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COMPARATIVE STUDY TO ANALYZE THE EFFECT OF MANUAL THERAPY COMBINED WITH EXERCISE VERSUS ELECTROTHERAPY COMBINED WITH EXERCISE IN SUBACROMIAL IMPINGEMENT SYNDROME

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Abstract

Background: The shoulder joint plays an important role in the function of the upper limb and in the activities of daily living. Human shoulder movements involve a highly coordinated and complex interaction between muscles, ligaments, and bones. Both static and dynamic stabilizing structures contribute to maintaining joint stability while allowing the shoulder to achieve the greatest range of motion among all joints in the human body. Shoulder pathologies are very common with the lifetime risk. Subacromial impingement syndrome (SAIS) is considered the most frequently reported shoulder disorder accounting for 27% of total shoulder disorder. In this study Manual therapy and electrotherapy with combined exercises programe has been introduce to reduce and improve function.

Objective: The objective of the study is to i) Assess the efficacy of manual therapy in rehabilitation to improve pain and disability in the treatment of sub-acromial impingement syndrome. ii) Assess the efficacy of electrotherapy in rehabilitation to improve pain and disability in the treatment of sub-acromial impingement syndrome.iii) Assess the effectiveness of exercise in rehab to improve ADL (Activity of daily living), strength and balance in the treatment of sub-acromial impingement syndrome. iv) Finally, the study will compare the results of both intervention strategies in terms of improving dynamic shoulder function in individuals diagnosed with sub-acromial impingement syndrome.

Methods: 60 patient diagnosed with the subacromial impingement syndrome by orthopedic OPD or physiotherapy department were initially assessed for the inclusion or exclusion criteria. Prior to the treatment procedure patient are oriented to the study. Participants are divided into 2 groups and both groups assessed for the pre test parameter.

Outcome measure : Shoulder pain and disability index (SPADI) and goniometry is used for measuring pre and post intervention evaluation.

Results: The Study was significant in reducing pain level and improving functional ability. At the end of six week intervention, for both group: Group A (Electrotherapy with exercises) and Group B (Manual therapy with exercises) showed improvement in the symptoms. Based on the results the study supports research hypothesis that there was a significant improvement in the ROM and functional ability or ADL performance associated with sub-acromial impingement syndrome.

Conclusion: The findings of the interventions indicate that when exercise is combined with either electrotherapy or manual therapy, both approaches lead to improvements in range of motion and functional ability. However, the results suggest that when exercise is combined with manual therapy, the outcomes may be slightly better compared to electrotherapy combined with exercise.

INTRODUCTION

The shoulder joint plays an important role in the function of the upper limb and in the activities of daily living(1,2). Human shoulder movements involve a highly coordinated and complex interaction between muscles, ligaments, and bones. Both static and dynamic stabilizing structures contribute to maintaining joint stability while allowing the shoulder to achieve the greatest range of motion among all joints in the human body(3). This wide mobility enables the upper limb to position the hand and elbow effectively in space and allows individuals, particularly athletes, to perform a variety of sports-related activities. However, such extensive mobility also increases the susceptibility of the joint to injury. Shoulder pathologies are very common with the lifetime risk(1,4). Subacromial impingement syndrome (SAIS) is considered the most frequently reported shoulder disorder accounting for 27% of total shoulder disorder(5). It is not a single condition but rather a spectrum of pathologies, ranging from subacromial bursitis to rotator cuff tendinopathy and, in severe cases, full-thickness rotator cuff tears(6,7). The subacromial space is anatomically bordered by the humeral head inferiorly, and superiorly by the anterior third of the acromion the coracoacromial ligament, and the acromioclavicular joint. Within this space lie key structures such as the supraspinatus tendon, the subacromial bursa, the tendon of the long head of the biceps brachii, and the joint capsule of the shoulder. Any of these may become involved when SAIS develops (3,8,9,). Researchers often classify the causes or risk factors of SAIS into intrinsic and extrinsic categories. Intrinsic factors(10) include partial or complete tendon tears, usually linked to age-related degeneration, repetitive overuse, tensile overload, or trauma. Other contributors may be osteophyte formation, changes in acromial morphology, muscular imbalance and weakness, and faulty shoulder kinematics, all of which increase the likelihood of impingement. Extrinsic factors,(10) on the other hand, involve mechanical compression from surrounding structures that irritate or damage the tendon. These may arise from poor posture, abnormal scapular or glenohumeral motion, tightness in the posterior capsule, or structural variations of the acromion or coracoacromial arch. In reality, both extrinsic compression and intrinsic

