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Original Research Article

A COMPARATIVE STUDY TO FIND THE EFFECT OF STABILIZATION AND EXTENSION EXERCISES ON PATIENTS WITH SUB ACUTE NON-SPECIFIC LOW BACK PAIN

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ABSTRACT

Aim: The purpose of the study is to find out the effectiveness of lumbar stabilization exercises and extension exercises in patients with sub acute non-specific low back pain.

Materials and Methods: 30 patients with non specific sub acute low back pain and no clinical signs suggesting spinal instability were recruited (Stabilization training: n=15; Mc Kenzies back extension: n=15). Both groups received 6 weeks of exercises intervention. Outcome measure were pain (Visual analog scale), range of motion (inch tape), disability (Modified Oswestry disability questionnaire) which were measured before and after intervention.

Results: Both groups showed improvement post intervention. Statistically significant difference was observed between the 2 groups for relief of pain (mean difference=0.64, p=0.003), increase in range of motion (mean difference= 0.32,p=0.005) and reduction in disability scores (mean difference=3.40, p=0.003) favoring the trunk stabilization exercises.

Conclusion: The lumbar stabilization exercises programme has shown a significant improvement in outcome measures and reduced the disability to a greater extent with that of back extension exercise approach among subjects with sub acute non specific low back pain.

Key words: Lumbar Stabilization, Mckenzie , Oswestry Disability Questionnaire, Non Specific Low Back Pain, Sub Acute.

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INTRODUCTION

Low back pain is a nagging health problem and it is the most commonly treated condition. It is usually defined as pain, muscle tension or stiffness localized below the costal margin and above the inferior gluteal folds with or without leg pain (sciatica). Most of us will experience at least one episode of low back pain during our life time. Low back pain has life time incidence of 50-80% and accounts for 60% of referrals to an outpatient physiotherapy department [1].

Non specific low back pain is defined as symptoms without a clear specific cause that is low back pain of unknown origin. About 90% of all patients with low back pain will have non-specific low back pain, which, in essence, is a diagnosis based on exclusion of specific

pathologyThe most important symptoms of non-specific low back pain are pain and disability [1].

Specific low back pain is defined as symptoms caused by a specific patho physiological mechanism, such as hernia nuclei pulposi, infection, Osteoporosis, rheumatoid arthritis, fracture or tumor. Low back pain is classified as [2]:

In the acute stage(< 4 weeks) shows good prognosis and 90% settle within six weeks, able to return to work.

The sub acute stage(4-12 weeks) is the critical stage for intervention. Psychosocial issues become more important.

In the chronic stage(>12 weeks) the prognosis is poor. Likelihood of return to work diminishes with time. Medical treatment, rehabilitation, and vocational rehabilitation are difficult and success rate is low [3].

Most episodes of low back pain have a favorable prognosis, but recurrences within a year are common. The main challenge is the early identification of patients at risk for chronicity and subsequently preventing the chronicity [1].

Core training or lumbar stabilization which is aimed at the muscles of the trunk, abdomen and pelvis [4]. The goals of spinal stabilization are to (a) increases the capacity of the muscular stabilization system to maintain the neutral zone of the spine within its physiological limits, (b) increases the low back tolerance to insult through the conditioning of key musculature, (c) restore muscle size, strength, and endurance, d) re-establish coordinated muscle activity as required for prevention of recurrence and restoration of function and, (e) reduce pain associated with spinal instability [5-9].

Evidence suggests that McKenzie extension exercises on low back pain patients when administered there was greater decrease in pain and disability [10-12]. A study on 25 patients and concluded that modified oswestry disability questionnaire scale is considered to be an effective scale in measuring disability which holds the reliability and validity [13]. R. Williams etal(1993) did a study on 15 patients and stated that modified scober method is a reliable method for measuring lumbar flexion for patients with low back pain [15]. Wright etal in the study stated that a testing procedure using a Simple Tape Measure have comparable reliability and validity as they are relatively easy to measure the range of motion [16,17].

Need for the study is for early identification of patients with low back pain are at a risk for long term disability which is theoretically and practically important because early and specific interventions may be developed and used in this subgroup of patients. Stabilization and movement are critically dependent on the coordination of all muscles surrounding the lumbar spine in particular: the transverses abdominus and multifidus are needed for the optimal stabilization.

