A Comparative Study to Analyze the Effect of Lumbar Stabilization and Conventional Back Extension Exercises on Mechanical Pain in Patients with Chronic Low Back Pain in Greater Noida

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Abstract:
Lumbar discomfort is a major problem due to its harmful effects on health and high frequency in the general population. Depending on where and how long the pain lasts, there are three general categorizations for Lumbar discomfort: acute less than 6 weeks, sub-acute 6 to 12 weeks, and chronic more than 12 weeks. Several theories concerning the cause of nonspecific LBP feature poor posture, low body mass, hamstring flexibility, psychological discomfort, diminished trunk extensor endurance, and faulty muscular control of trunk. Pain in the lower back is a challenging illness which can result from injuries pertaining to the muscles and ligaments providing support vertebral column or from overuse or strain. One common treatment method for Lumbar discomfort is exercise therapy. This includes diverse forms of therapies including muscular strengthening, several forms of flexibility and stretching, and cardiovascular exercise for overall physical fitness. Normally, the stabilization system's job is to give the spine enough stability to meet the demands of changing circumstances immediately due to the posture changes with static and dynamic loads. As Per traditional understanding, spinal stabilization primarily relies on spinal biomechanics, the intervertebral disc, spinal ligaments, and osseous components. The stabilization and mobility of the lumbar spine can be facilitated by any muscle that exits the lumbar region. However, according to certain research, the lumbar multifidus and transverses abdominis muscles are very crucial for the stability of the lumbar segment. There is preliminary data indicating that those with long-term Lumbar discomfort do not properly recruit their core muscles and display core weakness13. Standard Exercise for back extension and exercises for lumbar stability both are used to treat low back discomfort. Thus, an effort is undertaken to compare and investigate the benefits of traditional back extension exercises and lumbar stabilization activities in patients with chronic Lumbar discomfort.

Keywords: Lumbar Discomfort, Chronic Low Back Pain, Exercise Therapy, Lumbar Stabilization

Need of Study:
To investigate how lumbar spinal stabilisation exercises and traditional back extension exercises affect mechanical pain in patients with persistent Lumbar discomfort.
Aim of the Study: The purpose of the study is to examine how well traditional back extension exercises and lumbar stabilisation exercises address mechanical pain in patients with chronic Lumbar discomfort.

Objective of the Study:
1. To assess how well traditional back extension exercises and lumbar stabilisation improve functional result by lowering pain.
2. To assess how well back extension exercises and lumbar stabilisation exercises improve functional result by lowering pain in patients with mechanical Lumbar discomfort.

Hypothesis:
Experimental Hypothesis- Exercises for lumbar stabilisation have the potential to be more beneficial than traditional back extension exercises.

Alternate Hypothesis- Exercises for conventional back extension are more effective than those for lumbar stabilisation.

Null Hypothesis- Exercises for lumbar stabilisation cannot be substantially different from traditional back extension exercises.

Methodology:
Number and Source- This study included 60 patients experiencing chronic lumbar discomfort of mechanical origin. They visited Prakash hospital Physiotherapy Department in Greater Noida. Convenient samples of 30 patients were allocated in each group. Details of the subjects are given below:

Inclusion Criteria
- Patient who fall within the 20–50 age range.
- Patients with Lumbar discomfort lasting for more than three months of duration.
- Chronic mechanical Lumbar discomfort existing since last 3 months or more.

Exclusion Criteria
- Spinal surgery
- Spondylolisthesis
- Sciatica
- Prolapsed inter-vertebral disc.
- Recent abdominal surgery
- Spinal canal stenosis
- Sacroiliac joint pathology
- Referred pain due to visceral problem.
- Any cardiac pathology
- Limb length discrepancy
- Any deformities of the spine
- Neurological deficit
Sampling: Randomized Sampling

Design of the Study: Experimental study

Variables:
- Dependent- Numerical Pain Rating scale
- Independent- Lumbar stabilization exercises and Conventional back extension exercises

Sources: Sixty patients with mechanical lumbar discomfort, who sought treatment at the physiotherapy department of Prakash Hospital, were included in this study.

Instruments and Tools used:
- Assessment format made for the study.
- Treatment couch
- Pain scale NPRS

Procedure:
Every patient meeting the inclusion criteria underwent a comprehensive clinical evaluation. Written informed consent was obtained from each participant in both groups. Subsequently, patients were asked to complete a Visual Analogue Score assessment. Group allocation was determined using randomized sampling methods, with patients assigned to either group I or group II.

Protocol:
For group I (control)-Conventional back extension exercises.

Group I Interventions-Patients belonging to group I conventional back extension exercises are given for six weeks. Prior to starting the treatment, patients were assessed and made to fill up NPRS Score was taken. Following exercises intervention were given to patients belonging to this group.

Week: 1-2
- Bridging Gluteus Maximus bridges
- Prone on elbow with extension
- Prone on hand with extension

Week: 3-4
- Bridging with one leg-lift

Fig-1: Prone with single arm lift
Fig-2: Prone with single leg-lift

Fig-3: Prone Position raise your arm and leg alternately

Week: 5-6 Prone with double arm and leg-lift.

For group II: Lumbar stabilization exercises. (Experimental group)

Group II interventions patients belonging to group II lumbar stabilization exercises are given for six weeks. Prior to starting the treatment patients were assessed and made to fill up NPRS score was taken. Following exercises intervention were given to patients belonging to this group.

Week: 1-2

Fig-4: Transverse abdominis contraction in crook lying position.
Week: 3-4

Fig-5: In Quadruped Position single arm lift.

Fig-6: In Quadruped Position single leg lift.

