

RESEARCH REPORT

COMPARISON OF EFFECTIVENESS OF MOBILIZATION AND SELF-EXERCISES IN ADHESIVE CAPSULITIS OF SHOULDER

ABSTRACT

OBJECTIVE

To compare the effectiveness of mobilization and self-exercises in the management of adhesive capsulitis of shoulder

STUDY DESIGN

Randomized Control Trial

SAMPLE SELECTION

30 patients of adhesive capsulitis of shoulder from physiotherapy department of tertiary care hospitals of Karachi were selected through simple random sampling technique.

PROCEDURE

Treatment was continued for 5 days per week for the period of 3 weeks followed by assessment. Patients were randomly divided into two equal groups. Group A was treated with midrange mobilization while group B performed self-exercises. Both groups received TENS and hot pack prior to the exercises. Mean \pm SD, frequencies and percentages were used for descriptive analysis. ROM via goniometry and pain intensity through VAS was analyzed by paired t-test within the groups and by independent t-test between the groups, using SPSS. P-value of less than 0.05 was considered significant.

RESULTS

60% were females (n=18) and 40% were males (n=12) with mean age of 50.17 ± 6.37 years. Significant improvement (p-value <0.05) in pain and shoulder ROM was observed among patients of Group A as compared to Group B. Pain intensity was decreased to 1.67 ± 0.62 in group A, whereas ROMs in these patients were also better than other group.

CONCLUSION

Joint mobilization is more effective than self-exercises in reducing pain and increasing ROM of patients of adhesive capsulitis of shoulder.

KEYWORDS

Adhesive Capsulitis, Mobilization, Self-exercises, VAS, ROM, Frozen Shoulder

Muhammad Usman Khan

Assistant Professor
Ziauddin College of Rehabilitation Sciences
Ziauddin University
m_khanusman@hotmail.com

Ghazala Noor Nizami

Assistant Professor
Ziauddin College of Rehabilitation Science
Ziauddin University
ghazi_17@hotmail.com

Ali Farhad

Assistant Professor
Ziauddin College of Rehabilitation Sciences
Ziauddin University
alifarhadtharwani@gmail.com

[Khan MU, Nizami GN, Farhad A. Comparison of Effectiveness of Mobilization & Self-exercises in Adhesive Capsulitis of Shoulder. Pak. j. rehabil. 2018;7(1):35-41]

INTRODUCTION

Adhesive capsulitis is generally recognized as Frozen Shoulder. It is one of the common musculo-skeletal problems of shoulder, causing the pain and restricted range of motion (ROM) of shoulder in all directions leading to painful stiffness of shoulder¹. In 1872, Duplay identified this condition and named as Scapulo-humeral Periarthritis. Later, in 1934, the term Frozen Shoulder was used by Codman, he found that the frozen shoulder is of unknown etiology and characterized by painful and progressive restriction of movement of shoulder, with normal x-ray². Term Adhesive capsulitis was later coined by Naviesarin 1945, describing the involvement of shoulder joint capsule. Adhesive capsulitis or Frozen Shoulder can be Primary or idiopathic in origin. Furthermore, it can be secondary due to intrinsic, extrinsic or systemic origin³.

Globally, 2-4% of the population of age between 40-65 years was suffering from adhesive capsulitis, among them 18-20% were diabetic^{4,5}. Mostly people in sixth decade of their life get affected from adhesive capsulitis and the chances of onset before 40 years are rare. In Asian population, 15.6% patients have adhesive capsulitis and the peak age was 60-64 years⁶. Moreover it is more common in females than males^{4,5}. Its incidence in females is estimated to increase by 8% for every ten years⁷.

It can occur in both shoulders or the other shoulder can be involved after the years of first one⁸. The patients suffering from long term diabetes mellitus have more chances of adhesive capsulitis. Adhesive capsulitis is characterized into three stages, painful stage, frozen stage and recovery stage^{9,10}. The radiographic appearance is usually normal in adhesive capsulitis, but it shows decreased capsular size on arthrography. Patients have complaints of sleep disturbance due to severe pain at night, pain associated with or without movement, limited activities of daily living and range of motion¹¹. In early stage, frozen shoulder is usually appear similar to other problems of shoulder, like trauma, rotator cuff tear or contusion, subacromial bursitis, or even neuropathies⁹. Shoulder pain can lead to severe disability because of pain and stiffness. Some studies stated that almost 40% of the individuals suffered from these symptoms for about 3 years¹². Frozen shoulder is usually associated with other systemic and non-systemic pathologies; the most common comorbid with an incidence of 10-36% is diabetes mellitus¹³. Other comorbid may be hypothyroidism, hyperthyroidism, stroke, pulmonary disorders, cardiac diseases, Parkinson's, surgeries that can affect the ROM of shoulder joint for coronary artery bypass graft (CABG), angioplasty or angiography through hand, neurological surgery or radial neck dissection and sometimes fracture of clavicle. It is also common in patients suffering from breast and cervical cancers⁹.

