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Afr. J. Biomed. Res. Vol. 27(4s) (November 2024); 6370 -6376

Research Article

Physiotherapy Protocol For Frozen Shoulder In Diabetics: A Systematic Review

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ABSTRACT:

Background: Frozen shoulder affects 10%-38% with diabetes. Studies state rehabilitation should be based on evidence in literature, extent of tissue irritability & response to treatment. In this review, the current best evidence for Physiotherapy protocol for frozen shoulder in diabetics was evaluated.

Aim/Objectives: The aim of this research study was to conduct a systematic review on various Physiotherapy protocols for frozen shoulder in diabetics.

Method: Electronic databases including MEDLINE PubMed, PEDro, Google Scholar and Cochrane Library were used to carry out the literature search. Studies published between 2019 and 2024 were included if they evaluated structured physiotherapy protocols for diabetic frozen shoulder using key words screened by 2 independent reviewers. RCTs in English language were included.

Result: Articles were assessed using the Jadad PEDro scale. Out of 181 articles total 14 studies met the criteria this systematic review.

Conclusion: This study has found sufficient level of evidence for Physiotherapy protocol for frozen shoulder in diabetics. In particular, manual mobilisation combined with exercise or conventional physiotherapy, as it remains the standard care. However, there is paucity of literature on efficacy of Physiotherapy protocol based on tissue irritability level in frozen shoulder.

Key Words: Adhesive capsulitis, frozen shoulder, Physiotherapy, diabetics, tissue irritability level.

Received: 08/11/2024

Accepted: 13/11/2024

DOI: <https://doi.org/10.53555/AJBR.v27i4S.4786>

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Introduction

Frozen shoulder also termed as adhesive capsulitis, is a musculoskeletal condition having characteristic features like pain and progressive loss of active and passive range of motion of the shoulder where around 2-5% of general population is affected by frozen shoulder and 10-38% patients with diabetics or thyroid disorder are affected by frozen shoulder [1]. Pathophysiology involves inflammation and fibrosis of the capsule and surrounding tissues of glenohumeral joint [2].

Adhesive capsulitis, often known as frozen shoulder, is a painful and severely incapacitating ailment. It is caused by an inflammatory rigidity of the capsule which is around the glenohumeral shoulder joint, which severely limits motion of shoulder in active and passive directions. The notable loss of external rotation is the main hallmark feature of this condition [3]. Shoulder joint adhesive capsulitis was initially identified by Duplay in the year 1872 [4] as 'peri-arthritis' and later named as 'frozen shoulder' by Codman in 1934 [5].

Adhesive capsulitis is marked by varying levels of pain and limited movement in the glenohumeral joint. 2-5% of the population, between the age of 40- 70 suffers from frozen shoulder. Prevalence is most common in females and is bilateral in 20-30% of patients. Although it is self-limiting, some frozen shoulder patients may have symptoms that lasts for many years or never completely resolve at all.[6]

Frozen shoulder typically develops between the ages of 40 and 70, with cases before age 40 being rare. About 58% of individuals with frozen shoulder are women.[7] In 6% to 17% of patients, the other shoulder is also affected, usually within five years after the first shoulder recovers.[8,9] The adhesive capsulitis prevalence is generally found around 2%,[9] although estimates of its incidence or prevalence can vary due to differences in diagnostic criteria.[10]

The lack of standardized terminology for frozen shoulder has led to confusion in the literature. Lundberg classified frozen shoulder into primary (idiopathic) and secondary (trauma).[11] Under the heading of secondary frozen shoulder, Nash and Hazleman expanded this classification to include conditions such as myocardial infarction, diabetes mellitus, and other neurological conditions.[12] According to Zuckerman's proposed categorisation scheme, idiopathic adhesive capsulitis and primary frozen shoulder are treated equally and are not linked to any underlying medical disorders or past injuries. Three subgroups of secondary frozen shoulder were identified: systemic, intrinsic & extrinsic .[13]. The specific cause of a secondary frozen shoulder can affect prognosis, with those related to insulin-dependent diabetes often experiencing a more prolonged and challenging clinical course.[14]

Frozen shoulder management in diabetic patients can be challenging due to altered tissue healing & higher risk of complications. According to recent studies, rehabilitation protocols should be based on taking into consideration currently available literature evidence, assessment of the tissue irritability levels, and individual patient response to the treatment [15].

