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Article

Effectiveness of Mulligan Mobilization and Maitland Mobilization Methods in Alleviating Pain and Enhancing Functional Mobility Among Chronic Low Back Pain (CLBP) Sufferers

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ABSTRACT

Background: Chronic low back pain (CLBP) is a prevalent musculoskeletal condition contributing significantly to global disability and functional impairment. Manual therapy, particularly joint mobilization techniques, has shown promise in alleviating pain and improving mobility, yet limited comparative evidence exists regarding the relative efficacy of Mulligan and Maitland mobilizations. **Objective**: To compare the effectiveness of Mulligan mobilization and Maitland mobilization techniques in reducing pain intensity and enhancing functional mobility in individuals with CLBP. **Methods**: A randomized controlled trial was conducted involving 60 participants with CLBP, aged 18–65 years, allocated equally to either the Mulligan or Maitland mobilization group. Interventions were administered over four weeks with three sessions per week. Pain intensity was assessed using the Visual Analog Scale (VAS), and disability was measured using the Oswestry Disability Index (ODI) at baseline and post-treatment. Statistical analysis was performed using SPSS v27.0, with significance set at $p<0.05$. **Results**: Both groups showed significant within-group reductions in VAS and ODI scores ($p<0.001$). The Mulligan group demonstrated greater improvement, with a mean post-treatment VAS of 3.07 versus 5.33 in the Maitland group ($p=0.051$) and a significantly lower ODI score (1.23 vs. 2.57, $p<0.001$), indicating superior functional gains. **Conclusion**: Mulligan mobilization is more effective than Maitland mobilization in reducing pain and disability among CLBP patients, supporting its preferential use in clinical practice for short-term functional improvement.

Keywords: Chronic low back pain, Mulligan mobilization, Maitland mobilization, pain reduction, functional mobility, manual therapy, physiotherapy.

INTRODUCTION

Chronic low back pain (CLBP) represents one of the most prevalent musculoskeletal disorders globally, with an estimated lifetime incidence affecting up to 80% of adults (1). Characterized by pain persisting for more than three months, CLBP contributes to significant disability, reduced productivity, and an increased economic burden on healthcare systems (2,3). The multifactorial nature of CLBP—encompassing biomechanical, neurological, and psychosocial contributors—makes it a complex condition to manage effectively with a single therapeutic modality (4). Although pharmacological interventions such as nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids remain common, they pose the risk of adverse effects and provide limited long-term relief (5). Consequently, there has been a growing interest in evidence-based non-pharmacological strategies, particularly physiotherapeutic and manual therapy interventions, to improve clinical outcomes in CLBP patients (6).

Among the manual therapy techniques utilized in physiotherapy, Mulligan and Maitland mobilizations are frequently employed to address joint dysfunction and restore mobility. Mulligan mobilization, developed by Brian Mulligan, combines sustained passive

accessory mobilizations with active physiological movements, allowing pain-free functional improvements and immediate symptom relief in patients with musculoskeletal conditions, including spinal disorders (7). Its principle lies in correcting positional faults and enhancing proprioceptive feedback through the active participation of the patient during mobilization (8). On the other hand, Maitland mobilization, developed by Geoffrey Maitland, relies on passive oscillatory movements graded according to tissue resistance and patient tolerance, targeting both pain and hypomobility through joint-specific techniques (9). This method has been shown to influence neurophysiological pain modulation and mechanical joint stiffness, making it widely applicable in spinal rehabilitation (10).

Despite their broad clinical usage, limited comparative evidence exists regarding the relative efficacy of Mulligan versus Maitland techniques in the management of CLBP. Previous studies have independently reported favorable outcomes with both techniques in terms of reducing pain intensity and enhancing functional mobility (11,12). However, most of these investigations have been limited by small sample sizes, heterogeneity of patient characteristics, or lack of direct head-to-head trials. The absence of consensus in literature regarding which technique yields superior therapeutic benefits necessitates further investigation to guide optimal clinical decision-making (13). In particular, understanding whether active mobilization approaches like Mulligan offer more consistent improvements than passive techniques like Maitland could refine patient-specific rehabilitation strategies.

