

Effectiveness of Black Burn Exercises Vs Conventional Physiotherapy Exercises in Patients with Shoulder Pain: A Comparative Study

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ABSTRACT

Background: The fundamental component of biomechanical perspective, the scapula offers an agile structure to preserve ball & socket kinematics in addition to providing a steady foundation for muscle activation. The altered scapular biomechanics can directly impact on shoulder and can cause shoulder pain. Adequate biomechanics of shoulder and scapula both are important for efficient functioning of shoulder. There are various exercises explained for scapular stabilization and shoulder strengthening. This study aims to compare the effectiveness of the Black burn exercises versus conventional physiotherapy exercises in subjects of shoulder pain.

Methods: Cumulatively 50 patients (28 Female & 22 Male) with shoulder pain were recruited after fulfilling the eligibility criteria. Randomly they were distributed into 2 different groups:

Group A was Experimental group, received Black burn exercises with Moist pack; Group B was Control group, received Conventional exercises with Moist Pack. Outcomes were documented in form of Numerous Pain Rating Scale for pain, Shoulder Range of Motion of Flexion-Abduction-Internal and External Rotation, Shoulder Pain and Disability Score at baseline and post-intervention at 28th Day.

Results: In the analysis of data, we observed statistically significance in (p-value<0.05) pre and post intervention of both the groups. Also, there was significant difference noted in pre and post intervention comparison in between both the groups.

Conclusion: Black burn exercises has showed superior results compared to conventional exercises in improving all three outcomes of Pain, Disability and Functions in patients of shoulder pain.

Keywords: Shoulder Pain, Black Burn Exercises, Conventional Physiotherapy, Pain and Functional level, Disability.

INTRODUCTION

Shoulder pain or disorder is the third most not unusual musculoskeletal situation amongst the overall populace with a lifetime prevalence of 70%.^[1,2] The prevalence

observed of shoulder joint pain among adults of age between 30-70 years is 22.9%. Due to the greater physical demands of the job, the prevalence was higher in elementary jobs. Globally Shoulder ache

shows the prevalence ranging among 7% and 26%.^[3]

As explained in the previously proven literatures any kind of imbalance or alteration in this normal joint anatomy can lead to Disturbance in normal functioning of physiological which can further lead to Pain and disability of the joint.^[4] It is recognized that both the scapulothoracic articulation and the glenohumeral joint must move in unison for these motions to happen. According to Inman et al., scapula looks for stable posture to maximize the force of the initial 30° flexion & 60° abduction from the humerus. When shoulder is unstable, the scapula develops distinct patterns of function: internal rotation increases when scapular plane is lifted, whereas reduced rotation occurs when arm that extends from shoulder is elevated. As previously mentioned, abnormally challenging muscular strength or incorrect muscle activation rhythms can cause disruptions to the glenohumeral rhythm.^[5]

Various numerous treatment options are available there for shoulder pain. Nonoperative control consists of NSAIDS, Steroid or PRP injections (Platelet Rich plasma) and FAST (Focused aspiration of soft tissue procedure). Non-operative rehabilitation includes rest, Rotator-cuff and scapular muscle strengthening strategies and ^[6] stretching, Passive movement exercise, Pulley exercising, Passive joint mobilization and ultrasound therapy, Thermotherapy, Cryotherapy and other electrotherapy modalities.^[7,8]

Exercise for scapular stabilization have been observed to be significant in reducing shoulder pain and shoulder inefficiency.^[8] There is study done to see the effectiveness of Blackburn exercises on shoulder impingement on pain and disability in rock climbers and they have given conclusion as the Blackburn exercises is an effective way of treating patients of shoulder impingement.^[9] Based on the literatures altered scapular biomechanics seems to be reason of long term or recurrence of the shoulder pain in patients. Focus should be

given on treating and preventing the scapular dyskinesia by stabilizing and strengthening the scapular muscles.