In quadruped position single arm lift with hold.
In quadruped position single leg lift with hold.
Transverse abdominis contraction in sitting and standing.

Fig-7: In side lying quadratus lumborum stabilizing using close chain side popping on the elbow and knee
Week: 5-6

In quadruped alternate arm and leg lift.

Transverse abdominus in crook lying where light resistance is applied by flexing and extending one lower extremity and vice versa.

Fig-8: Side-lying quadratus lumborum using close chain popping on the elbow and Foot.

Fig-9: Plank
All the above exercises were held to 5 to 20 seconds with 10 repetitions and rest period of 5 Seconds between each exercise.

**Result:**

Man-Whitney U test has been used to find the significant difference of NPRS score between Group I & Group II. The significance of NPRS within each group has been determined using the Friedman test for repeated measures. To determine the impact of each therapy, the Cohen d was used to calculate size and the percentage of change.

<table>
<thead>
<tr>
<th>Effect Level</th>
<th>Cohen d Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No effect</td>
<td>d &lt; 0.20</td>
</tr>
<tr>
<td>Mild effect</td>
<td>0.20 &lt; d &lt; 0.60</td>
</tr>
<tr>
<td>Moderate effect</td>
<td>0.60 &lt; d &lt; 0.90</td>
</tr>
<tr>
<td>Submaximal</td>
<td>0.90 &lt; d &lt; 1.50</td>
</tr>
<tr>
<td>Maximal effect</td>
<td>d &gt; 1.50</td>
</tr>
</tbody>
</table>

The data was analysed using statistical software, specifically SPSS 20 and SyStat 8.0, and visual aids such as graphs, tables, and charts were created using Microsoft Word and Excel. Statistical significance was determined at the 5% and 1% levels, with p-values less than 0.05 and 0.01, respectively, indicating significance. The study included patients aged between 20 and 50 years with mechanical low back pain. This age range was further divided into subgroups (20-30, 31-40, 41-50), and their response to treatment was statistically analysed. Subgroups within group II, comprising patients aged 20-30 and 31-40 years, demonstrated significant improvement compared to their counterparts in group I. Conversely, patients aged 20-30 and 41-50 years in group I exhibited significant improvement compared to their counterparts in group II.

Our study included an equal number of male and female patients, with 30 individuals in each group. Duration of pain in group I is ranging from 3 to 6 months with mean duration of pain.
of 4.20 ± 0.92 (SD) and duration of pain in group II is ranging from 3 to 6 months, with mean duration of pain is 4.10 ± 0.89 (SD). The difference of mean duration of pain between two groups is not statistically significant with p = 0.670.

Pain represents comparison of NPRS score between two groups. There was significant improvement in pain among both the groups as tested by Friedmann test and the probability of chance among the groups was p < 0.001.

The calculated effect size was higher among patients in group II (6.56) compared to those in group I (4.79), with a percentage change of 81.90% in group II patients compared to 68.73% in group I subjects. When comparing the pain reduction between group I and group II, statistically significant differences were observed. In the first week, patients in group I experienced a significant reduction in pain (p = 0.025), with mean pain scores of 5.43 ± 0.9 (SD), compared to group II patients with mean pain scores of 6.03 ± 0.96 (SD). However, as treatment progressed, by the end of the 5th and 6th weeks, group II patients demonstrated a significant reduction in pain (p = 0.007) compared to their group I counterparts.

Graph-1 Comparison of Age.

Graph-2 Male-Female Ratio.
Graph-3 showing duration of pain

Graph-4 Showing Comparison of NPRS Scores between two Groups

Discussion:

According to a study by James R, persons with persistent lumbar pain benefit from exercise regardless of the kind of activity. In the current investigation, back extension exercises and specialised stabilisation exercises were both beneficial in lowering pain and impairment; however, only the specific stabilisation exercises were able to address the motor control deficit. According to Suraj Kumar and Vijay P. Sharma, individuals with persistent Lumbar discomfort can heal more quickly when they use both conventional and dynamic muscular stabilisation, particularly when it comes to pain management. The greater improvement in DMST (dynamic muscular stabilisation techniques) may result from the restoration of muscle strength along with improved posture, coordination, and balance in the context of pain and functional impairment. Kaul Rohini, Thakral Gaurav, and Sandhu Jaspal Singh compared the benefits of traditional back extension exercise with lumbar stabilisation exercise for the treatment of persistent disc prolapse. Better outcomes are seen via lumbar stabilisation. Also, Fabio Renova to Franca, Thomaz Nogueira Burke, Erica Sato Hanada, and others demonstrate the impact of muscle training and segmental stabilisation on persistent Lumbar discomfort. The effects of a core stabilisation exercise programme and traditional physiotherapy on persistent Lumbar discomfort are demonstrated by Ram Prasad Muthukrishnan. Comparing core stabilisation to traditional physiotherapy, more advantageous findings were seen with core stability. Consequently, most of the studies came to similar conclusions as this one, with core stabilisation exercises showing more improvement. The rationale behind this is that the spinal column is supported in appropriate alignment by the firm base that the
core muscles offer. The small sample size of the study did, however, provide several difficulties. This has an impact on how broadly applicable the study's conclusions are. Furthermore, the sample was taken exclusively from one hospital. Furthermore, the study described above solely assessed the parameter of pain. Future research could consider incorporating common functional measures to evaluate functional outcomes more comprehensively.

Conclusion:
This study found that persistent lumbar discomfort could be effectively treated using both lumbar stabilization exercises and traditional back extension exercises.

- NPRS improves significantly in both groups, but group II is more effective than group I.
- Both clinical and statistical evidence have demonstrated that lumbar stabilisation exercises (experimental group) are superior in lowering pain and enhancing functional result.

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