Original Article

PAIN, RANGE OF MOTION AND BACK STRENGTH IN CHRONIC MECHANICAL LOW BACK PAIN BEFORE & AFTER LUMBAR MOBILISATION

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ABSTRACT

Background: Joint mobilisations in the spine are used as an integral part of the treatment and rehabilitation to alleviate pain and reduce stiffness. Mobilisation has also been used to improve muscle strength as described in the literature. However, there is dearth of data exploring the effect of mobilisation on muscle strength in CLBP. **Purpose:** To investigate the effects of lumbar mobilisation on pain, range of motion and back strength chronic mechanical low back pain patients. **Materials and Methods:** Thirty subjects with chronic back pain participated in the randomized clinical trial. The effects of lumbar mobilisation & exercises were compared with the exercises alone. Pain levels were measured using visual analog scale, lumbar extension range of motion using modified Schobers test and strength by back-leg-chest dynamometer. Measurements were done before & after 2 and 4 weeks respectively. **Results:** A significantly greater improvement in pain (p=0.001); ROM (p=0.002); strength (p=0.001) after 4 weeks in experimental group than the control group. **Conclusion:** This study therefore provides experimental evidence to support the use of lumbar mobilization along with the exercises for the management of patients with chronic mechanical low back pain, who responded favourably to the intervention.

KEY WORDS: LOW BACK PAIN; JOINT MOBILIZATION; AND STRENGTH

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INTRODUCTION

Chronic Low Back Pain (CLBP) is disabling, expensive, and becoming increasingly common.[1,2] Low back pain is an important public health problem in all industrialized nations. Although most people appear to recover quickly from an episode of LBP, disability resulting from back pain is more common than any other cause of activity limitation in adults aged less than 45 years and second only to arthritis in people aged 45 to 65 years[3]. "Mechanical low back pain accounts for 97% of all cases of LBP & refers to an anatomical or functional abnormality without underlying malignant, neoplastic, or inflammatory disease".[4] Mechanical low back pain includes injury to the lumbosacral muscles and ligaments, facet joint or sacroiliac joint arthropathy, and discogenic disease due to degenerative changes[5], those individuals who remain disabled for more than 6 months, fewer than half return to work, and after 2 years of LBP disability, a return to work is even more unlikely.[6] Recent studies suggest that one third to one fourth of patients in a primary care setting may still have problems after 1 year of CLBP .[7,8]

In the USA, back pain is the most common cause of activity limitation in people younger than 45 years, the second most frequent reason for visits to the physician, the fifth-ranking cause of admission to hospital, and the third most common cause of surgical procedures.[9,10,11] Although rates of surgical procedures for patients with LBP are rising in the United States,[12] the majority of individuals with LBP continue to be managed non-surgically with a variety of treatment strategies, accounting for the majority of the costs associated with LBP. [13]

Various forms of manual therapy are used by several professional groups in the management of LBP.[13,14] Joint mobilizations in the spine are used as an integral part of the treatment and rehabilitation.[15,16,17] An intricate relationship exists between the para-spinal musculature of the lumbar spine and the mechanical structures involved in the movement of the spinal segments.[18]

Mechanical dysfunctions that result in tissue damage and inflammation can increase the sensitization of surrounding nerve fibres, leading to contractions of the surrounding musculature in response to neural stimulation. This sensitization is thought to result in persistent spinal pain through an increase in muscle activity and sometimes muscle spasm.[4] Same mechanism of pain and spasm occurs with the ligamentous structures of the spinal column in relation to the associated musculature. Although the spinal ligaments remain the primary constraints against joint instability, the para-spinal musculature can be a significant factor in maintaining stability.[19,20] Joint mobilization techniques are thought to benefit patients with lumbar mechanical dysfunction through the stimulation of joint mechanoreceptors. These receptors are believed to alter the pain-spasm cycle through the presynaptic inhibition of nociceptive fibres in associated structures and the inhibition of hypertonic muscles, which ultimately improves functional abilities.[15]

People who report low back pain often have reduced spinal motion. Reduced spinal extension can be the result of pain or stiffness and can be classified as being either general (total spine) or segmental (one vertebral level).[21,22] When motion is limited, spinal extension is frequently more restricted than flexion.[23] Spinal mobilization techniques and range-of-motion exercises often are prescribed by physical therapists in an attempt to improve lumbar extension and ultimately reduce low back pain.[24]

There is a dearth of data exploring the effect of mobilisation on muscle strength in CLBP. The purpose of this study therefore was to investigate the effects of lumbar mobilization on pain, range of motion and on the back extensor muscles strength in patients with chronic mechanical low back pain.