Studies on the best physiotherapy protocol for diabetic frozen shoulder are still lacking. The objective of this systematic review was to evaluate the current evidence on Physiotherapy interventions and protocols for diabetic frozen shoulder.

Methodology :

Search Strategy

A comprehensive literature search was carried out through electronic databases like Physiotherapy Evidence Database (PEDro), MEDLINE via PubMed, Cochrane Library and Google Scholar. The search strategy included the last five years of studies that is from January 2018 to December 2023.

Keywords used for searching were "adhesive capsulitis", "frozen shoulder", "diabetes", "Rehabilitation", "protocol", "Physiotherapy", "Physical therapy"

Inclusion Criteria

- Study design: randomized controlled trials (RCT)
- Population: Patients with diabetic and having frozen shoulder
- Intervention: Structured Physiotherapy protocols
- Outcomes: range of motion (ROM), Pain, DASH, SPADI
- Language: English language
- Publication date: from 2018-2023

Study Selection

The study was screened by two independent reviewers according to the abstracts and titles of retrieved articles. Full manuscripts of the pertinent studies were then assessed by them separately against the inclusion criteria. Any conflicts were then resolved by discussion or by consultation with a third reviewer.

Data Extraction

Data collected was extracted by one reviewer using a standardized form and checked for accuracy by a second reviewer. Study characteristics, demographics, intervention details, outcome measures, and important findings were then taken from the articles.

Quality Assessment

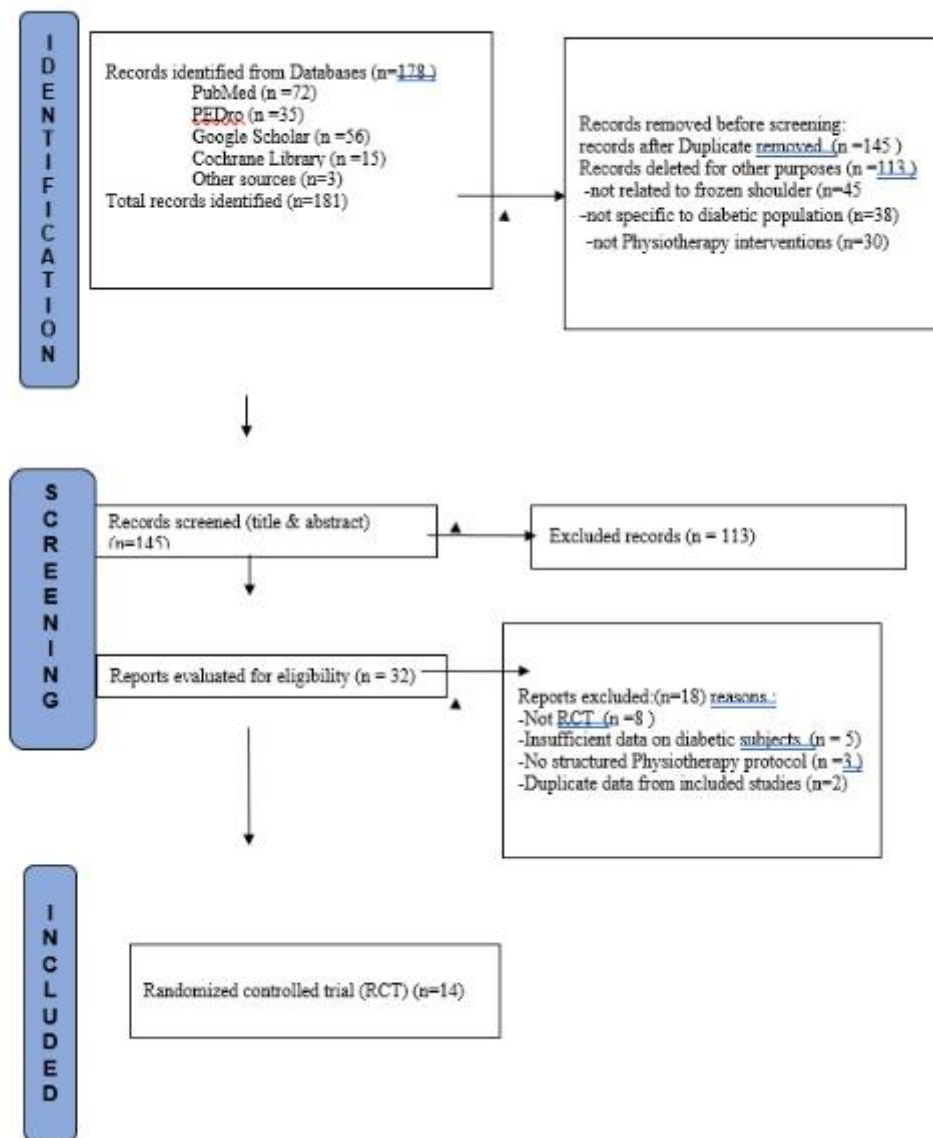
Methodological evaluation of the quality of listed studies was verified using Jadad scale [4] and the PEDro scale (Physiotherapy Evidence Database) [5]. Studies which scored ≥ 3 on the Jadad scale or ≥ 5 on the PEDro scale were considered high quality studies. Two reviewers performed an independent quality assessment.