degeneration often act together in the development of SAIS. Management strategies typically begin with conservative approaches such as physiotherapy and corticosteroid injections, while surgical intervention is reserved for patients who do not respond to non-operative treatment but in this study we focus on physical therapy management that includes interventions are being used by physical therapists including exercises, manual therapy(18,19), taping, and electrotherapeutic modalities for the management of SAIS. Therapeutic exercise(24,25,26,27) plays a key role in improving shoulder function. It typically involves a structured combination of scapular stabilization, rotator cuff strengthening, range of motion (ROM) exercises, proprioceptive neuromuscular facilitation (PNF), and stretching techniques. Together, these interventions help restore movement, enhance muscle control, and improve overall shoulder performance. In routine clinical practice, physiotherapy rehabilitation often starts with the application of heat to reduce soft tissue discomfort. This is followed by the use of various electrotherapy modalities. Commonly used interventions include transcutaneous electrical nerve stimulation (TENS) (11,12),interferential current(13,14), and ultrasound, which help in pain relief, improving blood flow, and preparing the patient for subsequent exercise therapy.

Therefore, through this study we aim to determine whether, along with improvement in pain and functional ability, the shoulder biomechanics or scapular dyskinesia associated with subacromial impingement syndrome also improves. This is important because altered biomechanics may lead to repetitive recurrence of symptoms. Moreover, this aspect remains an important feature that has not been sufficiently investigated in previous studies.Physiotherapy plays a vital role in the management of this condition. Traditionally, electrotherapy modalities along with exercises are widely used for pain reduction and functional improvement. On the other hand, manual therapy combined with exercise has recently gained importance as it helps to restore joint mobility, correct biomechanics, and improve overall shoulder function.Although both approaches are commonly practiced, there is limited evidence directly comparing the effectiveness of manual therapy with exercise versus electrotherapy with exercise. Therefore, this study is needed to explore which combination provides better outcomes in terms of pain relief, mobility, and

functional recovery, ultimately helping clinicians choose the most effective and patient-friendly treatment.

MATERIAL & METHOD

Study Setting: Patients were treated five times per week for six weeks at the Department of Physiotherapy, Pacific Medical College and Hospital, Udaipur.

Sample Design: Randomized sampling

Study Population: Patient with subacromial impingement syndrome, both male and female participants are included.

Sample Selection: 60 Patient will be randomized selected and assessed for the pre-test parameter.

Study Duration: one year

Sample Size: 60 patients

Treatment Duration: Single session 45-60 minutes for (5 days per week) for 6 weeks.

SELECTION CRITERIA:

Inclusion Criteria: The study would likely include patients who meet specific criteria such as:

- Informed consent/ willingness to participate in the study
- Age group 18 – 40
- Males and females with shoulder impingement syndrome.
  Diagnosed with special orthopedic test (Empty Cane test, Drop Arm Test, Yergason's Test)

Exclusion Criteria: Certain factors exclude patients from the study, such as:

- Patients with diabetes
- Patient with recent fracture / stress fracture
- Any unhealed wound present at treatment site
- Age group less than 18 and more than 40
- Neurological Disorders
- Orthopedic Surgeries: History of orthopedic surgery in the last year related to shoulder

PROCEDURE

Permission for conduct Study is taken from the institutional ethical committee of PMCH, Pacific medical university bhilo ka bedla Udaipur(RAJ).

Individuals Diagnosed with shoulder impingement syndrome by the Physiotherapy department, Orthopedic department OPD; initially assessed for the inclusion or exclusion criteria. Prior to the treatment procedure, all participants were informed about the purpose, procedures, potential benefits, and possible risks of the study. Written informed consent was obtained from each participant prior to enrollment. Following the consent process, the participants were randomly allocated into two groups.

- 60 subjects were selected on the basis on inclusion criteria and randomly divided into Group-A and Group B.
- Group A (n=30) treated with electrotherapy and exercise therapy.
- Group B (n=30) treated with manual therapy and exercise therapy.