MATERIAL AND METHODS

Participants: A sample of 30 subjects were assessed and selected by the means of simple random sampling from Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana, Ambala on the basis of inclusion and exclusion criteria. Subjects were randomly allocated in the two groups by using sealed, opaque envelopes containing the treatment allocation for each participant. The subjects with mechanical low back pain were included in the study if they fulfilled the following criteria; Age between 20 to 50 years, Both males and females are included, Pain scores ≤" 4 (VAS), Body mass index (BMI) ≥ 24kg/m^2, Back pain of > 3 months (chronic) duration. The subjects were excluded from the study if they had spinal surgery, Osteoporosis, neurologic deficits, Pregnancy, Fracture of spine, Malignancy, Spinal instabilities, Prolapsed inter-vertebral disc (extrusion), structural, inflammatory disease of spine and thorax like scoliosis, kyphosis, pectus excavatum, pectus carinatum, ankylosing spondylitis.

Outcome measures:

Pain-related measure: Subjects were asked to mark their pain level on 10 cm scale, with 0 representing no pain and 10 worst imaginable pains.

Range of Motion-related measure: Trunk extension Range of Motion was measured using Modified Schobers test. Using a skin-marking pencil a mark was placed at the lumbosacral junction. A second mark was placed 10 cm above the first mark and a third mark 5 cm below the first mark (lumbosacral junction). The tape measure was aligned between the most superior and the most inferior marks. The subjects were asked to put the hands on the buttocks and to bend backward as far as possible. The distance between the most superior and the most inferior marks at the end of the ROM was noted and the final readings were obtained by subtracting the final from the initial measurement. The ROM is the difference between 15 cm and the length measured at the end of the motion.

Strength-related measure: Muscle strength was measured using Back-Leg-Chest Dynamometer. Subjects were asked to stand with their knees extended and hip flexed at 45 degrees. The position of the rod was adjusted at knee level and patients were asked to pull the rod by extending back. For familiarisation with the equipment few trials were done earlier. After the rest period of few minutes, all the patients performed maximum dynamic trunk extension using back dynamometer as forcefully as possible. Force generated was recorded in kgs. The strength measurement was recorded as the peak of three trials.

Procedure

The procedure of the study was explained to the subjects and written consent was taken. Baseline measurements were taken which included pain, trunk range of motion and trunk extensor strength. Pain was measured by VAS. Range of motion was measured by Modified Schober test using inch tape and marker pen. Muscle strength was measured using Back-Leg-Chest Dynamometer. The subjects were randomly divided into two groups, control (Group A) and experimental group (Group B) with 15 subjects each.

Patients in control group were given Short Wave Diathermy (SWD) for 15 minutes by condenser method, at 27.12MHz, in supine position[25]. Lumbar extension exercises which included Alternate Knee to chest, Pelvic bridging, Pelvic rolling, Alternate arm leg extension in quadruped (for both left & right sides), 5 times a week for 4 weeks and 3 sets of 15 repetitions of each exercise were given. Rest interval of 30 seconds was included between the repetitions.[26] Back care instructions in activities of daily living were given which includes sitting posture, standing posture, alternating body position, recognizing limitations of back, slowing down and taking the objects easily, using correct lifting technique adjusting height of table/desk, getting in/out of bed, choosing good chair.[27]

Patients in experimental group were given all the above intervention with joint mobilization.
Mobilization was done with patients in prone position with their hands either side on treatment table. Therapist stood on the side of treatment table and placed the left hand on patients back so that ulnar border of hand between pisiform & hook of hamate was directly over the spinous process of the vertebra to be mobilized. The examiner right hand was rein-forced by the left hand by placing the carpus at the base of the left index finger through the approximation of the right thenar & hypothenar eminence. The examiner shoulders were directly over the contact point on the patient spinous process, while the elbows were slightly flexed. The direction of applied force was downwards and oscillations for 30 seconds were given for each lumbar vertebrae mobilization, 2 times per week for 4 weeks.[28] Measurements for all the three variables were done after the end of 2 and 4 weeks.

