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Comparative Efficacy of Maitland's Mobilization & Mulligan's Mobilization in Chronic Non-Specific Low Back Pain Among Hospital Ward Nurses- An Interventional Study

Dr. Vaishnavi Pawar[1], Dr. Amrutkuvar Rayjade[2*]

[1]M. P. Th, D.Y. Patil College of Physiotherapy, Kolhapur, Email ID: vaishnavikpawar25physio@gmail.com

[2*]Principal, Department of Orthopedics Manual Therapy, D.Y. Patil College of Physiotherapy, Kolhapur,
Email ID: dramrutkuvarsrayjade@gmail.com

***Corresponding Author:**

Dr. Amrutkuvar Rayjade

Principal, Department of Orthopedics Manual Therapy, D.Y. Patil College of Physiotherapy, Kolhapur,
Email ID: dramrutkuvarsrayjade@gmail.com

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ABSTRACT

Introduction: Low back pain is a problem that continues to exert significant strain on the healthcare system. Back injuries were found to be six times more common in nurses than in other health workers. Both acute and chronic lower back pain (LBP) can result from lumbar strains and sprains brought on by stretch injuries to the muscles, ligaments, or tendons in the lower back area. Maitland and Mulligan mobilization techniques are known to be beneficial for persons suffering from low back pain. As a result, there is a need to investigate the effects of Maitland's mobilization and Mulligan's mobilization for low back pain among hospital working nurses.

Methodology: This study examined nurses with non-specific chronic low back pain, aged between 25-45 years who had non-specific chronic low back pain with reduced range of motion, pain and increased disability index. According to study's criteria, 54 participants were selected for the study and randomly assigned into two groups to receive two different treatments along with Hot Moist Pack and conventional therapy. Group A received SNAG's Mulligan's mobilization and Group B received Maitland's mobilization. The Numerical Pain Rating Scale(NPRS), Bubble Inclinometer and Modified Oswestry Disability Index (MODI) were used as outcome measures.

Results: The comparison between the means and S.D of Group A and Group B reveals that both groups experienced improvements, though Group B consistently showed slightly better outcomes across all measured parameters. In terms of pain reduction, Group B had a lower mean NPRS (Numeric Pain Rating Scale) score of 2.67 (±0.62) with a statistically significant p-value of 0.0041. For disability, measured by the MODI (Modified Oswestry Disability Index), Group B with a lower mean score of 10.63 (±3.01) and a significant p-value of 0.0398. Lumbar range of motion also showed improvement in Group B where Lumbar flexion was higher in Group B, with a mean of 69.44° (±8.81) supported by a p-value of 0.0026. Similarly, lumbar extension was greater in Group B, averaging 24.26° (±3.81). the difference was highly significant, with a p-value of 8.44713×10^{-5}. Overall, Group B demonstrated superior outcomes in pain reduction, disability improvement, and lumbar mobility compared to Group A.

Conclusion: The result of study suggests that both Mulligan's Mobilization and Maitland's posteroanterior mobilization reduced the symptoms and improved mobility in the patients suffering from chronic non-specific low back pain. Better improvement was shown by Maitland's group than SNAG group.

Keywords: *Nurses, Chronic Non-Specific Low Back Pain, Mobilization, Range of Motion, Pain, Disability, Maitland's Mobilization, Mulligan's Mobilization.*

1. INTRODUCTION

Chronic Non-Specific Low Back Pain (NSLBP), a common musculoskeletal condition characterized by pain and discomfort above the inferior gluteal folds and below the costal border, lacks a clear diagnostic pathology. One NSLBP is a significant occupational health issue for healthcare workers, particularly hospital ward nurses, due to the physically demanding nature of their work.