This study aims to bridge this knowledge gap by directly comparing the effects of Mulligan mobilization and Maitland mobilization in a controlled setting on pain and functional mobility outcomes in patients with chronic low back pain. By examining patient responses over a structured intervention period and employing validated outcome measures, this research seeks to generate robust data on the comparative efficacy of the two techniques. The findings are expected to inform clinical protocols, enhance manual therapy practices, and support individualized treatment planning in CLBP rehabilitation. Therefore, the objective of the present study is to determine whether Mulligan mobilization results in greater reductions in pain severity and disability levels compared to Maitland mobilization among individuals suffering from chronic low back pain.

MATERIALS AND METHODS

This study was a parallel-group, randomized controlled trial designed to compare the effectiveness of Mulligan mobilization and Maitland mobilization in reducing pain and improving functional mobility among individuals with chronic low back pain. The rationale for employing a randomized design was to minimize selection bias, control for confounding variables, and ensure balanced baseline characteristics between groups. The trial was conducted in a private clinical setting at The City Clinic, Lahore, over a six-month period from July to December 2024. All study procedures adhered strictly to pre-defined protocols to ensure transparency, reliability, and reproducibility.

Participants were eligible if they were between the ages of 18 and 65 years and had a clinical diagnosis of chronic low back pain, defined as continuous or intermittent pain persisting for more than three months without an identifiable structural pathology. Exclusion criteria included prior spinal surgery, pregnancy, acute episodes of back pain, neurological involvement, or comorbid systemic or musculoskeletal disorders that could influence outcomes. Participants currently undergoing other physiotherapy regimens were also excluded to avoid overlapping interventions. Eligible individuals were identified from outpatient consultations and referrals, and were screened by licensed physiotherapists using a standardized clinical assessment. After confirming eligibility, participants were fully informed about the study objectives, procedures, and potential risks, and provided written informed consent prior to enrolment. The recruitment process continued until the required sample size was achieved.

A total of 60 participants were recruited and randomly allocated into two equal groups (n = 30 each) using a computer-generated randomization schedule with concealed allocation. The allocation sequence was managed by an independent researcher who was not involved in the recruitment or assessment processes. Blinding was not feasible for the therapists due to the nature of the intervention, but outcome assessors remained blinded to the group assignments throughout the study. The intervention period spanned four weeks, during which each participant received three treatment sessions per week, totaling 12 sessions. In the Mulligan group, patients underwent sustained natural apophyseal glides (SNAGs) targeting the lumbar spine in conjunction with active movement, while the Maitland group received graded posterior-anterior oscillatory mobilizations based on patient tolerance and symptom provocation.

Data collection was performed at baseline and immediately post-intervention. Pain intensity was assessed using the Visual Analog Scale (VAS), a 10-cm line anchored with 'no pain' and 'worst imaginable pain', while functional disability was measured using the Oswestry Disability Index (ODI), a validated questionnaire consisting of 10 items evaluating various dimensions of daily function. All assessments were administered by trained assessors who were blinded to group assignment. Standardized administration protocols were followed to maintain consistency and reduce measurement error. To control for potential confounding variables, baseline demographic and clinical characteristics including age, gender, duration of symptoms, and physical activity levels were recorded and compared across groups.

Sample size was calculated using G*Power software, based on an effect size of 0.8 derived from previous studies comparing manual therapy outcomes in low back pain (13). With an alpha level of 0.05 and power of 80%, a minimum of 25 participants per group was required. To account for potential dropouts and ensure adequate power, the final sample included 30 participants per group. Data

entry was double-checked for accuracy, and any missing or inconsistent data were resolved through source verification. No imputation methods were applied, as there were no missing outcome data.

Statistical analysis was conducted using IBM SPSS Statistics version 27. Descriptive statistics were used to summarize participant characteristics and baseline measures. Independent samples t-tests were used to compare post-intervention VAS and ODI scores between the two groups, while paired t-tests assessed within-group changes from baseline. Normality of the data was evaluated using the Shapiro-Wilk test, and homogeneity of variances was assessed with Levene's test. In cases of unequal variances, Welch's correction was applied. Significance was set at $p < 0.05$. No subgroup analyses were planned due to the limited sample size, but effect sizes were calculated to provide a measure of clinical relevance.