Regimens for the treatment of adhesive capsulitis have been highlighted in researches. Over the past 3 decades, many treatment options have been debated in literatures, ranging from traditional physical therapy, use of electro physical agents, non-steroidal anti-inflammatory drugs (NSAIDs), steroids, hydrotherapy, phototherapy, contrast therapy, manipulation under anesthesia and different surgical processes¹⁴⁻¹⁷. Rehabilitation plan comprising of exercises, stretching, massage and use of electro-physical modalities have been shown to alleviate pain and found effective in gaining ROM in all planes. Exercises include Codman's pendulum exercises, active and passive ROM exercises, self-assisted exercise by using other hand and wand, self-stretching exercise by finger ladder or wall climbing, pulley exercises, shoulder wheel exercises¹⁸.

Superficial and deep heating modalities are considered as conventional therapies that also come under the umbrella of electro-physical agents. Literature shows that relaxation of muscles can be achieved by applying moist heating pad, and also helps in the reduction in resistance thus promote ROM^{19,20}. Moreover, application of Transcutaneous Electrical Nerve Stimulation (TENS) also helps in stimulating the mechanoreceptors and leading to the reduction in pain²⁰. A study conducted in 2013 by Doner et al, suggested that use of both hot pack and TENS are effective in reduction of pain and improvement of ROM of patients of adhesive capsulitis of shoulder²¹.

To treat the pain and stiffness of shoulder joint, passive mobilization techniques have also been used²¹⁻²². A study done in 2014, showed the improvement in glenohumeral joint range of motion with mobilization and active exercises, resulting in decrease in pain⁸. A study conducted by Johnson et al, debated regarding the posterior joint mobilization and anterior mobilization to improve external rotation of shoulder and found that posterior joint mobilization is more effective²³. ROM measurements of flexion, abduction, and extension, medial and lateral rotations of shoulder can be performed by conventional goniometer keeping the patient lying or seated, or by using Kinect²⁴.

Adhesive capsulitis can resolve on its own within 1-3 years or 20-50% patients suffer ROM restrictions for up to 10 years²². Many clinical trials have been conducted to compare different treatment techniques, including both conservative and operative methods¹⁴. Those clinical trials have different results¹⁴. A review conducted by Giovanni Maria D'Orsi et al stated that the best treatment for the adhesive capsulitis is still not confirmed¹⁴. As, there are numerous treatment approaches for the relief of adhesive capsulitis it is difficult to recognize the most beneficial and effective method. However, need of more clinical trials are needed to find the

better conservative method for the management of adhesive capsulitis of shoulder. The purpose of the current study was to compare the effectiveness of mobilization and self-exercises in the management of adhesive capsulitis of shoulder.

METHODOLOGY

Study Design

Experimental study design, Randomized Control Trial (RCT)

Study Setting

The study was conducted in physiotherapy department of tertiary care hospitals of Karachi, Pakistan.

Sample Size and Sampling Technique

30 patients were selected through simple random sampling technique and were divided into two groups equally.

Inclusion Criteria

Both male and female patients between age of 40 and 65 years with the diagnosis of adhesive capsulitis of shoulder were included in this study. These patients have limited shoulder ROM and painful stiff joint for at least 3 months^{22,25}.

Exclusion Criteria

Patients who have been diagnosed with any condition involving shoulder, such as, osteoarthritis, rheumatoid arthritis, biceps tendonitis, calcified tendonitis, impingement syndrome, rotator cuff tear or neuropathy were not included in the study. Patients having adhesive capsulitis of shoulder after any trauma or stroke were also not included in the study. Patients having any other severe health problem, such as, uncontrolled hypertension or uncontrolled diabetes, or injection with corticosteroids or history of surgery in the affected shoulder in the preceding 4 weeks were also excluded^{22, 25}.

