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EFFECTIVENESS OF DRY NEEDLING ACTIVATION OF GLUTEUS MAXIMUS ON LOW BACK PAIN DUE TO GLUTEAL AMNESIA: AN EXPERIMENTAL STUDY

, Dr. Jafar Khan

[1] Krishna Kumar Solanki, [2]Dr. Abid R Quershi, [3]Dr. Renuka Pal, [4]Dr, Jafar Khan, [5]Dr. Abhishek Arora, [6]Dr. Hasnen Sheikh, [7]Dr. Vaishnavi Jayakant Kania, [8]Dr. Suhani Bhatanagar, [9]Dr. Adil Raza Ansari, [10]Dr. Hirendra Katariya

[*1]M.P.Th. scholar, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[2] Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[3]Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[4]Dean & HOD, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[5]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[6]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[7]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[8]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[9]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

[10]Assistant Professor, Pacific college of Physiotherapy, Pacific medical university, Udaipur, Rajasthan

Corresponding Author: Krishna Kumar Solanki

Email: Krishnaku111997@gmail.com

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Abstract

Background

Low back pain is a common musculoskeletal condition that can limit daily activity, work participation and quality of life. In many patients, persistent low back pain is influenced not only by lumbar spine dysfunction but also by altered hip and pelvic muscle control. Gluteal amnesia refers to reduced or delayed activation of the gluteal muscles, particularly the gluteus maximus. When the gluteus maximus fails to activate efficiently, compensatory overuse of the lumbar extensors, hamstrings and surrounding lumbopelvic muscles may increase mechanical stress on the lower back. Dry needling may help reduce myofascial sensitivity and facilitate neuromuscular activation, especially when combined with a progressive gluteus maximus exercise protocol.

Objective

To assess the effectiveness of dry needling activation of the gluteus maximus combined with a specific exercise protocol on pain intensity, functional disability and gluteus maximus strength in individuals with low back pain due to gluteal amnesia.

Methods

An experimental comparative study was conducted among 60 individuals with low back pain associated with gluteal amnesia. Participants were divided into two groups of 30 each. Group A received a home exercise program, while Group B received dry needling activation of the gluteus maximus along with a structured gluteal activation and strengthening program. Outcome measures included Visual Analogue Scale (VAS), Oswestry Disability Index (ODI) and gluteus maximus strength using manual muscle testing. Pre-intervention and post-intervention values were compared using paired t-test and between-group changes were analyzed using independent t-test. The level of significance was set at $p < 0.05$.

Results

Both groups showed statistically significant improvement after intervention. Group A demonstrated reduction in VAS from 7.04 ± 1.06 to 4.93 ± 1.20, while Group B showed greater reduction from 6.72 ± 1.02 to 3.02 ± 1.17. ODI improved from 46.35 ± 7.98% to 32.43 ± 9.07% in Group A and from 46.94 ± 6.87% to 22.68 ± 9.31% in Group B. Gluteus maximus strength improved from 3.24 ± 0.35 to 3.94 ± 0.46 in Group A and from 3.12 ± 0.40 to 4.36 ± 0.42 in Group B. Between-group analysis showed significantly greater improvement in VAS, ODI and gluteus maximus strength in Group B ($p < 0.001$).

Conclusion

Dry needling activation of the gluteus maximus combined with a specific gluteal exercise protocol was more effective than a home exercise program alone in reducing pain, improving functional disability and enhancing gluteus maximus strength in individuals with low back pain due to gluteal amnesia.

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INTRODUCTION

Low back pain is among the most common musculoskeletal complaints encountered in physiotherapy practice. It contributes to activity limitation, work absenteeism, reduced functional ability and decreased quality of life. Although low back pain is often managed as a local lumbar spine problem, clinical movement analysis frequently shows that symptoms may be related to altered hip and pelvic control. The lumbar spine, pelvis and hip function as an integrated unit during standing, walking, lifting and transitional movements. Therefore, dysfunction of muscles around the pelvis, especially the gluteus maximus, may influence lumbar loading and contribute to persistent pain.