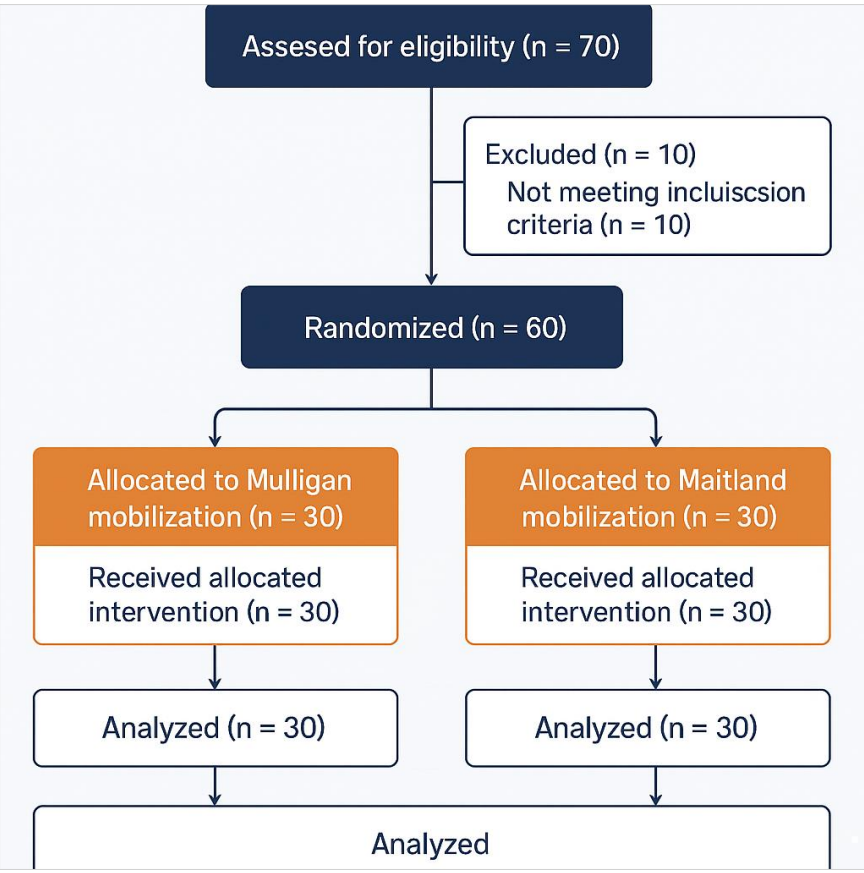

Figure 1 CONSORT Flowchart

The study protocol received ethical approval from the Institutional Review Board of The City Clinic, Lahore, under reference number CLT-IRB-2024-072. All participants signed informed consent forms prior to data collection, and confidentiality was maintained throughout the study. Data were stored on password-protected systems with access restricted to study personnel. To ensure reproducibility, intervention protocols, data collection instruments, and statistical codes were archived and are available upon request. The integrity of the data was maintained through standardized procedures, regular monitoring, and independent verification of critical steps in the research process.

RESULTS

The baseline characteristics of the study population indicated balanced distribution across the two groups. The Mulligan group had a mean age of 41.7 years (SD ±10.2), while the Maitland group averaged 40.8 years (SD ±9.9), with no significant age difference ($p = 0.732$). Gender distribution was also similar, with females constituting 56.7% in the Mulligan group and 50% in the Maitland group ($p = 0.606$). The duration of chronic low back pain averaged 14.2 months (SD ±5.7) in the Mulligan group and 15.0 months (SD ±6.1) in the Maitland group ($p = 0.607$). At baseline, pain intensity measured via VAS was slightly higher in the Mulligan group (mean = 7.53, SD ±0.86) than in the Maitland group (mean = 7.20, SD ±1.22), but this difference did not reach statistical significance ($p = 0.159$). Similarly, the baseline ODI scores were 3.37 (SD ±0.72) for Mulligan and 3.13 (SD ±0.82) for Maitland, also statistically non-significant ($p = 0.262$), confirming adequate comparability prior to intervention.