Intervention

The consent was taken from participants before the start of the study. Patients were asked about history of chief complaints, and previous medical history. Physical examination along with assessment tests of the shoulder were conducted on both sides. Moreover examinations of sternoclavicular joint, acromioclavicular joint, scapulothoracic joint and cervical spine were also performed.

The subjects were randomly distributed in Group A and B after obtaining informed consent. Initial assessment was done as soon as patient gets enrolled in the research. The treatment was then continued for 5 days a week for 3 weeks and reevaluation was done on weekly basis for next 3 weeks. Pain intensity was measured by 10-cm visual analogue scale (VAS)⁷. Shoulder range of motions

(ROM) were measured by goniometer^{9,24}. ROM measurements of abduction, flexion, internal and external rotations of shoulder were performed. For measuring abduction, the angle between the humerus and lateral chest wall was measured by Goniometer. ROM measurement of the flexion, medial rotation and lateral rotation were done when patient was kept in supine position. For medial and lateral rotation ROM measurement, the shoulder was kept 90° abducted and elbow was flexed 90°.

Thirty patients were randomly divided into two groups. Each group consisted of 15 participants. The patients of Group A were treated with Mobilization exercises and patients of Group B were treated with Self-exercises. The frequency of the treatment session of all patients was five days a week for three weeks.

Group A: TENS and hot pack were applied prior to the mobilization exercises. TENS was applied through convention mode for 15 minutes and hot pack was also applied for 15 minutes. Mobilization exercises included mid-range rhythmic oscillations in the supine position with stabilized scapula. Inferior oscillatory glides were given to improve shoulder abduction, posterior oscillatory glides to improve flexion and internal rotation and anterior oscillatory glides to increase extension and external rotation of shoulder joint²⁶.

Group B: Patients performed the given self-exercise program, after the application of TENS and hot pack. TENS was applied through convention mode for 15 minutes and hot pack was also applied for 15 minutes. Self-exercises include Codman's pendulum exercises, self-assisted flexion exercises (self-assistance by other hand and wand exercises), self-stretching exercise by finger ladder or wall climbing, pulley exercises, shoulder wheel exercises. Data Collection Tool

Assessment forms were used to record data. Shoulder ROMs were measured by goniometer and intensity of pain was assessed through 10-cm Visual Analogue Scale (VAS).

Ethical Consideration

The consent of the participants was taken before recruiting them into the study. The ethical considerations were taken after keeping in mind the recommendations of Belmont report related to human subjects. Participants were given equal opportunity to withdraw from the study without giving any reason. All the subjects recruited in the study were given full autonomy and the data recorded were kept confidential. Moreover it was in the priority to perform the trial without any prejudice and to be the best in the interest of the participants

Duration of the Study

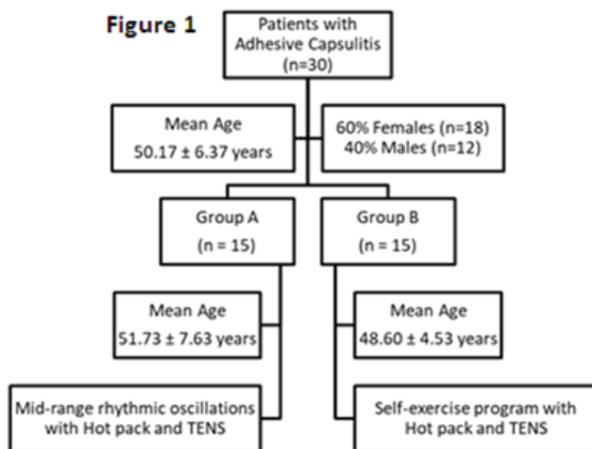
10 months

Data Analysis Strategies

Descriptive data was analyzed by Mean, Standard Deviation (SD), frequencies and percentages. ROM and pain intensity were statistically assessed by paired t-test within the groups and by independent t-test between the groups, using SPSS. P-value of less than 0.05 was considered significant.