The prevalence, risk factors, and consequences of NSLBP among hospital ward nurses are examined in this introduction, which also highlights contemporary research and its conclusions. Globally, a high frequency of NSLBP among nurses has been documented by numerous research.[1]A 12-month incidence rate of around 64.07% among nurses was found in a systematic analysis that concentrated on clinical settings in Africa. According to a study done in Saudi Arabia, 65.5% of nurses have NSLBP at some point in their careers. The prevalence of NSLBP in the nursing profession is demonstrated by these numbers.[2] Numerous occupational factors that are part of nurses' regular routines are responsible for the high frequency of NSLBP among them.[3] A meta-analysis found a number of important factors, such as standing for extended periods of time, bending and twisting awkwardly, and frequently carrying weights above 10 kg by hand. The lumbar spine is subjected to significant mechanical stress from these activities, which raises the possibility of NSLBP.[4] The prevalence of NSLBP is also influenced by the kind of ward in which nurses are employed. Intensive care unit and surgery ward nurses frequently deal with greater physical demands, which is associated with a rise in NSLBP patients. On the other hand, some research has found that the prevalence of NSLBP is lower on general surgery wards, which may be because of improved ergonomic awareness and practices.[5]

Psychosocial factors have a substantial impact on the development of NSLBP in addition to physical pressures. Higher NSLBP rates among nurses have been associated with exposure to workplace violence, job discontent, and workplace stress.[6]. The risk of NSLBP is further increased by a sedentary lifestyle and irregular exercise, which reduces the muscles that support the spine.[6] NSLBP, has significant effects on nurses' own health as well as the provision of healthcare. Reduced productivity, higher absenteeism, and a higher chance of quitting the job are all consequences of NSLBP. As a result, managing NSLBP is essential for both nursing health and upholding the highest standards of patient care.[7]

Chronic non-specific low back pain (NSLBP) is believed to be caused by a complex interaction of biomechanical, neuromuscular, and psychological variables and is not linked to any particular underlying condition. From a biomechanical standpoint, NSLBP is frequently associated with aberrant loading of lumbar spine structures, inefficient movement patterns, and compromised spinal stability.[8]

Dysfunction of Spinal Stability and Motor Control The lumbar spine is supported by three subsystems: the neural subsystem (nervous control), the active subsystem (muscles and tendons), and the passive subsystem (vertebrae, intervertebral discs, and ligaments).

Modified Lumbar Kinematics and Distribution of Load Modified spinal movement patterns, such as decreased lumbar range of motion, elevated pelvic tilt, and segmental instability, are linked to NSLBP. Uneven stress distribution throughout the facet joints, intervertebral discs, and surrounding tissues may be a result of these changed mechanics.

Fatigue and Muscle Imbalance

Muscle activity patterns are frequently disturbed in NSLBP patients. The deep and superficial trunk muscles are frequently out of balance, and fatigue-resistant stabilizing muscles (such as multifidus) are frequently atrophied or inhibited. However, phasic muscles, like the rectus abdominis, can get tight or hyperactive. Ineffective spinal stability, elevated shearing pressures, and heightened vulnerability to microtrauma during routine movements—particularly in situations involving repetitive loading—are all consequences of this mismatch.[9]

Postural Control and Deficits in Proprioception

An essential component of biomechanical regulation is proprioception. Patients with NSLBP frequently have decreased proprioceptive acuity, especially when it comes to balance control and joint position sensing. These deficiencies affect the body's capacity to maintain postural stability and repair incorrect spinal posture during activity. [9]

Interactions between Psycho mechanical

NSLBP is mostly biomechanical, although psychosocial elements like catastrophizing and fear-avoidance also play a role. By reducing movement diversity and using stiffening techniques during trunk tasks, these behaviors can change motor behavior, which raises mechanical stress and prolongs the pain cycle.[10]

NSLBP Risk Factors

Physical and Biomechanical Aspects includes Sedentary behavior, Prior injury.

Aspects related to psychology includes Fear-avoidance behavior, Anxiety and depression, Stress and job dissatisfaction:

Aspects of Lifestyle includes Obesity, Smoking, Poor quality of sleep.

Pain that lasts longer than 12 weeks, frequently with sporadic or continuous episodes, is the most common sign of NSLBP. It does not follow a dermatome pattern and is typically found between the gluteal folds and the lower rib cage. It may also radiate to the thighs. [11] Pain that is dull, agonizing, or throbbing and is occasionally characterized as tightness or stiffness. Since the pain is mechanical, movement and posture have an impact on it. It decreased mobility, particularly in the flexion and extension of the lumbar region. [12] Over time, one may develop antalgic postures, defensive guarding, altered gait, or

impaired posture and mobility. Fear of movement (kinesio phobia) is common, which can lead to deconditioning and worsening of symptoms.[13] According to studies, trunk stability is impacted by the delayed activation of stabilizing muscles such the multifidus and transversus abdominis.[14,15,16.]