- **Group A (n=30) will be treated with electrotherapy and exercise therapy**
- Ultrasound therapy (US): (over subacromial space).
- TENS or IFT: 15–20 min for pain relief.
- Hot pack (before exercises).

- **Group B (n=30) will be treated with manual therapy and exercise therapy.**

Week 1–2: Manual Therapy

- Soft tissue mobilization: Upper trapezius, levator scapulae, posterior cuff.
- Glenohumeral joint mobilizations: Grade I–II (inferior & posterior glide) for pain relief.
- Scapular mobilizations: Protraction/retraction, upward/downward rotation.
- Cervical/thoracic mobilization if stiffness contributes.

Week 3–4: Manual Therapy

- Posterior/inferior glenohumeral mobilizations.
- Thoracic spine mobilization to enhance extension.
- Soft tissue release of pec minor and infraspinatus.

Week 5–6 : Manual Therapy

- Maintenance mobilization: GH posterior/inferior glides.
- Myofascial release: Pec major/minor, latissimus if tight.

Combined exercise programme for both the group

- **Pendulum exercises** – Ask the patient to stand to the side of the table or couch and bend forward to at the waist keeping back straight. Unaffected arm is placed on the couch and affected arm is hanging downward. Instruct the patient to swing the arm slowly forward hai backward like a pendulum.
- **Passive & AAROM**: patient is positioned in supine lying and the therapist stands to the side of the couch. Therapist one hand supports the patients elbow and forarm and another hand is support the wrist and arm. Therapist slowly lift the arm in Flexion, abduction, external rotation in pain-free range or progresses to active assisted in which therapist ask the patient to lift the arm in flexion, abduction and external rotation and provide gentle assistance to complete the movement.
- **Isometrics**: Patient is positioned supine lying and place the arm by the side of body. Ask the patient to slightly flex the elbow and make a fist and now the therapist place the hand just over the fist and instruct the patient to try to move arm in flexion while the therapist resist the movement(isometric flexion).

  Patient is positioned standing facing wall with elbow straight. Keep elbow aligned directly below the shoulder wit the dorsum of hand facing the wall, press forward into the wall holf for 10 sec seconds and release slowly. Now stand about 6 inches from the wall and body should be perpendicular to the wall make a fist and gently press it into the wall and hold for 10 sec. Now the patient back facing the wall. Patient shoulde make k fistand gently presses into the wall and hold for 10 sec.
- **Scapular exercises** – Patient is positioned in erect standing position. Tie the resistance band to the door handle and hold it in both ends ask the patient to do shoulder blades back. Pull the blades back and let the elbow bend. Hold for 5 sec and let the arms come forwards.
- **Chin tuc-** Patient position- sitting. Ask the patient to keep the neck and shoulder relaxed. Look straight and gently glide the chin back and tuc the chin in neck area with gentle breath. Hold it for 5 sec and bring the chin

forward again.

- **Theraband strengthening**:

  Biceps theraband- Patient position- standing position. Step on a resistance band with one foot hold the band with same side hand, just above the thigh. Use biceps to curl the band up until it reaches to the shoulder.

  Triceps exercise with theraband- Patient position – standing position. Place the theraband around the neck grip the one of the end loop in each hand keep the elbows and wrist straight. Straighten the arms by pushing hands down while squeezing triceps.

  Shoulder internal rotation with theraband- Patient position –standing position. Tie the one end of resistance band on the middle of the door or something stable object. Place a rolled up towel under the arm. keep the wrist straight bend the elbow at the side (90degree) grasp the other hand of the band across the body . and forearm parallel to the ground. Hold for 5-10 seconds and slowly return.

  Shoulder external rotation with theraband- Ptient position – standing position begin with the one end securely attached at waist side. Place a towel roll under the arm grasp the other end of the band with tension pull the band away from the body or away from the wall rotating the forearm outward. Hold for 5-10 seconds and return slowly.

- **Shoulder Scaption**- Patient position standing or sitting. Ask the patient to lift the arms by his/her side bring them forward at a 30-45 degree angle.