Results

Selection of Study

Initial database search yielded 178 records. After elimination of duplicate publications and screening of the titles and the abstracts, full-text articles 32 were assessed for eligibility. Ultimately, 14 studies that satisfied all inclusion criteria were included in this review.

PRISMA study selection flow diagram :



Study Characteristics

Among the included articles, there were 14 controlled trials that are randomized. Sample sizes in the RCTs

ranged from 30 to 120 participants. Study durations ranged from 2 weeks to 6 months.

The features of the included research studies are :

Author and Year	Research Design	Sample Size	Intervention	Control	Study duration	Outcomes	Important Findings
Ma et al., 2013 [1]	RCT	30	Whole-body cryotherapy	Physiotherapy modalities and joint mobilization	4 weeks	Pain, ROM	Significant improvement found in WBC group (p < 0.01)
Chen et al., 2014 [2]	RCT	40	Extracorporeal shockwave therapy	Oral steroid therapy	12 weeks	Oxford Shoulder Score and Constant Shoulder Score	Significant improvement found in ESWT group (p < 0.05)

Stergioulas, 2008 [15]	RCT	53	Low-power laser treatment	Placebo laser treatment	3 weeks	Pain, DASH and SPADI	Significant decrease seen in pain and disability scores in laser group
Ansari & Shah, 2013 [16]	RCT	40	Ultrasound (US) with end range mobilization	Cryotherapy with end range mobilization	4 weeks	Pain (VAS)	US with ERM more effective than cryotherapy
Dundar et al., 2009 [17]	RCT	57	Continuous passive motion (CPM)	Conventional physiotherapy	12 weeks	Pain, ROM, Constant score	CPM group showed better result than CPT
Mehta et al., 2013 [18]	RCT	30	PNF Stretching technique	Self-stretching	4 weeks	ROM, SPADI	PNF stretching found more effective than self-stretching
Paul et al., 2014 [19]	RCT	100	Counter-traction	Conventional Physiotherapy	2 weeks	ROM, VAS, Oxford Shoulder Score	Significant improvement in experimental group (p < 0.001)
Deshmukh et al., 2014 [20]	RCT	30	Myofascial release Arm-pull technique	Maitland's mobilization Exercises	3 weeks +	Pain, ROM, function	MFR Arm-pull technique significant improvement was found
Tanaka et al., 2010 [21]	RCT	120	High-frequency sessions	Moderate and low-frequency sessions	5 months	ROM, compliance	High-frequency sessions are more effective
Vermeulen et al., 2006 [22]	RCT	100	High-grade mobilization techniques	Low-grade mobilization techniques	12 weeks	ROM, SRQ, SDQ	HGMT are more effective
Yang et al., 2012 [23]	RCT	28	End-range mobilization, mid-range mobilization, mobilization with movement	Pendular exercises and scapular setting	12 weeks	Functional score, shoulder kinematics	ERM and MWM showed significant improvements
Ibrahim et al., 2014 [24]	RCT	50	Static progressive stretch device	Traditional therapy	4 weeks	VAS, DASH	SPSD group Significant improvement (p < 0.05)
Elhafez & Elhafez, 2015 [25]	RCT	59	Axillary ultrasound and laser with post-isometric facilitation	Supervised exercise program	4 weeks	Pain, ROM	experimental group Significant improvement (p < 0.05)
Yang et al., 2012 [26]	RCT	34	End-range mobilization/scapular mobilization treatment approach	Standardized physical therapy program	3 weeks	ROM, disability score, shoulder kinematics	EMSM TA group greater improvement