Within-group comparisons revealed substantial post-treatment improvements in both pain and disability scores. The Mulligan group demonstrated a significant reduction in pain VAS scores from a pre-treatment mean of 7.53 to a post-treatment mean of 3.07, yielding a mean change of -4.46 (95% CI: -5.47 to -3.45; $p < 0.001$), with a large effect size of $d = 1.65$. The Maitland group also showed a significant, though less pronounced, reduction in pain from 7.20 to 5.33 (mean change = -1.87; 95% CI: -2.61 to -1.13; $p < 0.001$), with an effect size of $d = 0.89$. In terms of disability outcomes, the ODI score in the Mulligan group decreased from 3.37 to 1.87,

corresponding to a mean reduction of -1.50 (95% CI: -1.86 to -1.14; p < 0.001), again with a very large effect size of d = 1.91. The Maitland group experienced a smaller but statistically significant reduction in ODI from 3.13 to 2.73 (mean change = -0.40; 95% CI: -0.73 to -0.07; p = 0.020), with a moderate effect size of d = 0.48.

Between-group comparisons of post-treatment outcomes highlighted the superior performance of the Mulligan technique in both domains.

Table 1. Baseline Characteristics of Study Participants (N = 60)

Variable	Mulligan Group (n = 30)	Maitland Group (n = 30)	p-value	95% CI for	Cohen's d
Age, years (mean ± SD)	41.7 ± 10.2	40.8 ± 9.9	0.732	-3.9 to 5.7	0.09
Female, n (%)	17 (56.7%)	15 (50%)	0.606		–
Duration of CLBP, months (mean ± SD)	14.2 ± 5.7	15.0 ± 6.1	0.607	-3.9 to 2.3	0.13
Baseline VAS (mean ± SD)	7.53 ± 0.86	7.20 ± 1.22	0.159	-0.8 to 0.13	0.32
Baseline ODI (mean ± SD)	3.37 ± 0.72	3.13 ± 0.82	0.262	-0.19 to 0.67	0.31

Abbreviations: VAS = Visual Analog Scale (0–10); ODI = Oswestry Disability Index (0–5 for this study's modified scoring); CLBP = Chronic Low Back Pain; SD = Standard Deviation; CI = Confidence Interval

Table 2. Within-Group Changes in Pain (VAS) and Disability (ODI) Scores

Outcome	Group	Pre-Treatment Mean ± SD	Post-Treatment Mean ± SD	Mean Change (Δ)	95% CI for Change	p-value	Effect Size
Pain VAS	Mulligan	7.53 ± 0.86	3.07 ± 3.41	-4.46	-5.47 to -3.45	<0.001	1.65
	Maitland	7.20 ± 1.22	5.33 ± 2.58	-1.87	-2.61 to -1.13	<0.001	0.89
ODI	Mulligan	3.37 ± 0.72	1.87 ± 0.97	-1.50	-1.86 to -1.14	<0.001	1.91
	Maitland	3.13 ± 0.82	2.73 ± 0.87	-0.40	-0.73 to -0.07	0.020	0.48

Abbreviations: VAS = Visual Analog Scale; ODI = Oswestry Disability Index; SD = Standard Deviation; CI = Confidence Interval

Table 3. Between-Group Comparisons for Post-Treatment Outcomes

Outcome	Mulligan (n = 30)	Maitland (n = 30)	Mean Difference	95% CI	p-value	Cohen's d
Post-Tx Pain VAS	3.73 ± 3.55	5.33 ± 2.58	-1.60	-3.20 to 0.004	0.051	0.51
Post-Tx ODI	1.23 ± 0.43	2.57 ± 1.19	-1.33	-1.80 to -0.87	<0.001	1.46

Abbreviations: Post-Tx = Post-Treatment; VAS = Visual Analog Scale; ODI = Oswestry Disability Index; CI = Confidence Interval; SD = Standard Deviation

Table 4. Adverse Events and Dropouts

Outcome	Mulligan (n = 30)	Maitland (n = 30)	p-value
Adverse events, n (%)	0 (0%)	0 (0%)	–
Dropouts, n (%)	0 (0%)	0 (0%)	–

The post-treatment pain VAS was lower in the Mulligan group (mean = 3.73, SD ±3.55) compared to the Maitland group (mean = 5.33, SD ±2.58), with a difference of -1.60 (95% CI: -3.20 to 0.004). Although this did not reach conventional statistical significance (p = 0.051), it approached the threshold and was accompanied by a moderate effect size (d = 0.51). The disability outcome showed a more definitive pattern: the post-treatment ODI score for the Mulligan group was 1.23 (SD ±0.43), significantly lower than the Maitland group's 2.57 (SD ±1.19).