- **Closed kinetic chain stability(Wall push-ups):**Patient position – Standing. Ask the patient to stand facing the wall. Maintain a distance of the one arm from the wall and place the both palm on the wall at the shoulder level. Instruct the patient to slightly bend the elbow bring the body towards the wall and push the body away from the wall by straightening of elbow
- **Functional tasks**: Reaching, lifting (within tolerance).

DATA ANALYSIS AND RESULTS

The findings of the interventions indicate that when exercise is combined with either

electrotherapy or manual therapy, both approaches lead to improvements in range of motion and functional ability. However, the results suggest that when exercise is combined with manual therapy, the outcomes may be slightly better compared to electrotherapy combined with exercise.

The results are presented as Patient participated in group B shows more significant changes. Group B result were found better than group A result as data analysis showed shoulder abduction range of motion of group A mean±SD is 97.4±4.92 and improve to 117.40±5.31 in post test. Group B data of shoulder abduction range of motion pretest mean±SD is 98.2±4.76 and improve to 129.7.32±5.24 in post test. Data analysis of shoulder pain and disability index (SPADI) also significant for group B Compared to group A for group A pretest value of pain and disability component is mean±SD is 66.7±3.41is reduced to 50.76±3.28 in post test. The group B value of pain and disability component pretest mean±SD is 67.3±3.55 is reduced to 42.8±3.62 in post test. the total score of shoulder pain and disability index of group B value significantly reduced in post test

Table 1: Gender Distribution

Demographic Profile	Group A		Group B		Total	
	N	%	N	%	N	%
Female	18	30.00%	17	28.33%	35	58.33%
Male	12	20.00%	13	21.67%	25	41.67%
Total	30	50.00%	30	50.00%	60	100.00%

Graph -1 :Gender Description

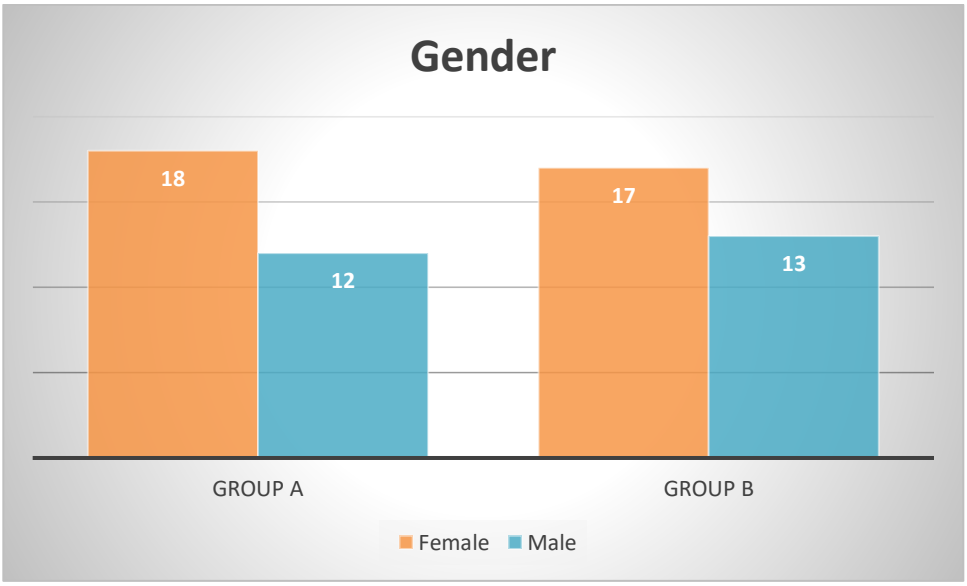


Table 1 and Graph 1 show the gender distribution of the participants in both groups. A total of 60 participants were included in the study, with 30 participants in Group A and 30 participants in Group B.