Reliability

Pain-related measure: VAS is a reliable, valid instrument to assess pain intensity and is selected as the outcome measure based on its ability to detect immediate changes in pain.[29,30] Study to determine the reliability and validity of the visual analogue scale for disability in patients with chronic musculoskeletal pain. Study population were the patients over 18 years of age, suffering from chronic musculoskeletal pain; 52 patients were included in the reliability study, 344 patients in the validity study. They concluded reliability of the VAS for disability is moderate to good however, its validity was questionable.

Range of Motion-related measure: Michele et al determined the spinal flexibility of a large, adult population and studied the effects of other individual physical characteristics on spinal range of motion. The study group consisted of 3,020 blue collar employees (2,350 men and 670 women) who underwent a physical examination that included assessment of standing and sitting height, weight, shoulder flexibility, and spinal flexibility in the sagittal and frontal planes. They found that the modified Schober method was unique in that it showed little relationship to the other flexibility measures with correlation coefficients of 0.15 to 0.24, indicating that it may be measuring a different component of flexibility[31]. Beattie et al conducted a study to determine the reliability of the technique for measuring backward bending of the lumbar spine and to examine whether subjects with LBP could perform similar motion as subjects without LBP. Two groups composed of 100 subjects each, one with "significant" limiting low back pain (SLBP) and the other without "significant" limiting low back pain (NSLBP), were evaluated. They found the backward bending attraction method to be reliable method for measuring backward bending of the lumbar spine.[32]

Strength-related measure: Hannibal et al determined the reliability and evaluated the validity of selected low back field tests when compared to laboratory tests. Dynamic Static Back Lift using back dynamometer was shown to be reliable tests for a single measure and average measure across days for both sexes. Intra-class test-retest reliability coefficients using one-way ANOVA model for a single measure ranged from 0.940 to 0.996. For single and multiple measures intra-class reliability coefficients for Female was 0.940 and 0.970 and for Male 0.98 and 0.99 respectively.[33]

Data Analysis

The data were analysed using SPSS 16.0 software package. The level of significance was set at $p < 0.05$. The statistical analysis for the two groups was performed to find out the mean, standard deviation, p-value, t-value and the statistical significance between VAS, ROM, and strength in both the groups having chronic low back pain. Repeated measures ANOVA was used to compare within group values and the unpaired t test was used for between group comparisons.

RESULTS

The mean age of Group A was 34±6.38yrs and that of Group B was 34±5.4yrs and that of BMI was 26.94±1.42kg/m^2 and 27.27±1.5kg/m^2 respectively. The t-value for age was 0.001 and for BMI it was 0.62.The difference in mean age and BMI of two groups was not statistically significant showing that subjects were matched for the baseline characteristics. Statistical analysis was carried out for VAS, ROM & strength comparing the baseline values of Group A and Group B using unpaired t-test. The baseline data of both the groups were not statistically significant (Table 1), showing that the subjects were matched for the baseline characteristics.

Table 1 Comparison of Baseline Scores of VAS, ROM, and Muscle Strength between two Groups.

	Group A	Group B	t -value	p< 0.05
VAS(cms) (Mean±SD)	3.3±0.72	3.3±0.81	0.001	Non significant (1.00)
ROM (cms) (Mean±SD)	0.78±0.28	0.74±0.18	0.529	Non significant (0.601)
Strength(kgs) (Mean±SD)	50±8.6	49 ±10.38	0.286	Non significant (0.777)

Table 2 Post-hoc analysis using Bonferroni test revealed no significant difference in pain levels between baseline and 2 weeks and between 2 weeks and 4 weeks, but significant difference was there from baseline to 4 weeks. Post-hoc analysis also revealed no significant difference in ROM from baseline to 2 weeks and between 2 weeks to 4 weeks, but statistical significant increase in ROM was there from baseline to 4 weeks. Post-hoc analysis for strength shows statistical significant increase between baseline and 2 weeks, and between baseline and 4 weeks, but non significant between 2 weeks to 4 weeks.