The Physiotherapy examination for NSLBP often includes a number of crucial components.

Subjective Evaluation Features of pain: onset, persistence (>12 weeks), variables that aggravate and relieve it, and variations throughout the day. Functional restrictions include trouble walking, bending, lifting, and standing or sitting for extended periods of time. **Physical Examination** Observation & Posture, Range of Motion (ROM), Palpation, Neurological Screening. **Functional Tests includes** Sit-to-stand test, Core stability tests.

Movement control tests. **Special Tests** Lumbar quadrant test: Slump test / Straight Leg Raise (SLR) **INVESTIGATION** When diagnosing NSLBP, a variety of investigations can be performed to confirm the diagnosis, assess the severity of the disease, and rule out other conditions with similar presentations. Clinical Diagnosis with help of following Imaging Studies like CT Scan, MRI (Magnetic resonance Imaging), X-ray.

Therapeutic Exercise

Exercise therapy is the cornerstone of Physiotherapy for CNSLBP. It includes general physical activity and specific targeted exercises that improve core strength, flexibility, and endurance.

Phase 1 Exercises (Acute Phase) Pelvic Tilt, Knee to Chest Stretch, Cat-Cow Stretch

Phase 2 Exercises (Sub-Acute Phase) – Plank, Bridge, Lat Pulldowns:

Phase 3 Exercises (Strengthening Phase) Superman, Bird Dog, Rowing Exercises

Phase 4 Exercises (Functional Phase Squat to Stand, Lunges, Step-Ups

Other Manual Therapy Tenique's Includes Myofascial Release (MFR), Instrument-Assisted Soft Tissue Mobilization (IASTM), Muscle Energy Techniques (METs), Positional Release Therapy (PRT) Patient Education, Cognitive Behavioral Therapy (CBT) and Graded Activity, Modalities (used adjunctively).

Maitland's Mobilization

Australian physiotherapist Geoffrey Maitland created Maitland's Mobilization, a manual treatment method that evaluates and treats pain and dysfunction by applying graded passive movements to the joints. It is a component of the larger Maitland Concept, which stresses the application of thorough subjective and objective evaluation to customize treatment as well as a clinical reasoning approach. Grades I and II of Maitland mobilizations are mostly utilized for pain relief through neurophysiological mechanisms, but Grades III and IV are intended to increase range of motion and stretch tight tissues in order to improve joint mobility. Usually utilized outside of the mobilization spectrum, grade V is a high-velocity thrust method that is occasionally employed in manual therapy practice.[17] This method is used to treat a variety of musculoskeletal conditions, such as peripheral joint issues, spinal diseases, and chronic pain syndromes like osteoarthritis and non-specific low back pain. Maitland's approach emphasizes the importance of continuous assessment and patient participation to deliver a customized and flexible therapy process. Numerous studies have demonstrated its efficacy in enhancing joint mobility, reducing pain, and enhancing functional outcomes, making it an essential part of manual treatment in modern physiotherapy practice. [18]

Mulligan's Mobilization

Mulligan's Mobilization with Movement (MWM) is a manual treatment technique developed by New Zealand physiotherapist Brian Mulligan. This concept combines lengthy auxiliary mobilizations with forceful physiological motions to rectify positioning faults and restore normal joint mechanics. Unlike traditional passive mobilizations, MWM methods involve active patient participation, promoting functional re-education of joint motion and reducing the likelihood of reliance on passive therapy. One important element that promotes movement confidence and reduces fear-avoidance behaviors is this approach's emphasis on pain-free mobilization, which involves performing mobilizations only when the patient can do the action painlessly.[19]