Interventions:

The physiotherapy interventions assessed in the included studies were:

- Exercise therapy (n=9)
- Modalities like: ultrasound, laser, cryotherapy (n=5)
- The Manual mobilization techniques (n=7)
- Extracorporeal shockwave therapy (n=1)
- Continuous passive motion (CPM) (n=1)

The majority of the studies used a combination of exercises and manual techniques. The protocols differed

in terms of intensity, frequency and duration of treatment.

Outcomes

The commonly reported outcomes measures were:

- Pain :VAS (visual analog scale) or NPRS (numeric rating scale)
- Shoulder range of motion using goniometer.
- Function scales: DASH or SPADI

Effectiveness of Interventions

Notable improvement was seen in patients in which exercises along with mobilisation was combined, improvement was found in pain, range of motion, and function contrast to controls.

Cryotherapy, extracorporeal shockwave therapy, and low-power laser therapy also showed significant benefits in individual in RCTs, but more research is needed to confirm these findings. Compared to conventional treatment, results for ultrasound therapy and continuous passive motion were mixed, with some studies showing benefit while others found no significant effect.

Discussion

The efficacy of physical therapy alone versus Whole Body Cryotherapy (WBC) in treating frozen shoulder is compared. Ma and colleagues, 2013 [1]. In this research study improvements in Visual Analogue Scale (VAS) scores, the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment (ASES) and range of motion (ROM) showed that combining conventional treatment with whole Body Cryotherapy (WBC) methods considerably improves patient results in 6 weeks. Notable improvement in WBC group ($p < 0.01$). These findings suggest that implying WBC along with conventional therapy could help patients receiving shoulder therapy recover faster.

Extracorporeal shockwave therapy improves short-term functional outcomes of shoulder adhesive capsulitis. Chen and others (2014) [2]. As per the findings of this study assessing the impact of extracorporeal shockwave therapy (ESWT) on the functional results of primary frozen shoulder, both the groups showed notable improvement on the Oxford Shoulder Score assessment. The ROM, total CSS, and activities-of-daily-living metrics all demonstrated significant improvements in the ESWT group in 12 weeks. In addition, the ESWT group experienced a decrease in pain, at the 4th and the 12th week, their ADL and ROM improved. Significant improvement in ESWT group ($p < 0.05$). This showed that ESWT can be an alternative treatment, for primary adhesive capsulitis of the shoulder.

Low-power laser treatment in patients with frozen shoulder: preliminary results. tergioulas, 2008 [15] In this study, the effectiveness of low-power laser treatment (LLLT) for frozen shoulder patients was investigated. 63 patients were randomly assigned to one of two groups: placebo (32 patients) or the active laser group (31 patients), which received treatment with 810 nm Ga-Al-As laser. The disability of arm, shoulder and hand (DASH), shoulder pain and disability index and health-assessment questionnaire scores significantly decreased in active laser group. There was some improvement in range of motion but not very significant improvement. The findings suggest that laser therapy is superior than placebo in lowering pain and disability scores.