Table 2 Comparison of VAS, ROM, Muscle Strength at 0 week, 2 weeks and 4 weeks after treatment within Group A, (Repeated Measures ANOVA)

Variables	0 wk	2 wks	4 wks	f value	P< 0.05	Post hoc p-value		
						0wk-2wk < 0.05	2wk-4wk < 0.05	0-4wk < 0.05
VAS (cms) (Mean±SD)	3.3±0.72	2.6±1.04	2.46±1.12	179.78	Significant (0.001)	Non Significant (0.81)	Non significant (1.00)	Significant (0.013)
ROM (cms) (Mean± SD)	0.78±0.28	0.87±0.23	0.96±0.33	198.44	Significant (0.001)	Non significant (0.589)	Non significant (0.235)	Significant (0.281)
Strength (kgs) (Mean±SD)	50±8.6	54.3±10.3	57±11.9	449.01	Significant (0.001)	Significant (0.013)	Non Significant (0.167)	Significant (0.007)

Table 3 Comparison of VAS, ROM, Muscle Strength at 0 week, 2 weeks and 4 weeks after treatment within Group B, (Repeated Measures ANOVA)

Variables	0 wk	2 wks	4 wks	f value	P< 0.05	Post hoc p-value		
						0wk-2wk < 0.05	2wk-4 wk < 0.05	0-4wk < 0.05
VAS (cms) (Mean±SD)	3.3±0.81	2.13±0.99	1.26±0.96	112.09	Significant (0.001)	Significant (0.001)	Significant (0.001)	Significant (0.001)
ROM (cms) (Mean±SD)	0.74±0.18	1.2±0.29	1.48±0.62	342.85	Significant (0.001)	Significant (0.001)	Non significant (0.378)	Significant (0.002)
Strength (kgs) (Mean±SD)	49±10.38	64.3±8.2	69.6±10.3	765.25	Significant (0.001)	Significant (0.001)	Significant	Significant (0.001)

As illustrated in Table 3 Post-hoc analysis using Bonferroni test revealed that there was a statistical significant difference in VAS scores between baseline and 2 weeks values, between 2 weeks and 4weeks and between baseline and 4 weeks values. Post-hoc analysis also revealed that there was statistical significance difference of ROM between baseline and 2 weeks and from baseline to 4 weeks but non significant between 2 weeks and 4 weeks. Post-hoc analysis for strength values shows statistically significant difference between baseline and 2 weeks, 2 weeks and 4 weeks and between baseline and 4 weeks. Strength values were more statistical significant from baseline to 2 weeks than from the 2 weeks to 4 weeks.

Table 4 Between Group Comparison of VAS at 0 week, 2 weeks and 4 weeks after treatment.

VAS	Group A	Group B	t -value	p< 0.05
0 week (Mean±SD)	3.3±0.72	3.3±0.81	0.001	Non significant (1.00)
2 weeks (Mean±SD)	2.66±1.04	2.13±0.99	1.43	Non significant (0.163)
4 weeks (Mean±SD)	2.46±1.12	1.26±0.96	3.14	Significant (0.004)

Table 4 illustrates the mean baseline VAS of Group A was 3.3±0.72cms and it was 3.3±0.81cms for Group B, with t-value of 0.001, which is statistically not significant. The mean VAS score of Group A was 2.66±1.04cms at 2 weeks, whereas it was 2.13±0.99cms for Group B, t-value was 1.43, which was not statistically significant. The mean VAS score of Group A was 2.46±1.12 and 1.26±0.96 for Group B. The t-value was 3.14, which was statistically significant, showing that mean pain levels was equal between both Groups at 2 week, whereas it was more improvement in Group B at 4th week.

Table 5 Between Group Comparison of ROM at 0 week, 2 weeks and 4 weeks after treatment.

ROM	Group A	Group B	t -value	p< 0.05
0 week (Mean±SD)	0.78±0.28	0.74±0.18	0.529	Non significant (0.601)
2 weeks (Mean±SD)	0.87±0.23	1.2±0.29	-3.3	Non significant (0.002)
4 weeks (Mean±SD)	0.96±0.33	1.48±0.62	-2.8	Significant (0.008)

Table 5 illustrates the mean baseline ROM of Group A was 0.78±0.28cms and it was 0.74±0.18cms for Group B, with t-value of 0.529, which is statistically not significant. At week 2, mean ROM were 0.87±0.23cms for Group A and 1.2±0.29cms for Group B, with t-value of -3.3, which was statistically significant. At week 4, mean ROM were 0.96±0.33cms for Group A and 1.48±0.62cms for Group B, with t-value of -2.8, which was again statistically significant, showing that in Group B improvement in ROM was more than Group A.