Black burn exercises aim on the strengthening both scapula – thoracic and shoulder muscles. As per our knowledge very few literatures are available, which shows effectiveness of black burn exercises in patients of various shoulder conditions which affect both glenohumeral and scapulothoracic joint. There is no study available which shows the effect of Black Burn exercises in general population having shoulder pain. So, in our study we have focused with aim, to see the effects of Black burn exercises in subjects of shoulder pain. The objective of the Study was to compare the effect of black burn exercises and conventional physiotherapy in subjects with shoulder pain.

MATERIALS & METHODS

Study was an experimental study; sample size estimation was performed considering 80% power allowing for 5% type I (Alpha) error. Considering 20% lost to follow up, the sample size was inflated to 25 participants per group.^[10]

Inclusion criteria were considered, Participants with several shoulder pain diagnosed by Orthopaedician of both genders Male & Female of Age 18 years or older with available Shoulder Elevation >110 degree (this amount of elevation is required for activation of the scapular muscle) were recruited. They must have not under went for Physiotherapy in past 3 Months. Patients having Neurological or vascular disorders, Neoplasms, referred pain from internal organs or systemic rheumatic conditions, having fractures or luxation of shoulder joint was excluded.

Prior to commencing the study, Ethical approval was taken from the “Institutional Ethics Committee” of H. M. Patel Centre for Medical care and Education, Karamsad. Participants were taken from the Physiotherapy OPD of Shree Krishna Hospital-Karamsad. They were explained about research purpose and procedure. After

doing the registration at CTRI- Clinical Trials Registry-India, study was started. Written consent was obtained from patients who agreed for their participation. Participants were randomly allocated in 2 groups by computer generated randomized numbers to avoid possible risk of participant selection bias. At first, baseline data was taken in the form of brief assessment. Then after, Numeric Pain rating scale, Shoulder Pain and Disability Index and shoulder ROM of Flexion, Abduction, Internal and External Rotations were taken as pre and post intervention outcomes by physiotherapist. Followed by which Physiotherapy Treatment was given in form of Black Burn Exercises and Conventional exercises.

Group A: Patients of Experimental group were given treatment in form of Moist heat pack for 15 minutes and then they performed active 6-Black Burn exercises (As showed in figure 1),10 repetitions each

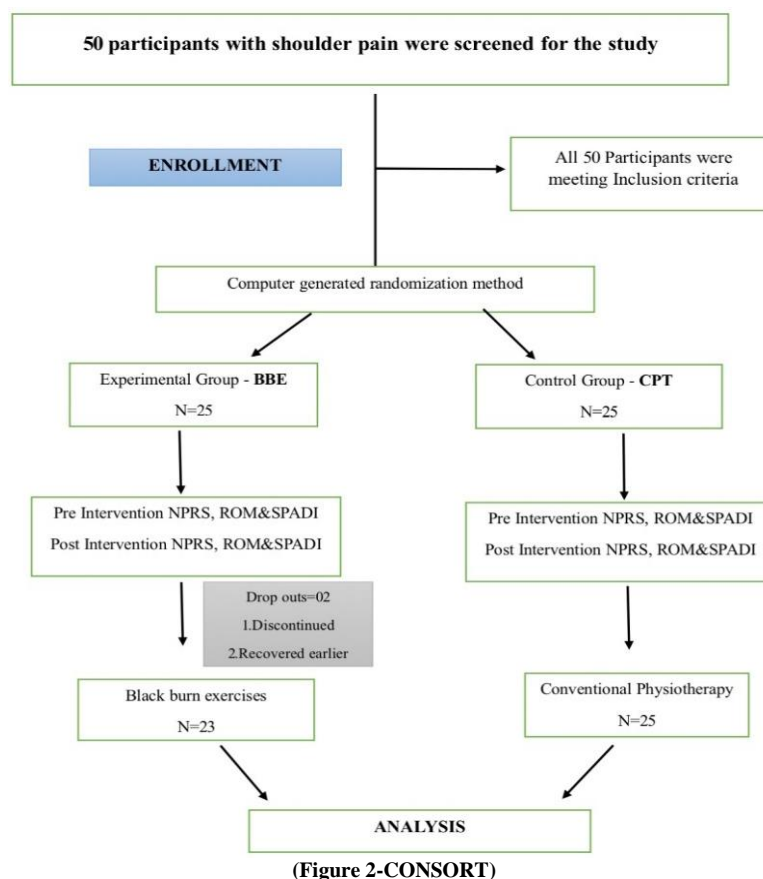
with hold for 5 seconds,3 times in week for 1 Month.^[10]