MATERIALS AND METHODS

The Study Design was a comparative study, with a sample size of 30 patients of age Group 25 to 45 years. The subjects were randomly allocated into two groups: A&B through Simple Randomized sampling method. Group A: 15 patients were given Trunk Stabilization training using lumbar core stabilization. Group B: 15 patients were given Trunk stabilization Training using Mc Kinezie extension exercises. The study was conducted in the Physiotherapy outpatient department of Apollo Hospital. Informed consent was taken from subjects prior to the study and cleared ethical committee from college ethical board.

The duration of the study was 6 weeks – Intervention program of 4 sessions per week, each session for 45 minutes with 10 repetitions for 3 sets and a rest period of 30 seconds. The materials used for the study were inch tape, revised oswestry disability questionnaire and interferential therapy [26].

Inclusion criteria: Patients having non specific Low Back Pain for more than 6 months and with no radicular symptoms (Radiating pain below knee, loss of sensation, loss of reflexes), Age group of 20-45 years, Both Males and Females.

Exclusion criteria: Excluded the patients with the following conditions: Nerve root compression or disc prolapse, Previous back surgery, Spondylarthrosis, Systemic illness, Muscular Tightness

Outcome measures: Range Of Motion-Inch

tape, Disability-Modified oswestry disability questionnaire, Pain-Visual Analogue Scale

Procedure: The exercise protocol was as follows:

Common warm up – exercise components are:

Exercise bicycle – 5 minutes of moderate pace.

Stretching Exercises: - Back stretches: - 3 repetitions hold time 15 – 45 seconds, rest interval of 30 seconds. Low back sustained rotation from supine position, single and double knee to chest from supine position, alternate spinal flexion – extension from 4 point kneeling position, trunk forward stretching while sitting on the heels and with trunk parallel to the floor, side bending in standing position with and without contra lateral arm elevation.

Pelvic/leg stretches: - Hip flexors stretch from Thomas test position, hamstrings muscle stretch from long – sitting position on the side of a treatment table for each leg individually, calf stretches with the knee straight and bent from standing position.

The Training program was carried out in the following manner:

Subjects were trained how to activate their Transverse abdominis and multifidis muscles [18]. Facilitation strategies included visualization techniques, verbal instruction, manual palpation and education using illustrations [19-23].

Training Groups:

Group A: Patients in this group were given trunk muscle stabilization training for duration of 45 minutes per each session, 4 days per week. Each exercise consists of 3 sets and 10 repetitions (10 seconds hold) in each set. Rest period of 30 seconds. Progression was made when a patient was able to perform 3 sets of 10-15 repetitions of an exercise with ease [4].

Supine: Crook lying (A natural Lordosis of lumbar spine is maintained) Transversus Abdominis contraction (drawing in). this exercises activates both transversus abdominis by drawing in the abdominis and the multifidus by maintaining the Lordosis.

Supine: Crook lying natural Lordosis of lumbar spine maintained. Transversus Abdomins drawing with alternate upper extremity and lower extremity movements(flexion and extension of arms and legs).

4 – Point kneeling – co-contraction of the Transversus Abdominis and multifidus.

4 – Point kneeling – co-contraction of Transversus Abdominis and multifidus and simultaneous upper and lower extremity extension.

Group B: The patient is taught self-correction of is bad posture with emphasis on maintaining normal lumbar lordosis in all the situations [24].

Extension to restore normal lumbar lordosis: Prone lying. Brief periods of prone lying for relaxation of the back muscles. Prone lying in extension with forearm and elbow support. In this position, the elbows are placed in line with the shoulder joints. Trunk is raised in extension by leaning on the forearm and curling of shoulders and upper back. Progress to exercise 3 and 4 when the constant pain is relieved. Prone lying extension on hand support. In this position hands are placed in line with the shoulder joints and trunk is gradually extended by leaning on the hands. Standing – extension. Standing upright, keep hands over the small of the back. Bend trunk backwards as much as possible.

RESULT AND ANALYSIS

At the end of 6 weeks, the study yielded the following result: Data was gathered & statistical analysis was done. Mean and standard deviation was calculated for Group A and Group B respectively. For intra group comparison single way Anova, and for inter group comparison "t" test was done. p value equal to or less than 0.05 was considered as evidence for statically significant findings.

Table 1: Showing the demographic profile.