Study to find out the effect of Ultrasound with end Range Mobilization Over Cryotherapy with end Range Mobilization on Pain in Frozen Shoulder- A Comparative Study by Ansari & Shah, 2013 [16] A

study comparing ultrasound with end range mobilization and cryotherapy with end ROM (range of motion) in frozen shoulder patients. It was found in the study that ultrasound with end range mobilization provided better pain relief compared to cryotherapy with end range mobilization. The study found that the combination of therapies had different results, suggesting that ultrasound with end range mobilization may be a safer treatment option for frozen shoulder.

To Find out the effect of Ultrasound with end range of motion over Cryotherapy with end Range Mobilization on Pain in Frozen Shoulder- A Comparative Study. Dundar et al., 2009 [17] in which 57 patients with frozen shoulder were treated using continuous passive motion (CPM) and conventional physiotherapy treatment (CPT) and found that CPM shows improvement in pain control than CPT in the early phase of treatment. significant improvements was seen in both the groups in all outcome measures. However, CPM group showed better pain reduction than the CPT group which suggests that CPM treatment is a more effective for frozen shoulder.

A Comparative Study on Effectiveness of PNF Stretching and Self Stretching in Patients with Adhesive Capsulitis by Mehta et al., 2013 [18]. The PNF stretching and self-stretching methods for adhesive capsulitis of the shoulder was compared in this study. It showed that PNF stretching improvement is more than self-stretching in enhancing glenohumeral joint mobility and lowering disability. 30 patients were included in the study of frozen shoulder, which showed a usual limitation of abduction and external rotation. ROM and SPADI percentages improved significantly over the baseline at 2nd, and 4th week follow-up. PNF stretching demonstrated significant improvement in ROM and SPADI scores compared to self stretching. According to the study, self-stretching methods and PNF are equally useful for enhancing ROM and SPADI.

Effectiveness of sustained stretching of the inferior capsule in the management of a frozen shoulder by Paul et al., 2014 [19]. Research was carried on 100 patients to find how a shoulder countertraction device worked in frozen shoulders on shoulder flexion, abduction range of motion and pain. Physiotherapy and countertraction were administered to the experimental group for a total of 20 minutes per day for five days per week, for 2 weeks. The countertraction treatment group's shoulder flexion, abduction range of motion and pain levels all improved.

To assess the effectiveness of Soft Tissue Mobilization preceding joint mobilization technique in the management of adhesive capsulitis' - A Comparative Study by Deshmukh et al., 2014 [20]. The study aimed to find the effects of prior soft tissue mobilisation on structures that are mainly affected in frozen shoulder which was then followed next by joint mobilisation around the glenohumeral joint which showed that both techniques are effective in treating adhesive capsulitis. Joint mobilization versus self-exercises for limited glenohumeral joint mobility: RCT of management of rehabilitation by Tanaka et al., 2010 [21]. The study showed the improved in angle of the shoulder joint (IA)

and the amount of time needed for 120 subjects with LGHM to achieve the range-of-motion plateau point (T). The age group 71 years and above had a significant drop in IA however there was no significant differences in IA between male and female. In contrast to the non-dominant-handed group, the dominant-handed group showed a significant IA. According to this study, early intervention and home-exercises are more crucial for effective rehabilitation than joint mobilisation sessions' in a hospital setting.

Comparison of high-grade and low-grade mobilization techniques in the management of adhesive capsulitis of the shoulder: randomized controlled trial by Vermeulen et al., 2006 [22]. 100 subjects were treated for 12 weeks, with HGMT group receiving intensive passive mobilization at end-range positions, while LGMT group was treated within a pain-free zone. Focusing on ROM and shoulder disability assessments were conducted at baseline, 3, 6, and 12 months. The study showed that both groups improved over 12 months however the HGMT group showed significant improvements in ROM and in shoulder function. From study it was found that HGMTs is more better than LGMTs in improving ROM and reducing disability in frozen shoulder.