Group B: Patients in the control group were given treatment in form of Moist heat pack for 15 minutes, then after Stretching exercises (Pectoralis major, Pectoralis minor and deltoid) 3 repetitions each with 10 second hold, Passive ROM exercises (Flexion-Extension-Abduction-Internal and external rotation), Girdle exercises (Shoulder Retraction-Protraction) and Pulley exercises,10-10 repetitions each without hold for 3 days in a week for 1 Month.^[11]

The primary outcome was Numeric Pain Rating Scale for pain, second outcome taken was, ROM of shoulder measured with goniometer by physiotherapist and third outcome taken was Shoulder Pain and Disability Index, it is a self-filled questionnaire. These 3 outcomes were documented by the researcher pre and post intervention, at Day-0 and Day-28th.



(Figure 1-Black Burn Exercises)



STATISTICAL ANALYSIS

Baseline characteristics of Demographics were seen for equal distribution. After the completion of data collection, analysis of 48 samples was done by the institutional statistician. 2 participants had dropped-out from the experimental group from total

samples. For the data analysis of intra and inter group Paired sample t-test and independent t-test were used respectively. Analysis of pre and post treatment data for all 3 outcomes was done to find the differences. *p-value of <0.05 was considered as statistically significant.

RESULT

Table 1: Baseline characteristics for Distribution of Gender.

Group	Male(N) (%)	Female(N) (%)	Total
Conventional	15 (60%)	10 (40%)	25
BlackBurn Exercises	6 (26.1%)	17 (73.9%)	23
Total	21 (43.8%)	27 (56.3%)	48

Table-1 is showing distribution of patients according to gender, as the table shows the frequency of females (56.3%) cumulatively in both the groups is higher than the males (43.8%).

Table-2 is showing the mean age of participants of both the groups. As the table shows the mean age of participants of the control group is 53.48 ± 7.34 years where as in the Experimental Group is 51 ± 11.54 years.

Table 2. The mean age of participants

Group	N	Mean \pm SD
Conventional	25	53.48 ± 7.34
Black Burn Exercises	23	51 ± 11.54

Table 3: The Mean of pre and post outcomes - Experimental group.

Variables	N	Mean	SD	P-value
Pre NPRS	23	7.83	0.83	<0.05
Post NPRS	23	2.96	0.97	
Pre ROM-Flexion	23	140.61	14.07	<0.05
Post ROM-Flexion	23	164.17	8.60	
Pre ROM-Abduction	23	136.39	18.67	<0.05
Post ROM-Abduction	23	158.48	14.12	
Pre ROM-IR	23	36.43	10.26	<0.05
Post ROM-IR	23	58.96	9.01	
Pre ROM-ER	23	39.35	11.02	<0.05
Post ROM-ER	23	59.96	7.9	
Pre SPADI-Total	23	67.52	8.76	<0.05
Post SPADI-Total	23	26.44	10.94	

Table 4: The Mean of pre and post treatment outcomes of Control group.