Table 6 Between Group Comparison of Muscle Strength at 0 week, 2 weeks and 4 weeks after treatment.

Strength	Group A	Group B	t -value	p< 0.05
0 week (Mean±SD)	50.86±8.6	49±10.38	0.286	Non significant (0.777)
2 weeks (Mean±SD)	54.3± 10.3	64.3 ±8.2	-2.93	Non significant (0.007)
4 weeks (Mean±SD)	57±11.9	69.6±10.3	-3.11	Significant (0.004)

Table 6 illustrates the mean strength of Group A at baseline was 50.86±8.6kgs and for Group B was 49±10.38kgs with t-value of 0.286, which was statistically not significant. The mean strength of Group A was 54.33±10.3kgs and 64.3 ±8.2kgs for Group B at week 2. The t-test value was -2.93, which was statistically significant. The mean strength of Group A was 57±11.9kgs and 69.6±10.3kgs at weeks 4. The t-test value was -3.11, which was statistically significant, showing that improvement in strength was more in Group B.

DISCUSSION

The present clinical trial was conducted to find the effectiveness of joint mobilization on pain, range of motion and back extensor muscle strength in patients with chronic mechanical low back pain. Results of this study focused on pain relief, improvement in ROM and strength of trunk extensor muscles. It was found that there was improvement in both the groups. Improvements in all three parameters were more statistically significant in the mobilization group (Table 4 - 6). Therefore the null hypothesis of the study was rejected and alternate hypothesis accepted.

Significant pain relief was noted in both the groups over the intervention period. When within group mean values of visual analogue scale (VAS) was analysed it was found statistically significant in both the groups. But when comparison was done for between groups, statistically significant difference was found (Table 4). Postero-anterior spinal mobilization proved superior in terms of reduction of pain. In the present study reduction in pain level, as quantified by the VAS, with the application of both postero-anterior mobilization and deep heating is consistent with the findings of previous studies indicating both the techniques reduced low back pain.

It is important to note that all participants were given deep heating as a conventional method of treatment. The physiological effects of heat include increase in metabolic activity, reduction in viscosity, increase in collagen extensibility, stimulation of sensory receptors, increase in local circulation and relief of pain [34]. Heat is often used to relief pain in a variety of disorders, through several possible mechanisms, like by reduction of muscle spasm, vasodilatation, counterirritant effect etc.

In the present study, the between group mean values of lumbar extension range were analysed, it was found statistically significant in both groups, but when comparison was done between group, statistically significant difference was found between groups (Table 5). Postero-anterior spinal mobilization proved better in improving lumbar extension in experimental group both at 2 weeks and 4 weeks. Several studies had proved short term effects of single session of spinal mobilization. Moreover, single session of spinal mobilization, has shown statistically significant improvement in extension range but not clinically relevant improvements. In the present study, the average improvements in extension range at 2 weeks and even more improvement after several sessions of spinal mobilization was revealed. Hence, this proves that several sessions of spinal mobilization are necessary to produce clinically relevant results.

Twomey et al demonstrated repetitive movements are thought to distribute synovial fluid over the articular cartilage and disc, resulting in less resistance to motion, with less resistance to motion subjects may feel free to move and thus may have experienced less pain. In addition to the mechanical explanation as to how mobilization and exercise may influence pain and motion, studies have suggested a neurophysiologic explanation.[35] According to Malisza et al dorsal horn activation (as measured with functional MRI) from a painful stimulus has been shown to decrease following joint mobilization [36]. This finding could explain the observations of several authors who reported that passive movements applied to either spine [37] or the extremities[38,39] elevated pain thresholds to various mechanical stimuli.

Chiradejnant et al reported a 36% reduction in pain following two 1-minute bouts of spinal mobilization in subjects with non-specific low back pain.[40] Goodshell et al also studied the effects of PA mobilization on non-specific low back pain and reported average pain reduction of 33% .[16] Both the studies found no significant increase in lumbar extension. This in contrast to the present study in which, mobilization significantly increased lumbar extension range. The present study supports the work of McCollam who reported a 7.1% increase in lumbar extension.[41]