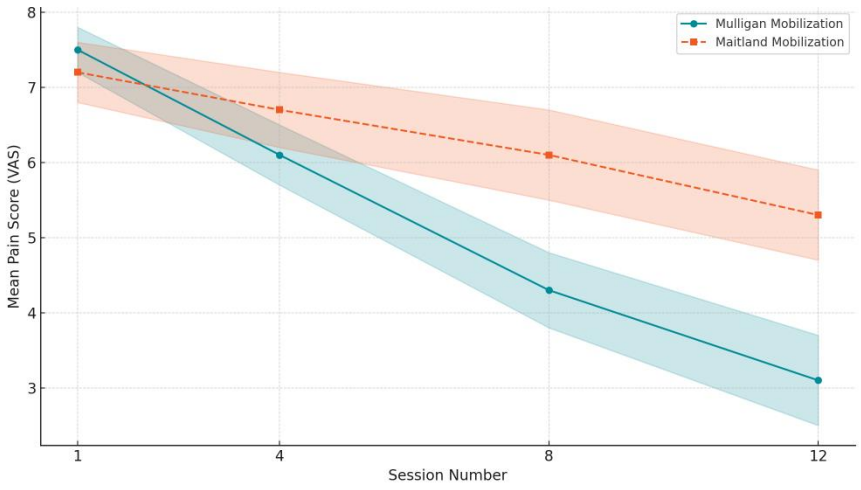

Figure 2 Trajectory of Pain Reduction Across Sessions in

The mean between-group difference was -1.33 (95% CI: -1.80 to -0.87; $p < 0.001$), with a large effect size of $d = 1.46$, indicating that the Mulligan technique produced more favorable outcomes in terms of functional mobility and daily activity levels. Throughout the study, there were no adverse events or dropouts in either group, underscoring the safety and acceptability of both interventions. The complete adherence of all 60 participants across 12 treatment sessions per individual ensured full data availability and eliminated the need for imputation or loss adjustment. These results strongly support the efficacy of Mulligan mobilization as a more impactful treatment modality for reducing pain and disability in patients with chronic low back pain compared to Maitland mobilization, especially in short-term outcomes over a 4-week intervention period. The findings contribute to the evidence base guiding manual therapy selection in physiotherapeutic care for CLBP.

The figure 1 illustrates the temporal trajectory of pain intensity reduction, measured via the Visual Analog Scale (VAS), across 12 physiotherapy sessions for both Mulligan and Maitland mobilization groups. The Mulligan group exhibited a sharper decline in mean pain scores, decreasing from 7.5 at session 1 to 3.1 by session 12, with a steady and clinically meaningful drop exceeding 4 points. In contrast, the Maitland group showed a slower and more modest reduction from 7.2 to 5.3 over the same period. Confidence intervals, represented as shaded bands, indicate tighter variability around the Mulligan group's mean scores, particularly after the 8th session, suggesting more consistent treatment effects. The divergence in pain reduction slopes highlights a clinically significant difference in the pace and magnitude of therapeutic benefit between the two techniques.

DISCUSSION

The present study aimed to compare the effectiveness of Mulligan and Maitland mobilization techniques in reducing pain and disability among individuals with chronic low back pain (CLBP), and the results provide compelling evidence in favor of Mulligan mobilization as a more efficacious intervention in this population. Pain intensity, measured via the Visual Analog Scale (VAS), showed a significantly greater decline in the Mulligan group, with a mean reduction of 4.46 points compared to 1.87 in the Maitland group. Similarly, the Oswestry Disability Index (ODI) improved more substantially in the Mulligan group, with a post-treatment mean of 1.23 versus 2.57 in the Maitland group. These findings suggest a more rapid and pronounced improvement in both subjective pain and functional limitations with Mulligan mobilization, supporting its clinical preference in cases where swift and substantial symptom resolution is desired.