The gluteus maximus is the largest and most powerful muscle of the body. It contributes to hip extension, external rotation, posterior pelvic control, upright posture and functional force transfer between the lower limb and trunk. During activities such as rising from a chair, climbing stairs, squatting, lifting and walking, the gluteus maximus helps generate movement while also reducing excessive compensatory load on the lumbar spine. Its anatomical connection with the pelvis, sacrum and thoracolumbar fascia makes it clinically important in lumbopelvic stability.

Gluteal amnesia, also known as inhibited gluteal activation or dead butt syndrome, is a neuromuscular condition in which the gluteal muscles do not activate effectively during functional activities. The muscle may not be completely weak, but its timing, recruitment and coordination may be altered. Prolonged sitting, sedentary lifestyle, poor posture, hip flexor tightness and reduced physical activity can contribute to this condition. When the gluteus maximus is inhibited, the hamstrings and lumbar extensors may dominate hip extension tasks, leading to altered movement patterns and increased stress over the lower back.

In individuals with low back pain due to gluteal amnesia, treatment directed only toward the lumbar spine may not fully address the underlying dysfunction. The patient may receive pain relief temporarily, but faulty movement patterns can continue if gluteal activation is not restored. Therefore, assessment and rehabilitation of gluteus maximus activation should be considered in selected cases of low back pain. A focused intervention that reduces pain, facilitates muscle activation and retrains movement may be more useful than a generalized approach alone.

Dry needling is a minimally invasive physiotherapy technique used for myofascial pain and neuromuscular dysfunction. In this technique, a thin sterile needle is inserted into trigger points or dysfunctional muscle regions to reduce local sensitivity, facilitate neuromuscular response and improve movement tolerance. In gluteal amnesia, dry needling of the gluteus maximus may help prepare the muscle for better activation. However, dry needling should be followed by specific exercises to reinforce proper recruitment and functional integration.

The present study was conducted to evaluate the effectiveness of dry needling activation of the gluteus maximus in individuals with low back pain due to gluteal amnesia. The study compared a home exercise program with dry needling activation combined with a structured gluteus maximus exercise protocol. The outcomes were assessed using VAS for pain, ODI for disability and gluteus maximus strength grading for target muscle activation.

NEED FOR THE STUDY

Low back pain is a major cause of functional limitation and disability in adults. In many cases, persistent low back pain is associated with movement dysfunction rather than only structural pathology. Gluteal amnesia is one such factor that

may remain undetected during routine assessment. When the gluteus maximus does not activate properly, the lumbar spine and surrounding muscles may compensate during daily activities, increasing stress on the lower back.

Conventional low back pain management commonly includes mobility exercises, stretching, strengthening, postural correction and home-based exercises. These interventions are useful, but in patients with gluteal amnesia, general exercise may not be sufficient if the patient continues to perform movements with lumbar extensor or hamstring dominance. Specific gluteus maximus activation and progressive strengthening are required to correct the underlying neuromuscular dysfunction.

Dry needling may be useful as an adjunct intervention because it can reduce myofascial trigger point sensitivity and improve the readiness of the gluteus maximus to activate. When combined with a structured exercise program, it may help restore hip extension mechanics, improve pelvic control and reduce compensatory lumbar loading. However, limited clinical research has examined dry needling activation of the gluteus maximus specifically in individuals with low back pain due to gluteal amnesia.

Therefore, this study was undertaken to compare a home exercise program with dry needling activation plus specific gluteus maximus exercises. The findings may help physiotherapists use a more targeted and functional approach in managing low back pain associated with gluteal dysfunction.

RESEARCH QUESTION

Does dry needling activation of the gluteus maximus combined with a specific exercise protocol reduce pain, improve functional disability and enhance gluteus maximus strength in individuals with low back pain due to gluteal amnesia compared with a home exercise program?

