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COMPARATIVE EFFECTS OF FLEXIBILITY AND STRENGTH TRAINING OF QUADRATUS LUMBORUM IN NON-SPECIFIC LOW BACK PAIN

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Abstract

The non-specific low back pain is now known to be the major health problem worldwide. And the prevalence of the non-specific low back pain is reported to be 84%. Non-specific low back pain is considered to be the cause of days lost from the work and also considered to be the indication for medical rehabilitation. Various types of treatments were designed to manage the back pain. The change in the activity of quadratus lumborum in the individuals with non-specific low back pain is unknown. Quadratus lumborum is one the common sources of the pain in the low back.

Objective: *To determine the combined effect of flexibility and strength training of Quadratus lumborum on non-specific low back pain.*

Methodology: *A randomized clinical trial study was conducted on sample of 30 subjects which were selected from Madinah teaching hospital Faisalabad and district head quarter toba tek singh. Treatment given to the patients was of (4session/week). Outcomes of interest are pain which measured by numeric pain rating scale, pain intensity were measured as base line, before treatment, after 1st session, after 4th session which is last session of treatment. Lumber Range of motion is measured at the baseline and at the last of treatment session.*

Conclusion: *The study concludes that there is significant difference between group A in comparison of group B of treatment group on the basis of NPRS and there is no significant difference between group A and B on the basis of ROM.*

INTRODUCTION

Lower back pain considered to be a commonality now-a-day. Non-specific lumbago is that sensation which occurs without any swelling, no particular pathology hinge as its source and no structural deformity. Lower back pain is a common manifestation. It usually occurs in high and middle income countries and occurs in all age groups in children and seniors (1). According to time period, it is classified as short term, intermediate and long-term category. Backache is a condition related to musculoskeletal system creates trouble in everyday life activities if it remains greater than 12 weeks (2).

The lifespan of low back pain is expressed in ratio as high as 84% and 11-12% people are handicapped from lumbago. Low back pain is classified into psychogenic, mechanical and non-mechanical. Mechanical lumber pain is of two

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types: specific and non-specific. Non-specific Low back pain is defined as absence of changes in structures of lumber region. The center of gravity influence body in many ways i.e balancing and protection which helps in avoidance of injury in most of body structures in different positions from sitting, standing and lying down although functional loading imbalance take place in Non-specific low back pain but non- specific lumbopelvic pain would not involve any kind of noticeable deformity like scoliosis and kyphosis with much of other problems such as crush syndrome, nerve impingement, bone injury, in vertebras and decrease in disc space (3).

According to duration, there are three main classes of LBP in which it is divided. Acute is less than 6 weeks, Sub-acute is in between 6 to 12 weeks and Chronic is greater than 12 weeks. In most of cases of NSLBP patient did not consult the doctor even the pain is worsen then convert into chronic (4).

Quadratus lumborum present at the lumber spine to pelvis and consequently having capability to extend the spine when quadratus lumborum contract bilaterally. QL muscles occupy the slack to balance or maintain the lumber spine at the time when lower fibers of erector spinae muscles are frail due to prolonged or long time sitting. All credit goes to its deliberate or planned position and pattern of its fiber. Quadratus lumborum is regard to be important means to evaluate for the anathesia during surgeries of the lower limb, abdominal and back area (5).

Stretching exercises are useful in the relief of quadratus lumborum and also help to return to normal range of motion. Different exercises are effective or benefit in treatment protocol such are curl up and side bridge exercise. It is effective in different patients with different treatment strategies. It also helpful with different modalities such as interferential current therapy and ultrasound therapy in different studies or evidences (6).