Table 2: Age Distribution

Age Group	Group A		Group B		Total	
	N	%	N	%	N	%
18–24	8	13.33%	7	11.67%	15	25.00%
25–30	12	20.00%	13	21.67%	25	41.67%
31–35	6	10.00%	6	10.00%	12	20.00%
36–40	4	6.67%	4	6.67%	8	13.33%
Total	30	50.00%	30	50.00%	60	100.00%

Graph 2: Age Distribution

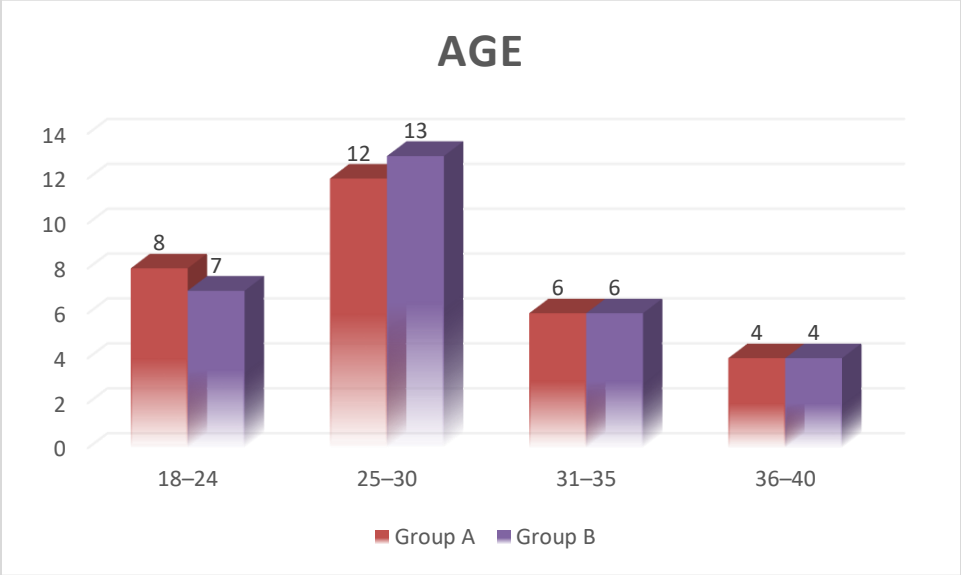


Table 2 and Graph 2 present the age distribution of the participants included in Group A and Group B. A total of 60 participants were included in the study, with 30 participants in each group.

Table 3: Residence Distribution Table

Residence	Group A		Group B		Total	
	N	%	N	%	N	%
Urban	22	36.67%	19	31.67%	41	68.33%
Rural	8	13.33%	11	18.33%	19	31.67%
Total	30	50.00%	30	50.00%	60	100.00%

Graph 3: Demograpic Distribution Table

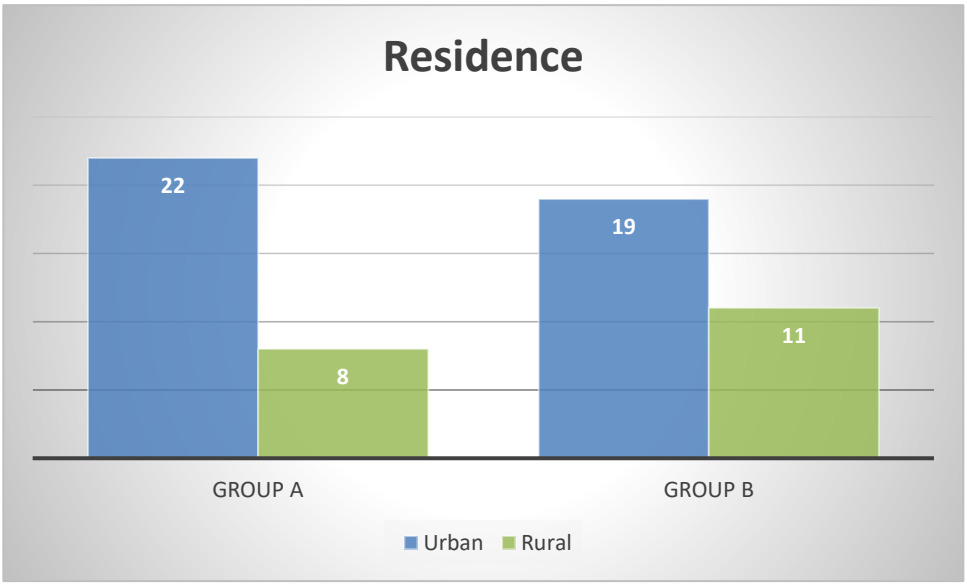


Table 3 and Graph 3 show the distribution of participants based on their place of demographic states (urban or rural) in both groups. A total of 60 participants were included in the study, with 30 participants in Group A and 30 participants in Group B.