Variables	N	Mean	SD	p-value
Pre NPRS	25	7.84	1.06	<0.05
Post NPRS	25	5.32	1.28	
Pre ROM-Flexion	25	136.48	18.54	<0.05
Post ROM-Flexion	25	153.64	14.98	
Pre ROM-Abduction	25	127.12	17.47	<0.05
Post ROM-Abduction	25	144.08	13.51	
Pre ROM-IR	25	34.44	11.03	<0.05
Post ROM-IR	25	45.16	9.85	
Pre ROM-ER	25	35.16	13.87	<0.05
Post ROM-ER	25	46.2	13.34	
Pre SPADI-Total	25	67.9	10.29	<0.05
Post SPADI-Total	25	44.05	12.20	

Table 5: The Mean value of pre and post treatment outcomes of both groups.

Variables	Treatment Group	Mean	SD	p-value
NPRS	Conventional	2.52	1.16	<0.05
	Black-Burn Exercise	4.87	0.97	
ROM Flexion	Conventional	-17.16	5.94	<0.029
	Black-Burn Exercise	-23.56	12.82	
ROM Abduction	Conventional	-16.96	7.69	<0.057
	Black-Burn Exercise	-22.09	10.43	
ROM IR	Conventional	-10.72	4.21	<0.05
	Black-Burn Exercise	-22.52	10.81	
ROM ER	Conventional	-11.04	4.52	<0.05
	Black-Burn Exercise	-20.61	7.99	
SPADI Total	Conventional	23.84	9.68	<0.05
	Black-Burn Exercise	41.07	10.24	

In the Table-3 mean value of NPRS and SPADI-pain is showing significant result after the Intervention, All the ROM has improved and SPADI-disability score is reduced. Values of outcomes pre and post mean difference is showing p-value <0.05 which shows statistical significance. Likewise same results are noted in Table 4. All the outcomes showed significant improvement statistically. As showed in Table-5 the mean difference of Pain outcome for NPRS and SPADI-pain of pre and post intervention of both groups is 2.52 ± 1.16 & 4.87 ± 0.97 respectively. Mean value of Experimental group is superior than the Control group, ROM outcome for Flexion: -17.16 ± 5.94 & -

23.56 ± 12.82 , for Abduction: -16.96 ± 7.69 & -22.09 ± 10.43 , for IR: -10.72 ± 4.21 & -22.52 ± 10.81 , for ER: -11.04 ± 4.52 & -20.61 ± 7.99 respectively. All the All ROM has highly increased, Except Abduction, it's p-value is <0.057 which explains no significance difference is noted in comparison of both groups after the treatment which means both the treatment has Equally improved Abduction ROM, For SPADI-disability is 64.07 ± 9.58 and 25.21 ± 11.51 respectively. Which is reduced, p-value is <0.05.

DISCUSSION

Accepting the alternative hypothesis and rejecting the null hypothesis that there are

beneficial effects of Black burn exercises on pain, disability and range of movement in participants with shoulder pain.

This study was focused on to find the effectiveness of BBE in shoulder pain. There were 50 participants incorporated from which 48 had completed the study and 2 were Drop-outs as 1 patient discontinued the treatment at 1st week and lost the contact and the other had improved symptoms earlier and discontinued before taking the post intervention measures. As showed in Table 3 and 4, After receiving BBE and CPT there was significantly diminished pain, restriction of ROM and Disability was noted compared to baseline. After each treatment, functional status and all the ROM of shoulder joint improved significantly. The significant dissimilarity was observed as showed in Table 5, in between two groups in outcomes for pain, upper limb functional score in disability in SPADI, and passive ROM.

GENDER & AGE

Several researchers have studied and reported in females, incidence of shoulder pain was observed to be more frequent.^[12] Likewise, as stated in the Table 1 in our evaluation also we get the gender frequency of female patients more than the male patients, females (56.3%) cumulatively in both the groups found higher than the males (43.8%).

The prevalence of shoulder pain for the particular age group has been found to be between 7-27%.^[13] In our study as statistics shown in the Table 2, the mean age of subjects in control group and experimental group is 53.48 ± 7.34 years, and 51 ± 11.54 years respectively, which practically falls within the range indicated based on available literatures of prevalence.

