were non-vegetarian. This group was divided into the intervention group and the control group. The intervention group gained stretching & strengthening 10-15 minutes with 10 repetitions for 2 times a day for 3 weeks. The experimental group while the control group received regular care for 3 weeks. The results showed that there was a significant improvement in shoulder function and range of motion in the experiment group. (Kuanar et al. 2023.)

For a study, 30 frozen shoulder patients participated. The group was separated into the experimental group and the control group. The experiment group received regular physiotherapy treatment combined with Kaltenborn posterior glide. Coracohumeral ligament positional stretching and the control group received shoulder pendular exercises with regular physiotherapy treatments. The experiment, group had a major deferent between pre and post intervention measurements in the goniometer and VAS scale (Visual analog scale). The

experiment group had significant improvement in the range of motion in the shoulder joint and the Visual analog scale measure showed reduced pain. The control group showed a significant improvement in the range of motion in the shoulder joint. Based on the results, inter group analysis showed significantly different improvements in the range of motion of the experiment group. (Walling et al. 2021.)

32 frozen shoulder patients aged 40 -60 years, participated in this study. The study was carried out between March to August 2023. The participants grouped A and B (control group and experiment group). The control group had regular conventional physiotherapy treatment and the experiment group had regular physiotherapy treatment with thoracic manipulation exercise. This intervention proceeded for 3 weeks. This study used the Visual analog scale and DASH scale (Disabilities of the Arm, Shoulder, and Hand) measure to pain and range of motion. According to the DASH (Disabilities of the Arm, Shoulder, and Hand) score, after the 2nd-week group's A and B showed significant differences between the pre- and post-intervention in the range of motion in the shoulder joint. After 3 weeks, the results of the Visual analog scale and (Disabilities of the Arm, Shoulder, and Hand (DASH) score results showed d significant reduction of pain and an improvement range of motion. Conventional physiotherapy treatment along with thoracic manipulation improves disability pain intensity and range of motion. (Bilal et al. 2021.)

62 frozen shoulder patients were recruited between July to December 2018 from the Mayo Hospital Physiotherapy Department of Lahore Pakistan, in a study carried out by Razzaq et al. 2022. The participants were in the age 30 -70 years stage frozen shoulder patients including this sample group. This group was divided into Group A and Group B. Group A received regular physiotherapy treatment with Mulligan mobilisation. Group B received regular physiotherapy treatment and muscle energy techniques. This study used a numeric pain rating scale (NPRS) to measure pain and a goniometer and shoulder pain and disability index (SPADI) to measure the range of motion and function in the

shoulder joint. Comparing pain between groups A and B according to the numeric pain scale, after post-intervention both groups showed a decrease the pain. Shoulder pain and disability index results showed group A has significant improvement in with group B. According to the results, Mulligan mobilisation and muscle energy technique were effective in improving shoulder joint range motion and functional activity. (Razzaq et al. 2022.)

In the different study, one hundred ten frozen shoulder patients were. The female-to-male ratio was 44: 66, and eighty-five patients in total were identified with primary frozen shoulder. 12% of patients were having bilateral frozen shoulder. As per the numerical pain rating scale, results showed pain reduction after the intervention. According to a range of motion data, there was a significant improvement in each motion. The results of this study demonstrated that shoulder manipulation treatment along with brachial plexus block helps to improve the range of motion, reduce pain, and increase shoulder function in stage 3 frozen shoulder patients. (Inglese et al. 2024.)

5. Discussion

This thesis selected six researches on different types of physiotherapy treatments for frozen shoulder patients, the main goal of this study was to find out the effect of physiotherapy treatment on the shoulder range of motion of frozen shoulder patients. All articles suggest that a combination of physiotherapy treatments interventions impacts well in improvement in the range of motion of the shoulder joint of frozen shoulder patients. Manipulation, mobilisation, and stretching exercises were the interventions discussed in the considering these articles.

The main aims of Wang et.al. 2023, and Kuanar et al. 2023 were to study the impact of physiotherapy to improve the range of motion in frozen shoulder

patients. They used regular physiotherapy treatments along with neuromuscular exercises, stretching, and strengthening exercises. According to the results, it was clear the that range of motion of frozen patients was significantly improved by these combined treatments. Additionally, the pain in the shoulder was reduced, and joint functions were improved.

Studies by Walling et.al. 2021 and Razzaq et al. 2022, are mainly concerned with the effect of mobilisation exercise along with physiotherapy treatment for shoulder function in frozen should patients. Walling et.al. utilized Kaltenborn posterior glide and coracohumeral ligament positional stretching techniques and results showed that the range of motion and shoulder function improved by this technique. Muscle energy technique and Mulligan mobilization used by Razzaq et al. The results suggested that the range of motion and pain were improved by this technique.

Manipulation technique with physiotherapy was impacted on frozen shoulder patients and was studied by Bilal et al. 2021 and Inglese et al. 2024. The effect of thoracic manipulation was studied by Bilal et al. 2021. According to the results, it was clear that thoracic manipulation combined with regular physiotherapy treatment helped to improve the shoulder range of motion with physiotherapy treatment. When applied brachial plexus block along with shoulder manipulation will improve the range of motion in frozen shoulder patients according to Inglese et al. 2024.

In conclusion, the results of all the considered studies showed that there is an impact from physiotherapy exercises can help to improve shoulder range of motion in frozen shoulder patients.

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