Table 4 :Group A Shoulder Abduction (Goniometer)

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	F (t)	Sig. (p-value)
Pre (0 week)	30	88	106	97.4	4.92		
Post (6 week)	30	107	126	117.6	5.31	15.84*	0.000 (p < .001)
Overall	60	88	126	107.5	11.72		

Graph 4 : Group A Shoulder Abduction (Goniometer)

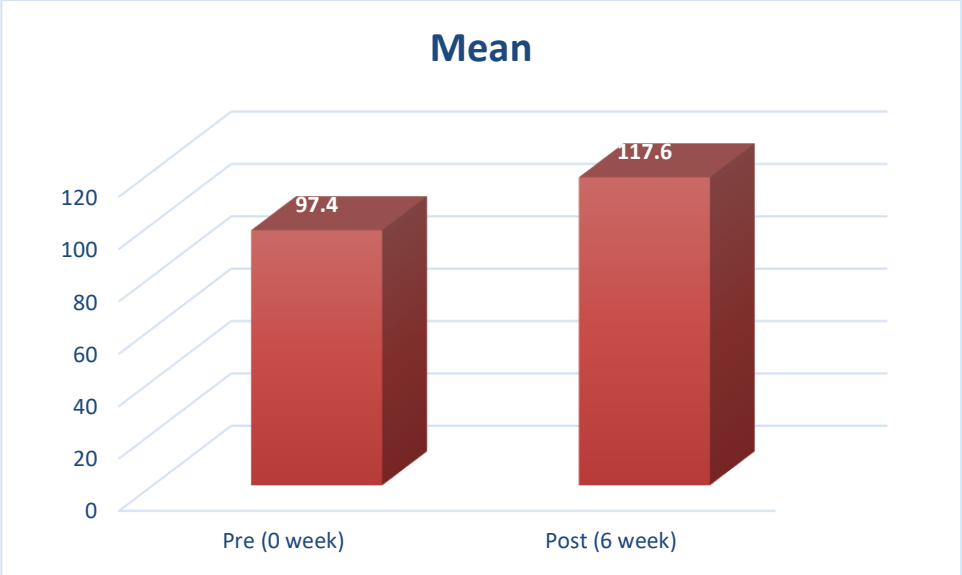


Table 4 and Graph 4 show the changes in shoulder abduction range of motion measured using a goniometer in Group A before and after the intervention period.

Table 5: Group A – SPADI

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	F (t)	Sig. (p-value)
Pre (0 week)	30	60	72	66.7	3.41		
Post (6 week)	30	45	56	50.6	3.28	18.92*	0.000 (p < .001)
Overall	60	45	72	58.65	8.97		

Graph 5: Group A – SPADI

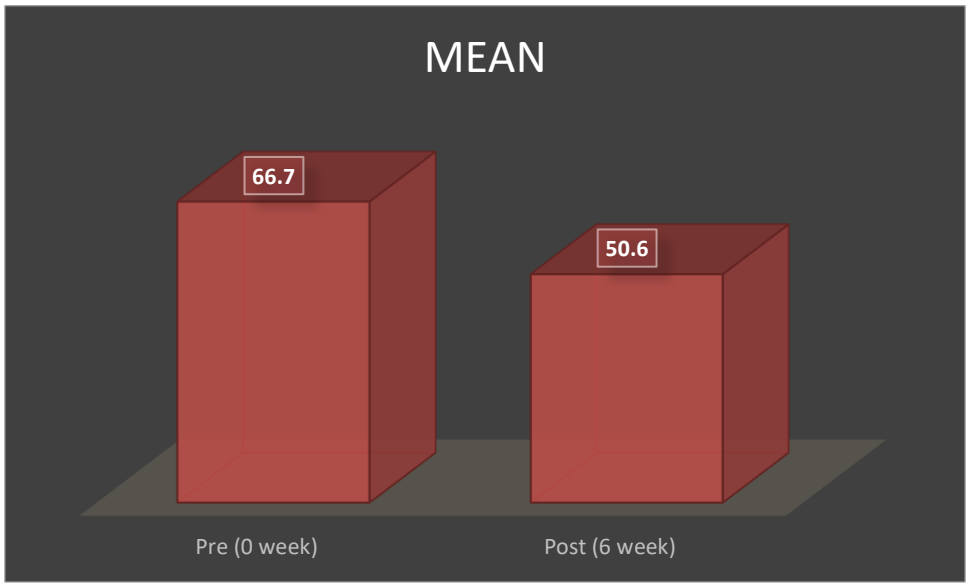


Table 5 and Graph 5 present the SPADI scores (shoulder pain and disability index) for Group A at pre-treatment and post-treatment time points.