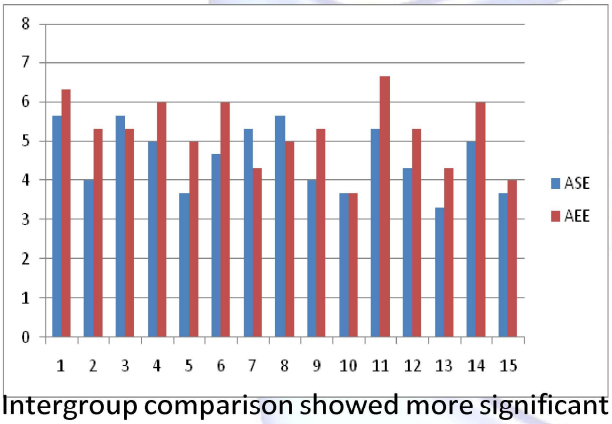
Treatment	Sex	N	Mean age	S.D
Group A Stabilization	Female	9	29.5	3.507
	Male	6	31.5	3.162
Group B Extension	Female	8	29.25	3.105
	Male	7	25.42	3.25

Intra group comparison for the improvement in pain using VAS scale showed that there is significant change in pain using both stabilization and extension exercises.

Table 2: Inter Group comparison for the improvement in pain.

S.No.	ASE	AEE		Avg SE	Avg EE
1	5.67	6.33	mean	4.6	5.24
2	4	5.33	variance	0.65	0.718
3	5.67	5.33	observations	15	15
4	5	6			
5	3.67	5			
6	4.67	6	df	28	
7	5.33	4.33	T statistic vaue	2.04	
8	5.67	5	t-statistic (table value)	1.643	
9	4	5.33	P-value (one tail test)	0.003602	
10	3.67	3.67	P-valu(two tail test)	0.555874	
11	5.33	6.67			
12	4.33	5.33			
13	3.33	4.33			
14	5	6			
15	3.67	4			

Graph 1: Pain - Stabilization Vs Extension exercise.



Intergroup comparison showed more significant change in pain with lumbar stabilization exercise.

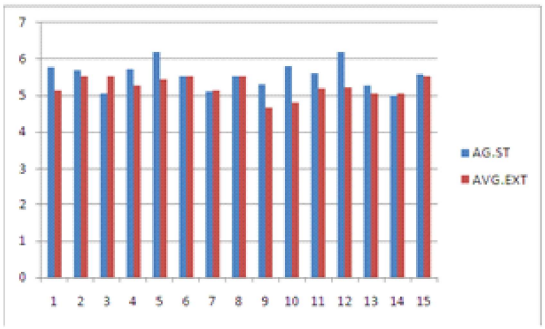
Intra Group comparison for the improvement in range of motion showed that there is a significant change in lumbar range of motion following both stabilization and extension exercises.

Table 3: Inter Group comparison for the improvement in range of motion.

S.No.	AG.ST	AVG.EXT		Mean Avg. ST	Mean Avg.Ext
1	5.77	5.13	mean	5.542222	5.224444
2	5.67	5.5	variance	1.85	0.06
3	5.03	5.5	observation	15	15
4	5.7	5.27			
5	6.17	5.43	T calculated value	0.26	
6	5.5	5.5	p-value(one tail test)	0.0052016	
7	5.1	5.13	p-value(two tail test)	0.0105276	
8	5.5	5.5			
9	5.3	4.67			
10	5.8	4.8			
11	5.6	5.17			
12	6.17	5.2			
13	5.27	5.03			
14	5	5.03			
15	5.57	5.5			
	83.13	78.37			

Inter Group comparison for the improvement in range of motion.

Graph 2: Range of motion- Stabilization vs Extension exercises.



Intergroup comparison for ROM showed that there is more significant change with lumbar stabilization exercise than that of extension exercises.

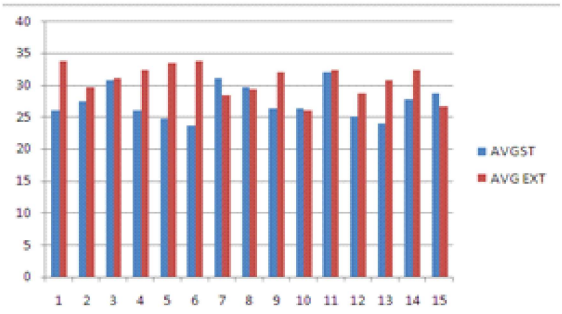
Intra Group comparison for the disability status using Modified Oswestry Disability Scale

Both groups showed significant change in p value pre and post treatment.

Table 4: Inter Group comparison showing the Disability status.