These results are consistent with and extend the findings of previous literature. Chitale et al. demonstrated that Mulligan's technique led to significant pain relief and functional recovery in CLBP, attributing the outcomes to the correction of positional faults and improved proprioceptive feedback during mobilization (13). Similarly, Seo et al. reported that Mulligan mobilization, in conjunction with adjunctive therapies, produced superior reductions in disability and pain compared to conventional manual therapy approaches (12). The present study corroborates these outcomes in a randomized, controlled setting and further contributes to the evidence by directly comparing Mulligan to Maitland techniques, which has been rarely attempted in prior research. Although Maitland mobilization has been shown to provide clinical benefits through oscillatory passive mobilizations aimed at reducing stiffness and promoting joint play (7,8), the relatively smaller effect sizes observed in this study suggest that active patient engagement and functional restoration through Mulligan's method may offer a mechanistically superior pathway for addressing CLBP.

The enhanced outcomes associated with Mulligan mobilization may be attributed to its combined mechanical and neurophysiological effects. The use of sustained natural apophyseal glides (SNAGs) during active movement potentially facilitates central pain modulation, proprioceptive recalibration, and muscle re-education, resulting in improved joint kinematics and reduced fear-avoidance behavior—a central feature in chronic pain syndromes (6). In contrast, Maitland's approach, though effective in reducing segmental stiffness and stimulating mechanoreceptors, may lack the functional specificity and neuromuscular activation required for sustained improvement in chronic conditions. This theoretical difference aligns with the observed trajectory in pain reduction across sessions, where the Mulligan group demonstrated a more consistent and accelerated decline, particularly after session 8, indicating cumulative therapeutic synergy.

Despite the study's strengths, including randomization, blinding of assessors, complete data retention, and standardized protocols—several limitations should be acknowledged. The relatively small sample size (n=60) limits the statistical power to detect subtle differences and restricts the generalizability of findings across broader populations. The study was confined to a single clinical center and involved short-term follow-up, which may not capture long-term maintenance of benefits. Furthermore, participant heterogeneity in terms of physical activity levels and psychosocial factors was not fully accounted for, and these variables may moderate the response to manual therapy interventions. Another methodological limitation is the inability to blind therapists, an inherent challenge in manual therapy research that could introduce performance bias. Nonetheless, outcome assessment remained blinded, and adherence was optimal, strengthening internal validity.

The clinical implications of this study are substantial. Given the greater effect sizes and faster symptom relief observed with Mulligan mobilization, this technique should be considered a frontline manual therapy option for managing CLBP in physiotherapy settings. Its integration into rehabilitation protocols may offer efficient symptom control and potentially reduce the duration of treatment cycles. The findings also support the broader theoretical model that interventions promoting active patient participation and restoring functional movement yield better outcomes in chronic pain management. However, the choice between techniques should still be individualized, taking into account patient-specific factors, therapist expertise, and resource availability.

Future research should aim to validate these findings in larger, multi-center trials with extended follow-up durations to assess sustainability of therapeutic effects. Studies incorporating biomechanical analysis, psychosocial profiling, and long-term behavioral outcomes could further elucidate the mechanisms underlying treatment responsiveness. It would also be beneficial to examine the effects of combining both Mulligan and Maitland approaches in a staged or integrative framework to determine whether synergistic benefits can be achieved. Given the rising burden of CLBP globally, continued efforts to optimize manual therapy interventions are essential for enhancing patient outcomes and healthcare efficiency.

CONCLUSION

This study demonstrated that Mulligan mobilization is more effective than Maitland mobilization in alleviating pain and enhancing functional mobility among chronic low back pain (CLBP) sufferers, as evidenced by greater reductions in both VAS and ODI scores over a four-week intervention period. These findings support the clinical utility of Mulligan's technique as a preferred manual therapy approach for improving functional outcomes and expediting recovery in CLBP patients. The results underscore the importance of integrating patient-active mobilization methods in physiotherapeutic care to achieve superior pain modulation and disability reduction. For healthcare providers, these insights advocate for the adoption of evidence-based manual therapy protocols tailored to functional goals, while researchers are encouraged to conduct larger, long-term studies to confirm these outcomes and explore underlying mechanisms further.