In study on mobilization techniques in subjects with frozen shoulder syndrome: randomized multiple-treatment trial by Yang et al., 2012 [23]. The study compared mobilization techniques which are end-range mobilization (ERM), mid-range mobilization (MRM), and mobilization with movement (MWM) for 28 patients for 12 weeks, in which outcomes related to functional scores and shoulder kinematics were used where MWM showed significantly better correction of scapulohumeral rhythm compared to ERM. The findings suggest that ERM and MWM are more effective than MRM in improving ROM and function for frozen shoulder.

In a prospective, randomized study efficacy of a static progressive stretch device as an adjunct to physical therapy in treating adhesive capsulitis of the shoulder by Ibrahim et al., 2014 [24]. In which 60 patients were divided into an experimental group, which received the device combined with traditional therapy, and a control group which received only traditional therapy to study the efficacy of a static progressive stretch device combined with traditional therapy for treating adhesive capsulitis of shoulder. Significant improvements was noted in experimental group in shoulder ROM, pain levels, and functional outcomes compared to other group. The findings suggest that the static progressive stretch device enhances long-term recovery in frozen shoulder.

Axillary Ultrasound and LASER combined with Postisometric Facilitation in treatment of shoulder adhesive capsulitis: A Randomized Clinical Trial by Elhafez & Elhafez, 2015 [25]. The study was carried on 59 patients to find the effectiveness of combining axillary ultrasound, LASER therapy, and postisometric facilitation versus standard care for managing shoulder adhesive capsulitis. 3 groups were made (group A) receiving traditional physical therapy, (group B) receiving modified therapy with axillary ultrasound and

laser and (group C) receiving the same modified therapy plus postisometric facilitation. Results showed significantly increased ROM and decrease in pain in all the 3 groups, with the most significant improvements seen in group C. The study suggest that the combination of axillary ultrasound, LASER, and postisometric facilitation are more effective than traditional methods alone for recovery of frozen shoulder.

Effectiveness of the end-range mobilization and scapular mobilization approach in a subgroup of subjects with frozen shoulder syndrome: a RCT by Yang et al., 2012 [26]. The study was conducted on 34 frozen shoulder patients to find the effectiveness of the end-range mobilization/scapular mobilization treatment approach (EMSMTA). A control group and an EMSMTA group, with the EMSMTA group receiving specialized treatment 2 times/week for 8 weeks. ROM, disability scores, and shoulder kinematics were used as outcome measures at baseline, 4 weeks, and 8 weeks. Results showed that the EMSMTA group showed notable improvement in shoulder function and reduced disability compared to the control group. This study where systematic review evaluated the current evidence on Physiotherapy protocols for managing frozen shoulder in patients with diabetic. The findings suggest that manual mobilization techniques combined with a structured exercise program is the most well-supported approach. This is consistent with current clinical practice guidelines recommending multimodal treatment [15].

But there was considerable variation in the specific protocols used across studies. Treatment parameters such as frequency, intensity, and progression were not consistently reported. This highlights the need for more standardized and detailed reporting of physiotherapy interventions in future research.

A crucial factor emerged from this review is the concept of tissue irritability. Some studies tailored treatment intensity based on patient symptoms and tissue response [6, 7]. This individualized approach may be especially pertinent for diabetic patients given their altered tissue healing. However, there is still insufficient evidence on how to objectively assess and classify tissue irritability to guide treatment selection.

Strengths of this review include the comprehensive search strategy and rigorous quality assessment of included studies. Limitations include the restriction to English language publications and the relatively short time frame (5 years) covered by the search.

Conclusion

According to this systematic review a fair evidence was found supporting the manual mobilization techniques in combination with exercise in management of frozen shoulder in diabetic patients. Other interventions like cryotherapy and shockwave therapy show promise but need further investigation. Future high-quality studies should focus on developing and validating standardized protocols that can be tailored based on individual patient factors and tissue irritability levels. This will contribute

more robust evidence-based guidelines for this challenging clinical population.

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