Quadratus lumborum also be treated by the strength training exercises with combination of MWM and many other fundamental treatments in different age group population like in obese people and in every age group (Siba Mulla, Poonam Patil). Therapeutic exercises includes flexibility and strength training exercises of lower back soft tissues and paravertebral muscles help to decrease the tension and compression of nerves and muscles, reduced muscle tightness (which directed towards the reduction in pain), increases muscles strength and improved lower back ROMs (7). Flexibility exercises very grateful in reducing the occurrence of LBP, reduce lumber elated disabilities. Due to disabilities or pain there is great reduction in ROM. There were limited researches done on quadratus lumborum and lower back pain in which QL was under focused but in most cases QL was misdiagnosed as an abdominal muscle but actually the QL is back muscle which have participation in back pain so we want to check the effectiveness of combined effect of flexibility and strength training of quadratus lumborum for the relief of non-specific low back pain in females. QL connects the pelvis to the spine and is there for capable for extending the lower back so there is basic association between the QL and low back pain. Purpose of this study determine the combined effects of flexibility and strength training versus alone flexibility training of quadratus lumborum in non-specific low back pain among female population.

Methodology

An experimental randomized clinical trial was conducted at Madina Teaching Hospital and the District Headquarter Hospital. Thirty women aged 35–55 years with intermittent non-specific low back pain of less than three months' duration were enrolled and, after screening for psychological stability and cognitive capacity, randomly allocated by lottery into two groups of 15 each. Three therapists were involved: Therapists A and B delivered interventions to Groups A and B, respectively, while Therapist C blinded to group allocation took baseline and post-intervention measurements. A total of 16 physiotherapy sessions were provided to both groups over 4 weeks. Participants in Group A performed a combined flexibility and strength protocol, beginning each session with **curl-ups:** from a supine position with one knee bent and

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the other extended to stabilize the pelvis and maintain lumbar neutrality, hands placed under the lower back and then lifted behind the head, patients raised their trunk off the plinth, held each of ten repetitions for 10 seconds, and gradually progressed from 4–5 to 10 reps over the intervention period. Next, they completed side-bridge holds by lying on one side with elbow flexed to 90° beneath the shoulder, legs straight; lifting the pelvis and shoulder off the plinth into a straight line head-to-toe, holding briefly before lowering, for six repetitions per side initially. Flexibility training included the **quadratus lumborum stretch:** seated with one leg bent and the other extended, patients reached the ipsilateral hand toward the ankle while raising the contralateral arm overhead and leaning laterally, holding for 30 seconds and repeating 10 times per side. Finally, the **bird-dog exercise** was performed on all fours with palms beneath shoulders and knees under hips; patients extended one arm and the contralateral leg in line with the trunk, held briefly, then returned to start and repeated on the opposite side for a total of 10 extensions per side. Group B followed the same curl-up and quadratus lumborum stretch protocol holding each repetition for 10 seconds and progressing from 4–5 to 15 repetitions without the Side Bridge or Bird Dog components. With exercises performed 4–5 repetitions initially and progressed to 15 repetitions over four weekly sessions of flexibility (4 sets/week) and two weekly sessions of strengthening (2 sets/week). Group B performed flexibility exercises only, holding each repetition for 10 seconds and progressing from 4–5 to 15 repetitions over the same schedule. All sessions were delivered twice weekly over four weeks by therapists A and B, with therapist C blinded to allocation conducting all baseline and post-treatment assessments. The standardize questionnaire was used to collect the data by therapist C. Pain intensity was assessed with the 0–10 Numeric Pain Rating Scale (minimal detectable change = 2.6), disability with the Oswestry Disability Index (interpreted cautiously due to its multidimensional nature), and lumbar range of motion with a measuring tape and goniometer (8).

RESULTS

A total of 30 participants were enrolled and randomly divided into two groups (Group A and Group B), with 15 patients in each. Descriptive and inferential statistics were applied. Repeated Measures Analysis of Variance (ANOVA) was used to evaluate within- and between-group differences over time. A p-value < 0.05 was considered statistically significant. Age distribution among participants in Group A ranged from 35 to 55 years, with the majority falling between 35–49 years. In Group B, similar age distribution was observed.