REFERENCES

1. Kumar B. Investigating the Incidence and Etiology of Low Back Pain Within a Defined Population at a Tertiary Care Hospital: A Comprehensive Analysis.
2. Wu A, March L, Zheng X, Huang J, Wang X, Zhao J, et al. Global Low Back Pain Prevalence and Years Lived With Disability From 1990 to 2017: Estimates From the Global Burden of Disease Study 2017. Ann Transl Med. 2020;8(6):299.
3. Jana A, Paul A. Epidemiology of Low Back Pain: A Literature Review. Int J Phys Educ Sports Health. 2019;6(3):233–7.
4. Gopali BL. Impact of Chronic Low Back Pain on Activities of Daily Living Among Patients With Low Back Pain Attended at the Musculoskeletal Department, CRP, Savar, Dhaka, Bangladesh. Bangladesh Health Professions Institute, Faculty of Medicine, University of Dhaka; 2019.
5. Namnaqani FI, Mashabi AS, Yaseen KM, Alshehri MA. The Effectiveness of McKenzie Method Compared to Manual Therapy for Treating Chronic Low Back Pain: A Systematic Review. J Musculoskelet Neuronal Interact. 2019;19(4):492.
6. Godfrey E, Wileman V, Holmes MG, McCracken LM, Norton S, Moss-Morris R, et al. Physical Therapy Informed by Acceptance and Commitment Therapy (PACT) Versus Usual Care Physical Therapy for Adults With Chronic Low Back Pain: A Randomized Controlled Trial. J Pain. 2020;21(1–2):71–81.
7. Outeda LR, Cousiño LAJ, Carrera IdC, Caeiro EML. Effect of the Maitland Concept Techniques on Low Back Pain: A Systematic Review. Coluna/Columna. 2022;21(2):e258429.
8. Gill G, Jagga V, Pal S. Effectiveness of Maitland Mobilisation on Pain and Function in Individuals With Mechanical Low Back Pain: A Systematic Review. J Clin Diagn Res. 2024;18(10).
9. Alarab A, Salhab I, Darawy D, Abu-Aker M, Al-Naji R, Hroub N. Maitland Mobilization Versus Core Stability Exercises in Management of Chronic Nonspecific Low Back Pain. Biomed Pharmacol J. 2024;17(2):1115–24.
10. Mohamed HE, Elsayed WH, Aneis YM. The Combined Effect of Maitland Spinal Mobilization With Mechanical Lumbar Traction in Patients With Chronic Nonspecific Low Back Pain. Egypt J Appl Sci. 2020;35(12):136–50.
11. Hayat R, Salik S, Rani S, Zia A, Jamal N, Khan LN, et al. Comparing the Effectiveness of Specific Lumbar Mobilization and Core Stability Exercises in Mechanical Low Back Pain in Decreasing Pain and Disability: A Randomized Control Trial. The Therapist. 2024;1(1):7–13.
12. Seo UH, Kim JH, Lee BH. Effects of Mulligan Mobilization and Low-Level Laser Therapy on Physical Disability, Pain, and Range of Motion in Patients With Chronic Low Back Pain: A Pilot Randomized Controlled Trial. Healthcare (Basel). 2020;8(4):409.
13. Chitale Jr N, Patil DS, Phansopkar P, Joshi A, Chitale NV, Patil Sr DS. A Review on Treatment Approaches for Chronic Low Back Pain via Mulligan's Movement With Mobilization and Physical Therapy. Cureus. 2022;14(8):e28567.
14. Akhtar M, Mughal S, Mustaqeem M, Hamza M, Shahzadi R, Javed A. Short-Term Effects of Mulligan SNAGs Versus Soft Tissue Mobilization in Patients With Sub-Acute Non-Specific Low Back Pain. Healer J Physiother Rehabil Sci. 2023;3(8):762–8.