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COMPARATIVE EFFECTS OF LUMBAR PARASPINAL MUSCLE STRENGTHENING VERSUS HIP EXTERNAL ROTATOR STRENGTHENING IN INDIVIDUALS WITH CHRONIC MECHANICAL LOW BACK PAIN

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ABSTRACT

Background: Chronic mechanical low back pain (CMLBP) is a major cause of disability worldwide and is frequently associated with muscle weakness, impaired spinal stability, and altered lumbopelvic biomechanics. Strength deficits in lumbar extensors and hip external rotators may contribute to persistent pain and functional limitations. **Objective:** To compare the effectiveness of lumbar paraspinal muscle strengthening exercises and hip external rotator strengthening exercises in reducing pain and functional disability in individuals with chronic mechanical low back pain.**Methods:** Thirty participants with CMLBP were randomly assigned into two groups. Group A received lumbar paraspinal strengthening exercises, while Group B received hip external rotator strengthening exercises. The intervention lasted six weeks. Pain intensity was measured using the Visual Analoge Scale (VAS), and functional disability was assessed using the Oswestry Disability Index (ODI). Within- and between-group comparisons were analysed using paired and unpaired t-tests. **Results:** Both groups demonstrated statistically significant improvements in pain and functional disability ($p < 0.05$). However, the hip external rotator strengthening group showed significantly greater reductions in pain and disability scores compared with the lumbar strengthening group ($p < 0.05$). **Conclusion:** Strengthening hip external rotators is more effective than lumbar paraspinal strengthening alone in reducing pain and improving functional ability in individuals with chronic mechanical low back pain.

KEYWORDS : chronic low back pain, hip external rotators, lumbar extensors, strengthening exercises, physiotherapy, disability

INTRODUCTION

Low back pain is defined as pain or discomfort localized between the lower rib margins and the gluteal folds. It remains one of the leading causes of disability globally and imposes significant socioeconomic burden. Approximately 60–80% of adults experience low back pain at some point in their lifetime, and a substantial proportion develop chronic symptoms lasting more than three months.[1]

Chronic mechanical low back pain is frequently associated with muscular weakness, reduced endurance, impaired motor control, and altered spinal stability.[2] Dysfunction of lumbar paraspinal muscles contributes to decreased spinal support and increased mechanical stress on passive spinal structures.[3]

Recent evidence highlights the importance of hip musculature in lumbopelvic stability. Weakness of hip external rotators and abductors can lead to altered pelvic alignment, increased femoral internal rotation, and compensatory lumbar stress during functional movements.[4,5] These biomechanical alterations may contribute to persistent low back pain and functional disability.

While lumbar stabilization exercises are widely used in rehabilitation, hip strengthening has emerged as an important adjunct intervention targeting lumbopelvic control.[6] However, limited comparative research exists examining the relative effectiveness of lumbar paraspinal strengthening versus hip external rotator strengthening in chronic mechanical low back pain.

Therefore, this study aimed to compare the effects of lumbar paraspinal muscle strengthening and hip external rotator strengthening exercises on pain intensity and functional disability in individuals with chronic mechanical low back pain.

METHODS

Study Design

This study was designed as a prospective, parallel-group, randomized comparative trial conducted in accordance with Consolidated Standards of Reporting Trials (CONSORT) guidelines. The study aimed to compare the effectiveness of lumbar paraspinal strengthening versus hip external rotator strengthening in individuals with chronic mechanical low back pain.

Participants

A total of 30 participants with a clinical diagnosis of chronic mechanical low back pain of more than three months' duration were recruited from outpatient physiotherapy settings. All participants were screened for eligibility based on predefined inclusion and exclusion criteria prior to enrollment.

Eligibility Criteria

Participants aged between 20 and 50 years, experiencing chronic mechanical low back pain aggravated by physical activity, were included. Individuals were excluded if they presented with neurological deficits, a history of spinal surgery, structural spinal deformities, inflammatory or systemic spinal disorders, or pregnancy.

Sample Size Consideration

A sample size of 30 participants (15 per group) was

determined based on feasibility and prior similar studies, ensuring adequate power to detect clinically meaningful differences between groups.

Randomization and Allocation Concealment

Participants were randomly allocated into two groups (Group A and Group B) using a computer-generated randomization sequence. Allocation concealment was ensured using sealed, opaque, sequentially numbered envelopes prepared by an independent researcher not involved in participant recruitment or assessment.