RESULT

The normality of the data was identified using Kurtosis, skewness and the Q-Q index in order to identify the nature of the test applied on the data. The result shows that the data was normally distributed and parametric test was applied to find out the level of significance among and within the groups. Among all the participants recruited in the study, 60% were females (n=18) and 40% were males (n=12), age ranging between 41 to 65 years, and the mean age was calculated as 50.17± 6.37 years. The mean age of participants of Group A was 51.73 ± 7.63 years, whereas, of Group B was 48.60 ± 4.53 years. The data was collected on a span of 3 weeks of treatment; initial readings of pain intensity on VAS and of ROM through goniometer were recorded and then weekly reevaluated. Summary is shown in Figure 1.



10 cm VAS was used to assess the pain intensity, the results indicated that there was significant improvement in Group A (p < 0.05), whereas reduction in pain in participant of group B was not much. Table 1 shows the values of pain intensity in terms of Mean and SD.

Assessment	Mean ± SD	
	Group A	Group B
Initial	8.85 ± 0.49	8.98 ± 0.56
Week 1	8.80 ± 0.42	8.07 ± 0.46
Week 2	5.40 ± 0.74	7.13 ± 0.74
Week 3	1.67 ± 0.62	5.80 ± 0.67
* P value < 0.05		

The abduction ROM was measured in degrees by goniometer and it has been found that the technique applied to patients of group A was more useful and significant in improving the ROM (p < 0.05). Data was shown in Table 2.

Assessment	Mean ± SD	
	Group A	Group B
Initial	39.33 ± 3.20	43.67 ± 6.11
week 1	48.00 ± 6.211	52.07 ± 5.20
week 2	78.67 ± 9.022	71.13 ± 8.53
week 3	120.33 ± 8.162	90.27 ± 6.76
* P value < 0.05		

The flexion ROM was measured in degrees by goniometer and results showed that ROM was significantly improved in patients of group A (P < 0.05). Whereas, flexion ROM was also improved in patients of group B. Results are shown in Table 3.

Assessment	Mean ± SD	
	Group A	Group B
Initial	110.00 ± 7.79	110.00 ± 6.04
Week 1	119.03 ± 7.12	115.40 ± 7.20
Week 2	138.27 ± 6.35	125.33 ± 6.13
Week 3	147.00 ± 7.96	130.67 ± 6.49
* P value < 0.05		

The external rotation ROM was measured in degrees by goniometer and results showed that ROM was significantly improved in patients of group A (p < 0.05). Results are shown in Table 4.

Assessment	Mean ± SD	
	Group A	Group B
Initial	35.33 ± 5.16	32.73 ± 4.79
Week 1	41.67 ± 4.08	36.06 ± 3.59
Week 2	59.33 ± 6.33	42.13 ± 6.63
Week 3	75.67 ± 6.58	45.06 ± 7.46
* P value < 0.05		

The internal rotation ROM was measured in degrees by goniometer and results showed significant improvement in group A ($p < 0.05$). Data was shown in Table 5.

Assessment	Mean ± SD	
	Group A	Group B
Initial	41.00 ± 4.31	42.06 ± 3.45
Week 1	46.67 ± 5.88	43.33 ± 6.48
Week 2	57.33 ± 4.58	47.00 ± 5.75
Week 3	65.67 ± 6.20	50.73 ± 6.75
* P value < 0.05		

DISCUSSION

In this study, two treatment methods were applied on patients of adhesive capsulitis. Participants of a group received mid-range rhythmic mobilization exercises, whereas, participants of another group performed self-exercises. This study found little improvement in pain scores after self-exercises that were focused on self-assistive stretching exercises including self-assisted flexion exercises with the help of other hand and wand, pulley and wheel exercises, and exercise by finger ladder or wall climbing. Griggs SM et al also evaluated the effects of stretching exercises among the patients of adhesive capsulitis and found significant improvement in pain score²⁷. 90% patients reported a satisfactory outcome from this treatment.

A RCT was done by Tanaka K et al and its title sounds similar to this study. It compared the effects of joint mobilization and self-exercises among patients having reduced glenohumeral joint mobility²⁸. There was a difference in the methodology of the study. This study focused in the mid-range mobilization, whereas, they have applied end range mobilization. Furthermore, the participants of that study were also assessed according to the frequency of treatment in a week.

Younghoon Kim and Gyu Chang Lee evaluated the immediate effect of angular joint mobilization on pain, ROM, and disability in a 53 years woman having adhesive capsulitis of the shoulder²⁹. They have given the 12 sessions for 6 weeks and found

improvement in shoulder pain, ROM, and disability. Results of our study also showed improvement in pain and ROM after mobilization.