HYPOTHESIS

Null Hypothesis (H0): Dry needling activation of the gluteus maximus combined with specific exercise will not produce a significant improvement in pain, disability or gluteus maximus strength in individuals with low back pain due to gluteal amnesia compared with a home exercise program.

Alternative Hypothesis (H1): Dry needling activation of the gluteus maximus combined with specific exercise will produce a significant improvement in pain, disability and gluteus maximus strength in individuals with low back pain due to gluteal amnesia compared with a home exercise program.

OBJECTIVES OF THE STUDY

- To evaluate the effect of dry needling activation of gluteus maximus on pain intensity in individuals with low back pain due to gluteal amnesia.
- To assess the effect of dry needling activation and specific exercise on functional disability using the Oswestry Disability Index.
- To assess changes in gluteus maximus strength after intervention.
- To compare outcomes between a home exercise program and dry needling activation with specific exercise protocol.

MATERIALS AND METHOD

Study Design

The present study was designed as an experimental comparative study to assess the effectiveness of dry needling activation of the gluteus maximus in individuals with low back pain due to gluteal amnesia.

Study Setting

The study was conducted at Pacific Medical College and Hospital, Bedla, Udaipur, Rajasthan.

Study Duration

The total study duration was one year. The intervention protocol was administered in a supervised and home-based manner according to the group allocation.

Sample Size and Sampling Technique

A total of 60 participants were included in the study. Participants were divided into two groups of 30 each using purposive sampling according to predefined inclusion and exclusion criteria.

Participant Characteristics

Male and female participants aged between 20 and 70 years with low back pain due to gluteal amnesia were included. All participants provided informed consent before inclusion in the study.

Inclusion Criteria

1. Individuals with low back pain associated with gluteal amnesia.
2. Age between 20 and 70 years.
3. Willingness to participate and provide informed consent.

Exclusion Criteria

4. Cancer.
5. Spinal trauma or amputation.
6. Systemic inflammatory disorders or progressive neurological conditions.
7. Pregnancy or open wound.
8. Current use of medications such as anticoagulants, steroids or NSAIDs as contraindicated for dry needling.
9. High degree burns.

Outcome Measures

Visual Analogue Scale (VAS) was used to assess pain intensity. The scale ranges from 0 to 10, where 0 indicates no pain and 10 indicates worst imaginable pain. It is a simple and sensitive measure for evaluating changes in pain after intervention.

Oswestry Disability Index (ODI) was used to measure low back pain-related disability. It evaluates the impact of pain on daily activities such as personal care, lifting, walking, sitting, standing, sleeping, social life and travel. Higher percentage scores indicate greater disability.

Gluteus maximus strength was assessed using manual muscle testing during prone hip extension. Strength was graded on a 0 to 5 scale, with higher values indicating better muscle strength and activation.

Intervention Protocol

Group A received a home exercise program including warm-up exercises, cat-cow stretch, pelvic tilts, knee-to-chest stretch, child pose, piriformis stretch, glute bridge, bird-dog, plank, side plank and cooldown exercises. The program focused on spinal mobility, flexibility, core activation and general strengthening.

Group B received dry needling activation of the gluteus maximus along with a progressive specific exercise protocol. The exercise program progressed from neuromuscular re-education and isometric activation to controlled movement, hip stability, dynamic control, load tolerance and functional strengthening. Exercises included gluteal squeeze, prone gluteal set, basic bridge, bridge with abduction, clamshells, quadruped hip extension, single-leg bridge, lateral band walks, step-ups, hip thrusts, deadlift-pattern training and functional carry drills.

Statistical Analysis

Data were analyzed using descriptive and inferential statistics. Mean and standard deviation were calculated for all outcome variables. Paired t-test was used for within-group pre-post comparisons, while independent t-test was used for between-group comparison of improvement. Pearson correlation was used to evaluate relationships among pain reduction, disability reduction and strength gain. A

p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 60 participants with low back pain due to gluteal amnesia were included in the study. Group A consisted of 30 participants who received a home exercise program, while Group B consisted of 30 participants who received dry needling activation with a specific gluteus maximus exercise protocol. Baseline values were comparable between both groups for age, VAS, ODI and gluteus maximus strength, indicating that post-intervention changes could be interpreted in relation to treatment effects.