Blinding

Due to the nature of the exercise interventions, blinding of participants and treating therapists was not feasible. However, outcome assessment was performed by an independent assessor who was blinded to group allocation to minimize detection bias.

Outcome Measures

Primary and secondary outcomes were assessed at baseline and after completion of the intervention period:

- **Pain Intensity:** Measured using the Visual Analogue Scale (VAS)
- **Functional Disability:** Assessed using the Oswestry Disability Index (ODI)

Both outcome measures are valid and reliable tools commonly used in low back pain research.

Intervention Protocol

Participants were randomly assigned to one of two intervention groups:

Group A (Lumbar Paraspinal Strengthening):

Participants performed a structured exercise program including prone trunk extension, superman exercise, and back extensor strengthening exercises.

Group B (Hip External Rotator Strengthening):

Participants performed clamshell exercise, fire hydrant exercise, seated hip external rotation, and figure-4 stretch targeting the hip external rotator muscles.

Both groups participated in supervised exercise sessions conducted three times per week for six weeks. Each session was standardized and monitored by a physiotherapist to ensure proper technique, progression, and adherence.

Adherence and Compliance

Attendance was recorded for each session, and participants were encouraged to complete all prescribed sessions. Any adverse events or dropouts were documented throughout the study period.

Statistical Analysis

Data analysis was performed using appropriate statistical software. Normality of data distribution was assessed prior to analysis. Within-group comparisons (pre- vs post-intervention) were conducted using paired t-tests, while between-group differences were analyzed using independent (unpaired) t-tests. A p-value of < 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee prior to commencement. Written informed consent was obtained from all participants before enrollment, and confidentiality of participant data was strictly maintained.

RESULTS

Table No: 1 Showing the number of patients divided in to groups.

Groups	Male (%)	Female (%)
Group A	36.7	63.3
Group B	43.3	56.7

Table No. 2 showing the change in pre and post treatment values of mean SD with unpaired t values and P values in Oswestry scale group A,B.

UnpairedT Test	Comparison			
	OSWESTRYSCALE			
	Pre		Post	
	Group A	Group B	Group A	Group B
Mean	34.13	34.40	24.93	27.13
S.D.	4.981	5.593	5.058	4.447
Number	30	30	30	30
Mean Difference	0.27		2.20	
UnpairedT Test	0.195		1.789	
P value	0.8461		0.0788	

Table No. 3 showing the change in pre and post treatment values of mean SD with unpaired t values and P values in VAS scale group A,B.

UnpairedT Test	Comparison			
	VAS SCALE			
	Pre		Post	
	Group A	Group B	Group A	Group B
Mean	4.32	4.57	2.00	2.75
S.D.	0.815	0.888	0.891	0.848
Number	30	30	30	30
Mean Difference	2.32		1.82	
P value	<0.001		<0.001	
Result	Significant		Significant	

DISCUSSION

The findings of this study indicate that strengthening both lumbar paraspinal muscles and hip external rotators can significantly reduce pain and disability in individuals with chronic mechanical low back pain. However, hip external rotator strengthening produced superior improvements.

Lumbar paraspinal strengthening enhances spinal stability and muscular endurance, thereby reducing mechanical strain on passive spinal structures.[3] Strengthening hip external rotators improves pelvic stability and controls femoral motion during functional tasks, reducing compensatory lumbar movement and mechanical stress.[5,6]

Previous research suggests that impaired hip muscle strength contributes to abnormal lumbopelvic rhythm and increased lumbar load.[4] Strengthening these muscles improves dynamic stability and functional movement patterns.

The superior outcomes observed in the hip strengthening group may be attributed to improved pelvic alignment, enhanced neuromuscular control, and reduced compensatory lumbar stress during movement.

Clinical Implications

- Hip external rotator strengthening should be included in rehabilitation programmes for chronic low back pain.
- Assessment of hip muscle strength is essential in patients with persistent low back pain.
- Integrating hip and lumbar stabilization exercises may improve long-term functional outcomes.

LIMITATIONS

- Small sample size
- Short intervention duration
- Lack of long-term follow-up
- Combined effects intervention were not studied

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Ethical Approval and Consent: As this study was limited to the analysis of previously published literature, ethical approval and informed patient consent were not required.

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CONCLUSION

Both lumbar paraspinal strengthening and hip external rotator strengthening exercises effectively reduce pain and functional disability in individuals with chronic mechanical low back pain. However, hip external rotator strengthening demonstrated superior outcomes, highlighting its critical role in lumbopelvic stability and rehabilitation.

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