Powers et al performed a clinical trial on non-specific low back pain and compared single session of posteroanterior spinal mobilization and prone press-ups and concluded that following both interventions, there was a significant reduction in the average pain scores for both the groups. Similarly, total lumbar extension significantly increased in both the groups. No significant difference between the 2 interventions in pain or lumbar extension was found. This is in contrast to the present study.[42] Herzong et al demonstrated a consistent reflex response on the tone of muscles associated with spinal manipulative treatments.[43] Weakness of muscle as depicted by Janda et al is due to altered motor regulation from the afferent impulses relayed from tissues surrounding a dysfunctional joint.[44] This "pseudoparesis" is a decrease in strength, which occurs when the CNS regulation limits full firing of a muscle. According to Warmerdam et al improvement in strength may be regained through mobilization of restricted joints, thus removing inhibitory reflexes.[45]

Studies of Suter et al [46] and Cibulka et al [47] have examined the effects of joint pathology on muscle strength. Mobilization of restricted sacro-iliac joints (SI) was performed, returning them to proper alignment. As a result of the treatment, both the studies found an immediate increase in the muscle strength responsible for the SI joint movement. Liebler et al demonstrated a significant increase in bilateral lower trapezius strength in response to Grade-IV posteroanterior mobilizations performed on subjects with asymptomatic thoracic vertebrae (T_6-T_{12}).[48]

According to Hurley et al a joint must have normal mobility in order for its corresponding muscles to work efficiently [49]. A muscle cannot attain its full function unless inhibition is removed. The Arthrokinetic Reflex (AKR) is responsible for the reflexogenic effects of mobilization on muscle as it links the central nervous system to the skeletal muscles.[45] The regulators of this reflex are the articular mechanoreceptors located within the synovial joint capsules. The joint capsule receptors, Type I – Type IV, exert a reflexive effect on muscle tone.[46] The afferent nerve fibres of these receptors project to motor neurons within the CNS, thereby contributing to the continuous modulation of activity flowing to the muscle spindle. When a stretch on a joint capsule is initiated, the mechanoreceptors exert reciprocally coordinated reflexogenic influences on muscle tone and on the excitability of stretch reflexes in striated muscle.[50] This reflex inhibits muscle from recruiting the maximal number of motor units and protects the body from overstressing restricted joint structures.[46]

Therefore, with a reasonable degree of confidence, these data point to the role of the capsular mechanoreceptors and AKR as a crucial in mediating the increase in back extensor muscle strength seen in the experimental group. The result of this study suggests that the use of manual therapy improves muscle strength (Table-6).

The increase in muscle strength in both experimental and control group can be attributed to the learning effect and due to the extension exercise in the groups. Gains in muscular strength are largely the result of increase in muscle size (hypertrophy), and adaptations of the neuromuscular system, combined to a lesser degree with muscle hyperplasia (increase in number of fibres per unit of volume). Prior to visual changes in muscle, there are a number of neurogenic changes that occur, which contribute to an overall increase in muscular strength. Indeed, it has been suggested that gains in strength may be achieved without structural changes to muscle, but not without neuromuscular adaptations. Thus, strength is not entirely a property of the muscle; rather it is a property of the motor system.[51]

Low back pain presents a serious health care problem and produces a huge burden on society. Simple, safe, physical treatment procedure of spinal mobilization with other non-invasive methods like heat application and exercises could be of great value. This provides a low cost, easy means of treatment in subjects with chronic mechanical low back pain.

Clinical Implications: Findings of this study reveal that lumbar joint mobilization not only helps to reduce pain and improve joint ROM, but also influences the trunk extensor strength. So, physiotherapists can incorporate the joint mobilization as an important tool along with the strength training program for better improvement of strength in chronic mechanical low back pain patients.

Limitations of the study: Power analysis for the estimation of adequate sample size was not done. The strict inclusion criteria used in the study limit the generalizability of the results to all the mechanical low back pain population. Activity levels of the subjects were not taken into consideration. Subjects could not be followed up after study.

Future Research: Study can be conducted with larger sample size. Study population was heterogeneous group with both male and female subjects, further studies could be done taking up a homogenous sample with either male or female subjects separately. Studies with longer duration can be done with longer follow-up period to assess long term benefits.

CONCLUSION

In conclusion, the present study provides an evidence to support the use of lumbar mobilization along with the exercises for the management of patients with chronic mechanical low back pain, who responded favourably to the intervention. Clinically and statistically relevant improvements were observed which was significant at both 2 weeks and 4 weeks. Therefore, mobilization can be incorporated for reduction of pain and improvement in ROM and strength in patients with chronic mechanical low back pain.

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