EXPERIMENTAL GROUP

In the Experimental group we have observed significant reduction in Pain intensity from pre intervention measurement of outcomes at day 1 to after intervention at day 28 which was 7.83 ± 0.83 to 2.96 ± 0.97

and 73.04 ± 8.46 to 27.83 ± 11.10 as showed in table 3.

Hariharasudhan et al. has done a systemic review to observe Effect of scapular stabilization exercise among the patients having feeling of subacromial impingement syndrome. In the study authors explained that clinically meaningful changes in pain intensity are found that show statistical significance in outcome NPRS. By doing strengthening of the scapular stabilizers, they will help to avoid any potential compression of the structures within them. Which can be the reason of developing pain.^[14]

The Black burn exercises train upper limb at and above 90° glenohumeral elevation, simulating typical functioning patterns of scapulohumeral rhythm. They mimic the typical physiological patterns of surrounding rotator cuff as well as scapular stabilizing muscles' co-contractions in this manner.^[15] Exercises for scapular stabilization increase muscular strength, motor control, mobility pattern, and position of joints awareness while lowering impairment in regarding the " the Western Ontario Rotator Cuff Index " and "SPADI-shoulder Pain and Disability index.". By restoring the natural scapula-humeral rhythm by increased strength of the muscles, joint alignment sense, and scapular rearrangement lessens impairment.^[16]

In a study done by Moghadam AN et al., it is stated that they have reviewed literature that by regulating the scapular musculature' length-tension relationship, stabilization of the scapula promotes muscular function.^[17] Thus, for the continuance of glenohumeral function, smoother scapular motions enable coordinated linked motion between the joint of the scapula along with humerus.^[18] These are the reasons of improvement found in our study as showed in Table 4.

CONTROL GROUP

In control group intensity of the pain was diminished from Pre intervention measurement outcomes at day 1 and after intervention at day 28 which was $7.84 \pm$

1.06 to 5.32 ± 1.28 and 73.68 ± 11.08 to 49.68 ± 14.19 respectively, as showed in table 4. According to the literatures available exercises that strengthen the muscles or stretch the soft tissues of shoulder have been shown in several studies to decrease pain and improve shoulder function by increasing Range of motion.^[19]

As per our knowledge for increased flexibility of surrounding muscles of shoulder which were tight, basic physiological and neuromuscular changes are responsible. It is believed that the main goal of a stretching exercise programme is to improve the muscle-tendon unit's extensibility, which in turn helps the body regain or reach the range of motion and flexibility needed for desirable or essential functional tasks. Stretching induced increases in range of motion can be attributed to biomechanical and neuronal alterations in the contractile and noncontractile components within the muscle-tendon unit. It is believed that either diminished muscle stiffness or improved muscular extensibility and length caused these alterations. Tension in passive muscles and tendons.^[20-23] During stretching tension increases when the arrangement of elastic element begins to extend. Sarcomeres abruptly extend as a result of mechanical interruption of the cross bridges at a certain point, which is caused by changes in nervous system together with the biomechanical structure.^[19] The primary in combination with the secondary afferent signals of intrafusal muscle fibres detect length changes when a stretching force is transmitted to a muscle-tendon unit either rapidly or gradually. This causes the extrafusal fibres to fire via alpha motor neurons within the spinal cord, triggering the reflex of stretching and raising (facilitating) tension within the muscle getting stretched.^[24,25] In a literature there is the negative outcome of the stretching intervention is mentioned by the author, who had narrated no effect of active ROM exercises on the clinical outcome after

giving conventional treatment for shoulder pain.^[26]

This causes the extrafusal fibers to fire via alpha motor neurons within the spinal cord, triggering the reflex of stretching and raising (facilitating) tension within the muscle getting stretched.^[27,28] Like-wise in our study also we found improvement in all four ROM in control group after intervention as showed in Table 3. In one study it is stated that for management of Rotator Cuff and Shoulder Impingement Syndrome, exercise therapy can greatly enhance function by improving ROM and lessening discomfort caused because of pain.^[29,30] Based on these available evidences we came to the knowledge that in our study we found the reduction in score of SPADI after giving the conventional exercise as showed in Table 4.