Descriptive statistics of Numerical Pain Rating Scale (NPRS) scores for both groups before and after the treatment presents in **Table 1.** Group A showed a decrease in mean pain score from 7.17 to 5.27, while Group B showed a decrease from 7.37 to 5.80. The reduction in NPRS was more notable in Group A, indicating a greater effect of the intervention.

Table 1: Descriptive Statistics of NPRS for Group A and Group B

Group	Time Point	Mean	Standard Deviation	N
Group A	Pre-Treatment	7.17	0.99	15
Group A	Post-Treatment	5.27	1.03	15
Group B	Pre-Treatment	7.37	0.81	15
Group B	Post-Treatment	5.80	0.77	15

results of the paired sample t-test comparing pre- and post-treatment NPRS scores in both groups. The results indicate statistically significant reductions in pain levels in both groups (p < 0.05), with Group A showing a slightly higher mean difference, supporting its greater clinical efficacy. Table 2

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Table 2: Paired Sample t-test for Pre and Post Treatment NPRS

Group	Mean Difference	Std. Deviation	t-value	Sig. (2-tailed)
Group A	1.90	0.76	9.72	0.000
Group B	1.57	0.56	12.08	0.000

Comparison of pain level on numerical pain rating scale (NPRS) at baseline and after session of 1st week, after session of 2nd week and after session of 4th week within both groups. After 1st session pain level almost remain constant from 7.1667±.99403 to 7.1667±.1.09653 for group A and for group B it from 7.3667±.81211 to 7.4333±.82086. After session of 2nd week the pain decreased in group A to 6.4667±1.21694 and the level of pain in group B also decreased to 6.5000±.88641and after last session there is significant decrease in pain of group A 5.2667±1.03280 as compared to group B 5.8000± .77460.

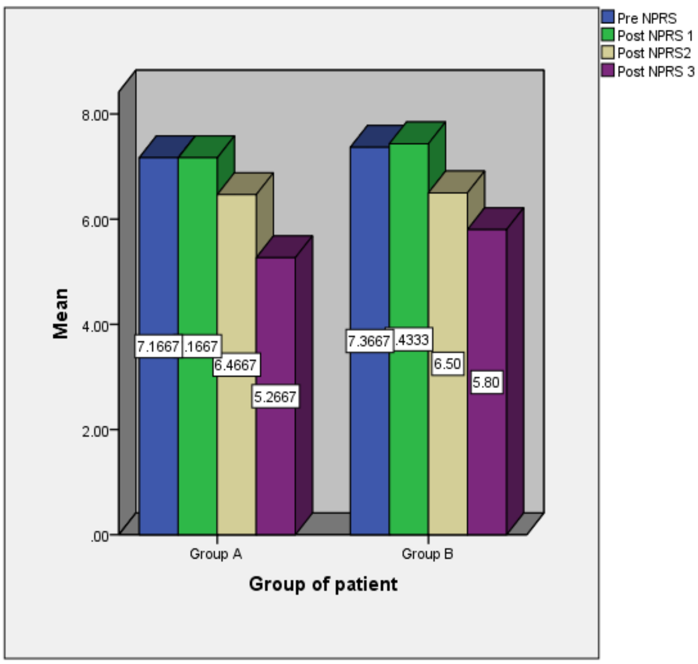

Figure 1: NPRS distribution for pain assessment

The value of lumbar flexion at baseline of group A is 40.8000±4.67822 and group B is 41.2667±2.89005. The mean value at the end of treatment of group A is43.4000±5.02565 and group B is 43.0667±2. 71153.There is minor difference in flexion of both groups. The level of significance was 0.000 which is less than 0.05 this shows significant improvement in flexion ROM.