Table 1. Baseline Comparability Between Groups

Variable	Group A Mean ± SD	Group B Mean ± SD	p value	Interpretation
Age (years)	39.47 ± 12.07	44.47 ± 12.37	0.119	Non-significant
VAS pre	7.04 ± 1.06	6.72 ± 1.02	0.243	Non-significant
ODI pre (%)	46.35 ± 7.98	46.94 ± 6.87	0.761	Non-significant
GM strength pre	3.24 ± 0.35	3.12 ± 0.40	0.222	Non-significant

The baseline comparison showed no statistically significant difference between Group A and Group B for age, VAS, ODI and gluteus maximus strength. This indicates that both groups were broadly comparable before the intervention.

Table 2. Comparison of VAS Scores Between Groups

Variable	Group A Mean ± SD	Group B Mean ± SD
VAS Pre-Test	7.04 ± 1.06	6.72 ± 1.02
VAS Post-Test	4.93 ± 1.20	3.02 ± 1.17
Mean Improvement	2.11 ± 0.53	3.71 ± 0.63

Both groups demonstrated reduction in pain after intervention. However, Group B showed greater reduction in VAS score compared with Group A. Between-group comparison of VAS improvement was statistically significant ($t = -10.66$, $p < 0.001$), indicating superior pain reduction in the dry needling activation group.