A study done by Yang et al concluded that the group having end-range mobilization have better results that the group having mid-range mobilization along with other techniques and modalities³⁰. Our study focused on mid-range mobilization technique in patients of one group.

A study that was conducted by Amanat et al, found that oscillatory mobilization and sustained stretch mobilization were equally effective in improving different ROM, pain and shoulder pain disability index³¹. Whereas, abduction was more improved through oscillatory mobilization. Our study showed that both methods of mobilization and exercises have improved the pain level and ROM of patients.

A study conducted by Doner et al compared two treatment methods. One group received hot pack, TENS and passive stretching exercises²¹. These passive stretching exercises included 30 seconds sustained stretch. Whereas, participants of one group of our study performed the stretching exercises by themselves. They used their other arm for assistance in flexion.

Chen et al conducted a study on 90 patients of shoulder pain and stiffness. One group received joint mobilization also with the advice and exercise, while other group had only advice and exercise³². Researchers concluded that addition of mobilization was not more effective than the method adopted for the other group. Their result did not match with the result of this study.

More clinical trials with different treatment combinations are needed to further evaluate the best management strategy for the patients of adhesive capsulitis of shoulder. The sample size of participants in each group of our study was small. Hence, it is required to conduct a study with larger sample size to identify the impact of the treatment on a broader aspect with greater precision.

CONCLUSION

It was concluded from the study that both the management strategies, that were mobilization and self-exercise approach for shoulder pain and range of motion were found to be effective in reducing the level of pain on Visual Analog Scale and improving Functional Range of Motion after three week of interventional strategy, however the impact of mobilization along with conventional approach of physical intervention were found to be more effective in improving the outcome measures used in this study