Table 6: Group B – Shoulder Abduction (Goniometer)

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	F (t)	Sig. (p-value)
Pre (0 week)	30	89	107	98.2	4.76		
Post (6 week)	30	120	140	129.7	5.24	22.61*	0.000 (p < .001)
Overall	60	89	140	113.95	16.54		

Graph 6: Group B – Shoulder Abduction (Goniometer)

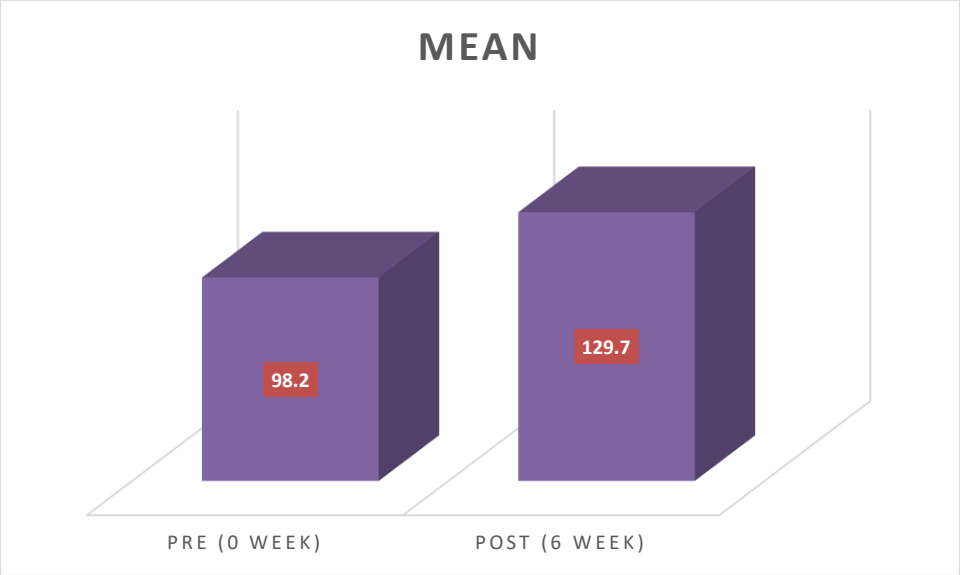


Table 6 and Graph 6 show the shoulder abduction range of motion for participants in Group B at pre-treatment and post-treatment.

Table 7: Group B – SPADI

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	F (t)	Sig. (p-value)
Pre (0 week)	30	61	73	67.3	3.55		
Post (6 week)	30	35	48	42.8	3.62	24.47*	0.000 (p < .001)
Overall	60	35	73	55.05	12.96		