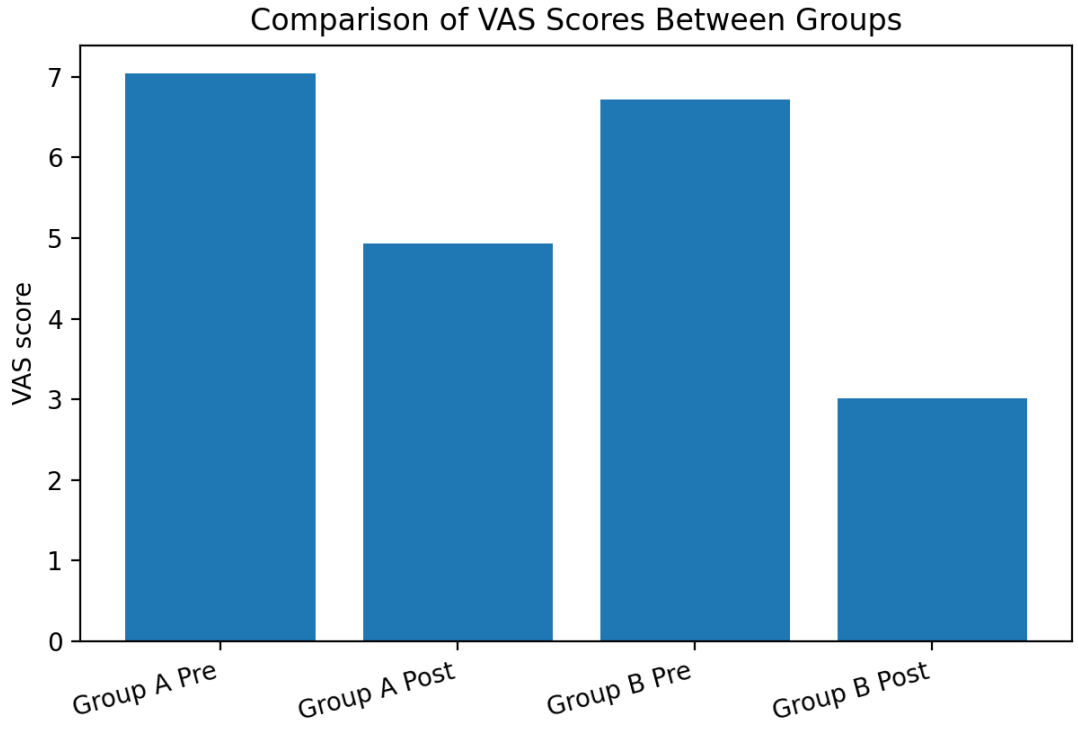

Figure 1: Comparison of VAS Scores Between Groups

Table 3. Comparison of ODI Scores Between Groups

Variable	Group A Mean ± SD	Group B Mean ± SD
ODI Pre-Test (%)	46.35 ± 7.98	46.94 ± 6.87
ODI Post-Test (%)	32.43 ± 9.07	22.68 ± 9.31
Mean Improvement	13.92 ± 3.31	24.26 ± 5.30

ODI scores reduced in both groups after treatment, showing functional improvement. The improvement was greater in Group B. Between-group comparison of ODI improvement showed a statistically significant difference ($t = -9.064$, $p < 0.001$), supporting superior functional recovery in the dry needling activation group.

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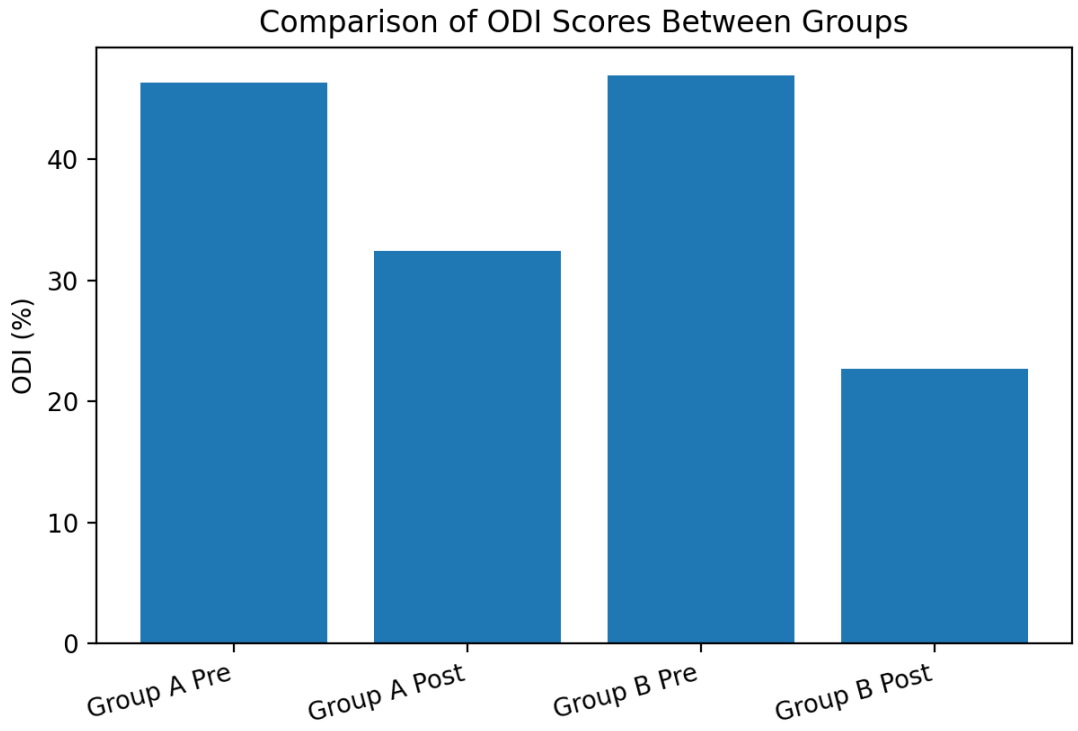

Figure 2: Comparison of ODI Scores Between Groups

Table 4. Comparison of Gluteus Maximus Strength

Variable	Group A Mean ± SD	Group B Mean ± SD
GM Strength Pre-Test	3.24 ± 0.35	3.12 ± 0.40
GM Strength Post-Test	3.94 ± 0.46	4.36 ± 0.42
Mean Gain	0.70	1.24

Both groups showed improvement in gluteus maximus strength after intervention. Group B showed a greater increase in strength, indicating that dry needling activation combined with progressive gluteal exercise was more effective in restoring gluteus maximus activation.