S.No.	Avgst	Avg Ext		Avg. St	Avg.Ext
1	26	33.66667			
2	27.33	29.66667	mean	27.26	30.66
3	30.66667	31	variance	6.41	5.68
4	26	32.33333	observations	15	15
5	24.66667	33.33333			
6	23.66667	33.66667	difference	28	
7	31	28.33333	t stat	3.65621	
8	29.66667	29.33333	t-table value	1.643	
9	26.33333	32	p-value(one tail test)	0.002888	
10	26.3333	26	p-value (two tail test)	0.001048	
11	32	32.33333			
12	25	28.66667			
13	24	30.66667			
14	27.66667	32.33333			
15	28.66667	26.66667			

Graph 3: Disability: Stabilization vs Extension exercises.



Both groups showed significant change in p value pre and post treatment, with stabilization group showing a significant change compared to extension group.

DISCUSSION

The results of this study showed that a period of exercise training for the deep stabilizing muscles of the spine, are capable of bringing about significant improvement in relief of pain, range of motion and functional ability in patients with sub acute non specific sub acute low back pain.

According to Panjabi, Goldby, Richardson et al all patients with low back pain may benefit from spinal stabilization exercise retraining as the deconditioning of trunk muscles leads to instability [8]. The findings tend to suggest that that trunk muscle stabilization exercises to that of back extension exercises improved patients pain, range of motion and reduced the patients self reported disability more effectively after the end of 6 weeks training period.

When performed according to the recommendations outlined, these exercises will activate both the local and global stabilizers. This program is recommended as part of a comprehensive individualized conditioning program. It should be performed daily initially and reduce to 4 times a week.

General stabilization exercises are useful as a means of spinal conditioning, exercises specifically designed to challenge and activate the local stabilizers are of primary importance due to the documented pathological changes in these muscles following or associated with low back pain [24,25].

Extension exercise is not enough unless the ways and means of maintaining the normal lordosis of the lumbar spine by self corrective methods is taught. Centralization or even distribution of pain following this maneuver is an indication of its efficacy.

Furthermore, evidence has substantiated the preventative benefits associated with training the local stabilizers and the spinal extensors. Spinal stabilization exercises, when performed according to the progressions recommended in this manuscript, require no special equipment or space, may be progressed based on the individual's ability , and are safe and applicable for the more common low back conditions experienced by patients.

A statically significant difference was observed between the 2 groups for increase in range of motion and relief of pain and reduction in disability scores in favor of the trunk stabilization exercises. Both groups made a clinically significant improvement. However the improvement in general exercise group was suboptimal composed with trunk stabilization exercise. According to previous studies it was considered minimally important.

The greater improvement in trunk stabilization exercise group may signify that perhaps specific muscle stabilization retraining is more relevant to patients with either gross spinal instability symptoms or pronounced side to side differences in the size of the multifidis muscle than to our subjects, who did not present any signs and symptoms of clinical instability a s described in literature [23].

Our results also indicated that at 6 weeks after the end of the training program there was an improvement in range of the motion which is very minimal between both the groups. Flexion ranges are taken into considerations because of the facts that trunk extensor musculature works more statistically and has a higher proportion of connective tissue than does trunk flexor musculature. Because of the difference in stiffness, it is reasonable that the application of the training program will result in trunk flexion mobility.

There were positive changes in the modified oswertry disability index for both the exercise groups. The improvements in functional ability could be seen as a direct result of decrease in [pain and improvement in flexibility, which supports the effectiveness of lumbar stabilization exercises in sub acute low back pain.

From a methodological point of view the frequency and duration of study intervention were deemed appropriate to produce demonstrable benefits based on previous studies of similar or less duration. Because increase in doses of low back exercises have been associated with increase in reported benefits(4), we attempted to avoid confounding our results due to this factor by balancing exercise dosage between groups, based on prior literature on the loading imposed on the trunk muscles with each

type of exercise. Therefore exercises were administered in a progressive manner for both groups.

The limitations of this study are clinically, in palpation of transverse abdominis multifidus contraction, there was no way of verifying whether these muscles were recruited appropriately. All though exercises were prescribed under biomechanical framework (to train muscles surrounding spine in order to protect it), the psychological principles of exercise delivery was not adopted strictly in the study.

CONCLUSION

The research studies shows that lumbar stabilization exercises are beneficial for individuals with low back pain because they stabilize the lumbar spine. Lumbar stabilization exercises may be better suited for patients with sub acute non specific low back pain but without any overt signs and symptoms of instability.

The results present here are important as they demonstrate that lumbar stabilization exercise program are aimed at improving pain, range of motion and functional disability. In line with the evidence from the study on patients with subacute non specific lowback pain it could be suggested that lumbar stabilization exercise program provided in group environment may be beneficial for successful management of patients with subacute non specific low back pain.

Conflicts of interest: None

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