BETWEEN THE GROUP ANALYSIS

As the results shown in Table 5, based on the statistical value of Mean difference of both groups, conclusion can be made that Black burn group has showed more significant reduction in Pain than the conventional group.

It is well understood that Muscular contraction is a component of isometric training, which improves muscular endurance as well as strength. The Golgi tendon organ, that is located at the intersection of a tendon with a muscle fiber, becomes the target of isometric exercise. It increases muscular tension by generating an action potential in response to a contraction of the muscle. In Blackburn exercises, the rhomboidal muscles and middle trapezius are strengthened by prone horizontal abduction; the bottom trapezius and latissimus dorsi are strengthened by prone horizontal scaption; the muscle latissimus dorsi is strengthened by prone horizontal external movement of rotation; in addition, the upper trapezius is strengthened by prone horizontal extension.^[31]

As mentioned by the authors Raut Vand Golhar S, that exercise and physical activity activates endogenous pain inhibitory

pathways and reduce susceptibility to unpleasant stimuli.

Black burn exercises also have the same pain-relieving effects. The isometric six-second hold assisted in building muscular strength, which will lessen the impairment brought on by muscle weakness.^[31] As an alternative, there is a conflicting data quoted by the authors Turgut E et al., about the impact of the stabilization exercises of the scapula for Shoulder Pain Syndrome patients for treating the primary condition.^[32] In other research it is revealed that a traditional rehabilitation programme of physical therapy was not additionally effective than scapular stabilization exercises which is contradicting result compared to our study.^[33] ROM of Abduction has not shown superiority in improvement among both groups, which is believed to be because of the angle of muscle work during the exercise. Black burn exercises strengthen the shoulder at elevation of 100 degree or above. This exercise does not focus on primary shoulder abductors like deltoid and supraspinatus muscles other than trapezius.

As previously explained in the literatures, the Blackburn exercise increases the strength of scapulothoracic as well as rotator cuff muscles (upper, middle and lower trapezius, serratus anterior, rhomboid, deltoid infraspinatus, teres major and minor) and also help to reduce the muscle imbalance. Thus, will reduce the excessive superior translation of humeral head in glenoid fossa during elevation and increases upward rotation of scapula and posterior tipping on thorax which in turns prevents the impingement of structures in subacromial space.^[34]

Based on the available literatures, in our study we found the results also in favor of the scapular stabilization exercises. As showed in table 5, significant results noted for Experimental group. Our study has few limitations as assessment of scapular dyskinesia was not included in screening procedure, as our focus was to aim on the treatment of the shoulder pain. If it was

included then better reasoning can be done for understanding of the effect of Black burn exercises. Our objective and focus were on the patients suffering from general shoulder pain So, condition specific results cannot be explain well based on our findings. We were not able to study a long-term effect of the intervention for the persistent time as the time duration was a short. These limitations will also help other authors for further research process.

CONCLUSION

In our study we have concluded that when comparison is done in between two approaches, Black Burn Exercises has been appeared to be superior in results than the Conventional exercises. Thus, we came to the conclusion that in addition to conventional exercise in treatment approach for shoulder joint pain, if Black burn exercises are added then it will show favorable effects in subjects suffering with the shoulder pain to reduce their pain, disability and the improvement in functional level. Clinically, this study will help to treat patients of shoulder pain by reducing the pain, and disability and improve their quality of life by reducing frequency of recurrence. Also, these exercises will be helpful in the clinical rehabilitation of patients who have scapular dyskinesia or involvement of any scapular muscle imbalance with shoulder pain.

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