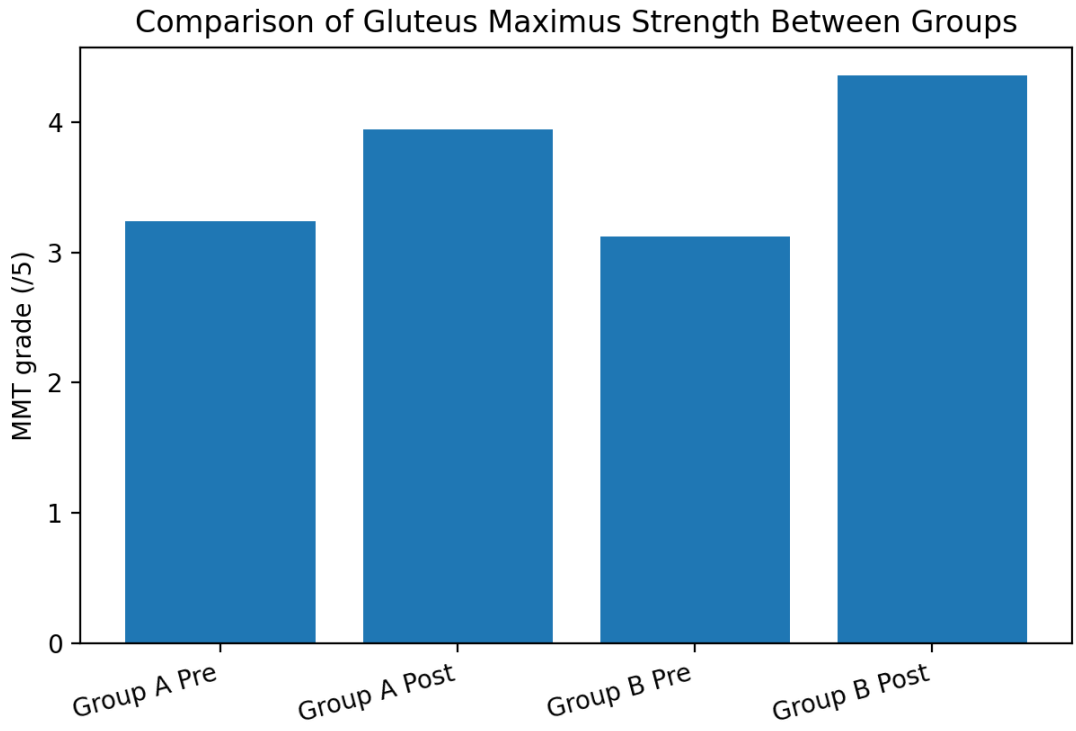

Figure 3: Comparison of Gluteus Maximus Strength Between Groups

Table 5. Paired t-Test Results

Variable	t-value Group A	p value	t-value Group B	p value
VAS	21.83	<0.001	32.24	<0.001
ODI	23.02	<0.001	25.09	<0.001
GM Strength	15.96	<0.001	28.23	<0.001

The paired t-test analysis showed statistically significant pre-post improvement in both groups for pain, disability and gluteus maximus strength. The magnitude of improvement was greater in Group B across all outcome measures.

Table 6. Correlation Analysis

Correlation	r value	p value	Interpretation
VAS reduction vs ODI reduction	0.564	<0.001	Positive association
Strength gain vs VAS reduction	0.504	<0.001	Positive association
Strength gain vs ODI reduction	0.667	<0.001	Positive association

Correlation analysis showed that greater pain reduction was associated with greater disability reduction. Strength gain also showed a positive relationship with both pain reduction and ODI improvement, suggesting that restoration of gluteus maximus activation may be clinically linked with better low back pain outcomes.