REFERENCES

- [1] Nagy MT, Macfarlane RJ, Khan Y, Waseem M. The frozen shoulder: myths and realities. *Open Orthop J.* 2013;7:352-355
- [2] Jadhav U, Gotecha D. Arthroscopic 360 degrees capsular release for treatment of adhesive capsulitis– A study of 40 cases. *Int. j. orthop. sci.* 2017;3(1):649-654
- [3] Kelley MJ, Shaffer MA, Kuhn JE, Michener LA, Seitz AL, Uhl TL, et al. Shoulder pain and mobility deficits: adhesive capsulitis. *J Orthop Sports Phys Ther.* 2013;43(5):A1-31.
- [4] Uppal HS, Evans JP, Smith C. Frozen Shoulder: A systematic review of the therapeutic options. *World J Orthop.* 2015;6(2):263-268
- [5] Clayton RA, Court-Brown CM. The epidemiology of musculoskeletal tendinous and ligamentous injuries. *Injury.* 2008;39(12):1338-1344
- [6] Malavolta EA, Gracitelli MEC, Pinto GMR, da Silveira AZF, Assunção JH, Ferreira Neto AA. Asian ethnicity: a risk factor for adhesive capsulitis? *Rev Bras Ortop.* Dec 2017. Available online from: www.sciencedirect.com/science/article/pii/S0102361617301510
- [7] Struyf F, Meeus M. Current evidence on physical therapy in patients with adhesive capsulitis: what are we missing? *Clin Rheumatol.* 2014;33(5):593-600.
- [8] Shivakumar HB, Chanappa TS, Balasaravanan R, Swathi KR. A comparative study between the efficacy of high grade mobilization with active exercises versus capsular stretching with active exercises on patients with adhesive capsulitis. *J Med Dent Sci.* 2014;3(14):3831
- [9] Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. *Curr Rev Musculoskelet Med.* 2008;1(3-4):180-189
- [10] Dias R, Cutts S, Massoud S. Frozen shoulder. *BMJ.* 2005;331(7530):1453-1456.
- [11] Frozen shoulder: what can a physical therapist do for my painful and stiff shoulder? *J Orthop Sports Phys Ther.* 2013;43(5):351
- [12] Park SW, Lee HS, Kim JH. The effectiveness of intensive mobilization techniques combined with capsular distension for adhesive capsulitis of the shoulder. *J Phys Ther Sci.* 2014;26(11):1767-1770
- [13] Inayat F, Ali NS, Shahid H, Younus F. Prevalence and determinants of frozen shoulder in patients with diabetes: A single center experience from Pakistan. *Cureus.* 2017;9(8):e1544.
- [14] D'Orsi GM, Via AG, Frizziero A, Oliva F. Treatment of adhesive capsulitis: A review. *Muscles Ligaments Tendons J.* 2012;2(2):70-78.
- [15] Musil D, Sadovský P, Stehlík J, Filip L, Vodicka Z. Arthroscopic capsular release in frozen shoulder syndrome. *Acta Chir Orthop Traumatol Cech.* 2009;76(2):98-103
- [16] Hannafin JA, Chiaia TA. Adhesive capsulitis. A treatment approach. *Clin Orthop Relat Res.* 2000;(372):95-109.
- [17] Neviasser AS, Hannafin JA. Adhesive capsulitis: a review of current treatment. *Am J Sports Med.* 2010;38(11):2346-2356
- [18] Page MJ, Green S, Kramer S, Johnston RV, McBain B, Chau M, Buchbinder R. Manual therapy and exercise for adhesive capsulitis (frozen shoulder). *Cochrane Database Syst Rev.* 2014;(8):CD011275.
- [19] Bleakley CM, Costello JT. Do thermal agents affect range of movement and mechanical properties in soft tissues? A systematic review. *Arch Phys Med Rehabil.* 2013;94(1):149-163.
- [20] Page MJ, Green S, Kramer S, Johnston RV, McBain B, Buchbinder R. Electrotherapy modalities for adhesive capsulitis (frozen shoulder). *Cochrane Database Syst Rev.* 2014;(10):CD011324.
- [21] Doner G, Guven Z, Atalay A, Celiker R. Evaluation of Mulligan's technique for adhesive capsulitis of the shoulder. *J Rehabil Med.* 2013 ;45(1):87-91
- [22] Cessie S, Vliet Vlieland TP. Comparison of high-grade and low-grade mobilization techniques in the management of adhesive capsulitis of the shoulder: randomized controlled trial. *Phys Ther.* 2006;86(3):355-368.
- [23] Johnson AJ, Godges JJ, Zimmerman GJ, Ounanian LL. The effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder adhesive capsulitis. *J Orthop Sports Phys Ther.* 2007;37(3):88-99
- [24] Lee SH, Yoon C, Chung SG, Kim HC, Kwak Y, Park HW, Kim K. Measurement of shoulder range of motion in patients with adhesive capsulitis using a Kinect. *PLoS One.* 2015;10(6):e0129398
- [25] Yang JL, Chang CW, Chen SY, Wang SF, Lin JJ. Mobilization techniques in subjects with frozen shoulder syndrome: randomized multiple-treatment trial. *Phys Ther.* 2007 ;87(10):1307-1315.
- [26] Agarwal S, Raza S, Moiz JA, Anwer S, Alghadir AH. Effects of two different mobilization techniques on pain, range of motion and functional disability in patients with adhesive capsulitis: a comparative study. *J Phys Ther Sci.* 2016;28(12):3342-3349.
- [27] Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis. A prospective functional outcome study of non-operative treatment. *J Bone Joint Surg Am.* 2000;82-A(10):1398-1407.
- [28] Tanaka K, Saura R, Takahashi N, Hiura Y, Hashimoto R. Joint mobilization versus self-exercises for limited glenohumeral joint mobility: randomized controlled study of management of rehabilitation. *Clin Rheumatol.* 2010;29(12):1439-1444.
- [29] Kim Y, Lee G. Immediate effects of angular joint mobilization (a new concept of joint mobilization) on pain, range of motion, and disability in a patient with shoulder adhesive capsulitis: A

- case report. *Am J Case Rep.* 2017;18:148-156.
- [30] Yang JL, Jan MH, Chang CW, Lin JJ. Effectiveness of the end-range mobilization and scapular mobilization approach in a subgroup of subjects with frozen shoulder syndrome: a randomized control trial. *Man Ther.* 2012;17(1):47-52
- [31] Amanat S, Sajjad AG, Kausar F, Mehmood Q, Hussain SA. Comparison of manual therapy techniques in adhesive capsulitis. *JIMC.* 2017;12(4):173-176
- [32] Chen JF, Ginn KA, Herbert RD. Passive mobilisation of shoulder region joints plus advice and exercise does not reduce pain and disability more than advice and exercise alone: a randomised trial. *Aust J Physiother.* 2009;55(1):17-23.