Graph7: Group B – SPADI

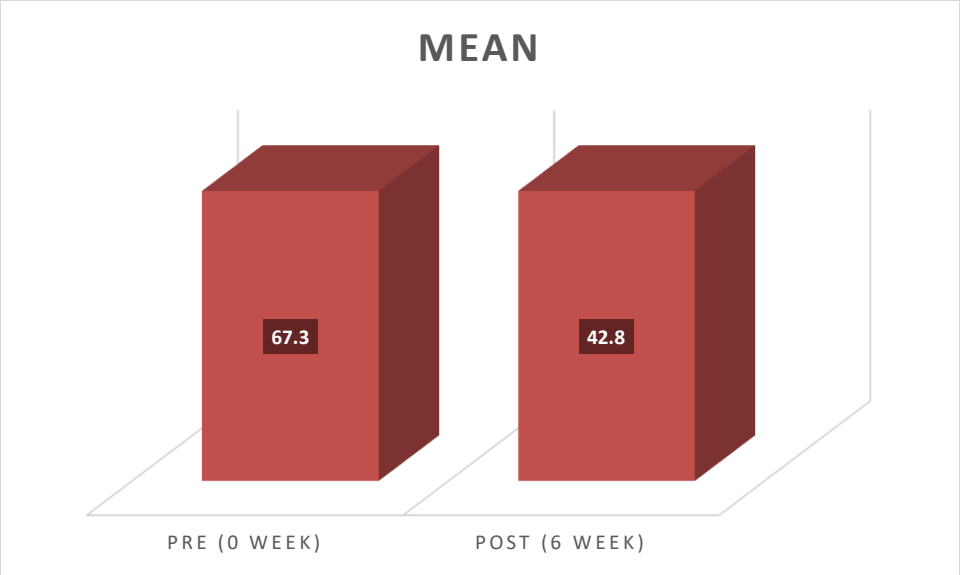


Table 7 and Graph 7 present the SPADI scores (pain and disability index) for participants in Group B at baseline and after 6 weeks of intervention.

DISCUSSION

The present comparative study was design to examine which technique or procedure (electro or manual therapy), when combined with exercise, provides better outcomes. A total of 60 patients were included and assessed using pre- and post-intervention outcome measures. The outcome measures used were the Shoulder Pain and Disability Index (SPADI) and range of motion measured with a goniometer. The findings of the interventions indicate that when exercise is combined with either electrotherapy or manual therapy, both approaches lead to improvements in range of motion and functional ability. However, the results suggest that when exercise is combined with manual therapy, the outcomes may be slightly better compared to electrotherapy combined with exercise.

When the findings of the present study are compared with the existing literature, it is evident that both treatment procedures are consistent with and strongly support the findings reported in previous studies. Ucurum SG et al.(2018) reported that exercises combined with electrotherapy significantly reduce pain and improve functional ability. These findings are highly correlated with the results of the present study and support our findings. A recent systematic review by Singh H et al. (2022) on the management of Subacromial Impingement Syndrome reported that

scapular exercises, resistance exercises, and myofascial trigger point release techniques are effective in reducing pain and improving functional ability. These findings are consistent with the results of the present study and further support our outcomes.

The findings of both procedures support improvement in the measured outcomes. However, the effect observed with electrotherapy appears to be comparatively lower than that of manual therapy. One possible explanation for this may be supported by previous studies, which suggest that repeated application of the same dose of Transcutaneous Electrical Nerve Stimulation (TENS) can lead to the development of analgesic tolerance. As a result, the pain-relieving effect may gradually decrease with repeated exposure to a similar stimulation dose.

As observed, Subacromial Impingement Syndrome is a common condition affecting individuals across young, middle-aged, and older populations. Several factors may contribute to the development of this condition, including both pathological and traumatic causes. However, one of the major contributing factors is soft-tissue imbalance, postural insufficiency, and Scapular Dyskinesia. Considering these contributing factors, the present study was conducted to address these impairments. After implementing a 6-week treatment program, the results indicated that both interventions exercise combined with electrotherapy and exercise combined with manual therapy led to improvements in range of motion and functional ability. However, the group that received manual therapy along with exercise demonstrated slightly better outcomes compared to the group that received electrotherapy combined with exercise.

CONCLUSION

The present comparative study was design to examine which technique or procedure (electro or manual therapy), when combined with exercise, provides better outcomes. A total of 60 patients were included and assessed using pre- and post-intervention outcome measures. The outcome measures used were the Shoulder Pain and Disability Index (SPADI) and range of motion measured with a goniometer. The findings of the interventions indicate that when exercise is combined with either electrotherapy or manual therapy, both approaches lead to improvements in range of motion and functional ability. However, the results suggest that when exercise is combined with manual therapy, the

outcomes may be slightly better compared to electrotherapy combined with exercise.

The findings and results of the present study are clinically important for physiotherapists involved in musculoskeletal and orthopedic rehabilitation, as well as for rehabilitation professionals and rehabilitation specialists. The use of these two procedures may contribute to improving treatment strategies in the field of shoulder rehabilitation. The results of this study can be applied clinically to assist healthcare professionals in the better management. However, further studies with a larger sample size and more rigorous inclusion and exclusion criteria are required to validate and generalize these findings."

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