DISCUSSION

The present experimental study was conducted to evaluate the effectiveness of dry needling activation of the gluteus maximus in individuals with low back pain due to gluteal amnesia. The findings demonstrated that both the home exercise program and dry needling with specific exercise protocol produced significant improvement in pain, disability and gluteus maximus strength. However, the

improvements were greater in the group receiving dry needling activation combined with progressive gluteal exercise training.

The reduction in VAS scores in both groups indicates that exercise-based physiotherapy is effective in reducing low back pain. Group A improved after mobility, flexibility, core and strengthening exercises. These exercises may have reduced pain by improving lumbar mobility, decreasing stiffness and enhancing movement confidence. However, Group B demonstrated a greater reduction in pain. This may be due to the combined effects of dry needling on myofascial trigger points and specific gluteus maximus activation exercises that reduced compensatory lumbar loading.

The significant reduction in ODI scores suggests that participants were not only experiencing pain relief but also functional improvement. Low back pain often interferes with sitting, standing, walking, lifting and sleeping. Group B showed greater functional improvement, which may be explained by better pelvic stability, improved hip extension mechanics and reduced dependence on lumbar extensor compensation. Improved gluteus maximus activation can help the patient perform daily activities with less strain over the lumbar spine.

Gluteus maximus strength increased in both groups, but the gain was greater in Group B. This finding supports the clinical rationale that dry needling activation, when followed by progressive gluteal exercises, may facilitate better neuromuscular recruitment of the target muscle. Dry needling may reduce local trigger point irritability and improve muscle readiness, while exercises reinforce the corrected activation pattern through repeated practice.

The correlation results further support the clinical relationship between pain, disability and gluteal strength. Participants who gained more gluteus maximus strength tended to show greater pain reduction and disability improvement. This suggests that gluteal activation is not merely an isolated muscle finding but may contribute meaningfully to overall lumbopelvic function.

Overall, the study supports the inclusion of gluteus maximus assessment and activation-based rehabilitation in patients with low back pain due to gluteal amnesia. A combined approach using dry needling and specific exercises appears to be more beneficial than a home exercise program alone. This has practical importance for physiotherapists because it emphasizes treating the underlying neuromuscular dysfunction rather than focusing only on symptomatic lumbar pain.

CONCLUSION

The present study concluded that dry needling activation of the gluteus maximus combined with a specific exercise protocol was effective in reducing pain intensity, improving functional disability and enhancing gluteus maximus strength in individuals with low back pain due to gluteal amnesia.

Both treatment groups showed statistically significant improvement after intervention. However, the dry needling activation group showed greater improvement than the home exercise group in VAS, ODI and gluteus maximus strength. These findings suggest that addressing gluteal inhibition through a targeted approach may provide superior clinical benefits in selected low back pain patients.

The study supports the alternative hypothesis and indicates that dry needling activation may be considered a useful adjunct to progressive gluteal strengthening and motor control exercises in low back pain associated with gluteal amnesia.

LIMITATIONS

- The sample size was limited to 60 participants, which may restrict generalization to a larger population.
- The study was conducted in a single clinical setting.

- Long-term follow-up was not included to assess maintenance of improvement.
- Gluteus maximus strength was assessed clinically using manual muscle testing rather than objective instruments such as dynamometry or electromyography.
- Occupation, physical activity level and lifestyle factors were not controlled in detail.
- The study did not include imaging or advanced biomechanical analysis to evaluate lumbopelvic movement patterns.

RECOMMENDATIONS

- Future studies should include a larger sample size and multicenter recruitment.
- Long-term follow-up should be performed to determine whether treatment benefits are maintained.
- Future research may use electromyography or dynamometry to measure gluteus maximus activation and strength more objectively.
- Comparative studies may include sham dry needling to isolate the specific effect of dry needling.
- Sport-specific, occupation-specific and activity-level subgroup analysis may be considered.
- Physiotherapists should consider assessing gluteus maximus activation in patients with recurrent or persistent low back pain.

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