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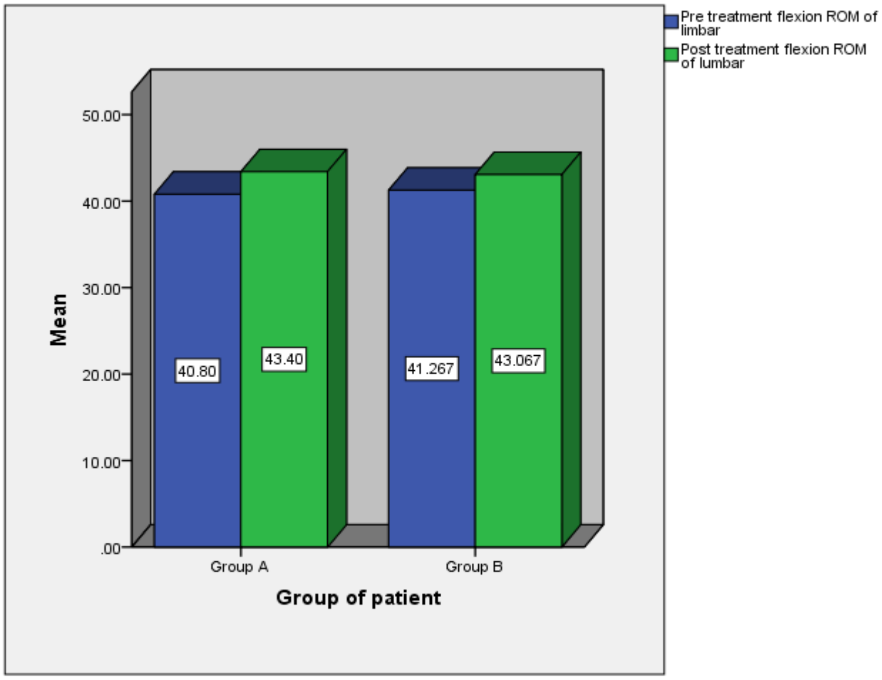

Figure: Comparison between the Pre and Post treatment flexion ROM of lumbar.

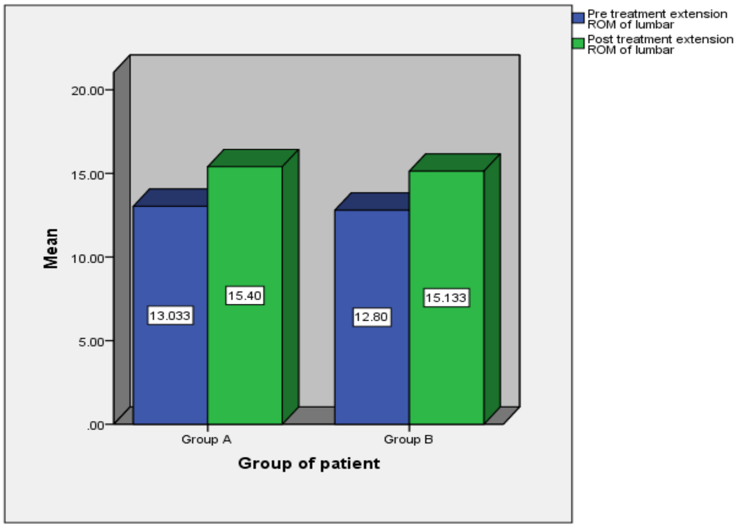

Figure 3: Comparison between the Pre and Post treatment extension range of motion of lumbar.

Descriptive statistics of NPRS of 30 subjects 15 in group A and 15 in group B at the pre NPRS (7.1667±.99403), post NPRS 1(7.1667±1.09653), post NPRS 2 (6.4667±1.21694), Post NPRS 3(5.2667±1.03280) of group A and the mean value of NPRS of group B was there was significant increase in pain from (7.1667±.99403)to (7.4333±.82086) and there is decreased in post NPRS 3(5.8000±.77460).Results shows there is greater decrease in pain in group A(experimental group). The mean of group A of pre-treatment ROM was 40.8000±4.67822 and the post-treatment ROM was 43.4000±5.02565. The mean of group B of pre-treatment flexion ROM was 41.2667±2.89005 and the post-treatment ROM was 43.0667±2.71153. The level of significance is 0.000 which is less than 0.05 which shows that there is significant increase in flexion ROM of lumbar. Table 3

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Table 3: **statistic of pre and post treatment flexion of lumbar spine**

Group of patient			Mean	N	Std. Deviation	P value
Group A	Pair 1	Pre-treatment flexion ROM of lumbar	40.8000	15	4.67822	
		Post treatment flexion ROM of lumbar	43.4000	15	5.02565	0.000
Group B	Pair 1	Pre-treatment flexion ROM of lumbar	41.2667	15	2.89005	
		Post treatment flexion ROM of lumbar	43.0667	15	2.71153	

The paired sample statistics and T-tests of both flexion and extension Range of Motion (ROM) of the lumbar spine in Group A and Group B reveal statistically significant improvement after treatment. There was an improvement in mean ROM post-treatment relative to pre-treatment values for both flexion and extension in both groups. The p-values for all of these comparisons were 0.000, which is below the standard cut-off of 0.05, indicating that these observed improvements were statistically significant.

DISCUSSION

The present study investigated the effects of a therapeutic intervention on lumbar spine range of motion (ROM), specifically examining flexion and extension, in two groups of patients. The findings demonstrated statistically significant improvements in both flexion and extension ROM post-treatment in both groups, with Group A showing slightly greater improvements compared to Group B.

A research was done by a researcher for the evaluation of results and effectiveness of classical physical therapy for the chronic non-specific low back pain. 487 studies were reviewed, 16 were observed and 10 were denied. From that collection 6 were involved by reviewing. 1 research was of low quality and 5 researches were of moderate quality. Machienze's method, massage, back school exercises were done, results for classical physical therapy proposal in chronic low back pain patients were ineffective. Lumbar spine mobility is crucial for functional independence and quality of life. Reduced ROM in flexion and extension is often associated with low back pain and functional impairment, and restoring these movements is a primary goal in rehabilitation programs. The current results align with previous studies that support the effectiveness of physical therapy interventions in improving spinal ROM. For instance, Abdel-aziem and Ahmed (2012) reported significant increases in lumbar ROM following a structured physical therapy program in individuals with chronic low back pain (9).

In this study, Group A exhibited a mean improvement of 2.6° in lumbar flexion and 2.37° in lumbar extension, while Group B demonstrated gains of 1.8° and 2.33°, respectively. These results suggest that the treatment protocol administered to Group A may have had superior clinical efficacy. This may be attributed to the nature of interventions provided to Group A, potentially involving more targeted mobilization or neuromuscular re-education techniques, which have been shown to positively affect spinal mechanics and segmental mobility (10,11).

The statistical significance ($p < 0.001$) observed across both flexion and extension movements in both groups confirms the clinical relevance of the intervention. The consistency in improvements across patients suggests a robust therapeutic effect, which is particularly important in the management of patients with restricted lumbar mobility or chronic lumbar dysfunction. These findings are supported by the work of Shum et al. (2005), who noted that lumbar segmental movement patterns improved significantly following manual therapy and exercise in patients with mechanical low back pain (12). Moreover, improvements in ROM have been associated with decreased pain intensity and enhanced functional performance, which reinforces the importance of incorporating such interventions in clinical practice (13).

However, certain limitations should be acknowledged. The sample size was relatively

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small (n=15 per group), which may affect the generalizability of the results. Furthermore, the study did not account for long-term follow-up, leaving the sustainability of the improvements uncertain. Future research should consider larger sample sizes, inclusion of control groups, and long-term assessments to evaluate the persistence of the observed benefits.

CONCLUSION

These findings suggest that the intervention applied was effective in enhancing lumbar spine mobility in terms of both flexion and extension. Notably, Group A showed slightly greater improvements in both flexion and extension ROM compared to Group B, indicating a potentially higher efficacy of the treatment administered to Group A. This supports the effectiveness of targeted therapeutic approaches in improving lumbar spine function among the studied patient population.

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