Small positional flaws in joints, which can be brought on by overuse or injury and produce pain and restricted range of motion, theoretically corroborate Mulligan's theory. By providing a sustained glide as the patient moves, the treatment aims to correctly realign the joint and restore pain-free function. Techniques such as Sustained Natural Apophyseal Glides (SNAGs) for the spinal joints and Natural Apophyseal Glides (NAGs) for the cervical spine can be used to treat a variety of conditions, including low back pain, cervicogenic headaches, shoulder dysfunction, and ankle sprains. Belts, taping, or pressures administered by a therapist increase the precision and efficacy of mobilization and often produce immediate pain and range of motion decreases. [20] Recent studies suggest the use of Mulligan mobilizations in a multimodal physiotherapy strategy. Several randomized controlled trials and systematic reviews have shown how effective it is at improving joint mobility, reducing pain, and enhancing function in musculoskeletal issues. Its interactive and functional aspect makes it

particularly appealing to modern rehabilitation, which places an emphasis on active patient involvement and movement-based treatment. Additionally, because of its quick clinical results and minimal risk of adverse effects, it is a helpful tool for managing both acute and chronic pain. [21]

Chronic non-specific low back pain (CNSLBP), a leading cause of disability worldwide, is a severe health concern, especially for hospital ward nurses. Because of the physically demanding nature of their work, which involves frequent lifting, patient handling, prolonged standing, and unpleasant postures, nurses are particularly vulnerable to developing CNSLBP. Studies show that between 50 and 80 percent of nurses experience low back pain, and many of these cases progress to chronic diseases due to poor ergonomics and continuous exposure to risk factors at work. [22]

Despite the high prevalence of CNSLBP in this demographic, there is still a lack of specialized research on manual therapy methods designed specifically to satisfy their unique occupational needs. Maitland's Mobilization and Mulligan's Mobilization are two well-liked manual therapy techniques that have been shown to be effective in treating musculoskeletal pain and dysfunction. Maitland's approach concentrates on passive graded mobilizations for pain relief and mobility development, whereas Mulligan's method emphasizes painless, active mobilization procedures to treat anomalies in joint alignment. Even though both approaches have proven successful when used independently, not much research has been done to compare them in order to ascertain whether approach produces superior clinical outcomes for nurses with CNSLBP in terms of reducing pain, enhancing mobility, and enhancing functional performance. [23]

Improving nurses' musculoskeletal health is crucial for their own well-being as well as the effectiveness of the healthcare system, considering the vital role they play in patient care. A comparison of these two mobilization strategies will yield important information about the best therapy strategy for this population. This could serve as a reference for clinical judgment and aid in the creation of evidence-based rehabilitation plans tailored to hospital ward nurses with persistent low back pain. [24]

2. METHODOLOGY

An Interventional Analytical Study done using Consecutive sampling method and Random sampling method at Orthopedic Manual Therapy OPD at Dr. D. Y. Patil Medical College Hospital and Research Institute, kadamwadi, Kolhapur. for a duration of 1 year with sample size of **54** (27 in each group).

Materials

Data collection sheet, Consent form, Pen, Bubble Inclinometer, Mulligan Belt, Plinth.

Subjects fulfilling exclusion and inclusion criteria were selected for study. Inclusion Criteria Hospital ward nurses diagnosed with chronic non-specific low back pain by a certified physiotherapist, Aged between 25-45 years, Duration of pain 12 weeks or more. Exclusion Criteria, Any traumatic injury to spine, Neurological involvement ex. Radiculopathy, Infective conditions of spine, autoimmune or malignancy disorders, Any history of spinal surgery, Spinal deformity, osteoporosis

3. PROCEDURE

The approval of study protocol was taken by college research protocol committee on 23 September 2024.The study was presented before institutional ethical committee for further approval. Once the ethical approval was approved Ref No:(D. Y. Patil University deemed to be university /IEC.177/2025) participants were screened on basis of inclusion and exclusion criteria. Initially, a brief demographic data including name, age, gender, etc. as per the data collection sheet was recorded. Written consent was taken from all the participants. Subjects were randomly allocated into two groups by using a computer randomization pattern and outcome measures were taken before the interventions. At the end of 3 weeks, the subjects were again assessed for the outcome measures. The two intervention groups are described as follow-

[SNAG (mulligan) along with conventional therapy using mulligan belt]

GROUP A
No. of subjects 27
Patients position- Sitting at the edge of table
Therapist position Stand behind the patient with
Mulligan belt placed around the patient's waist and
the therapist's hips. Direction of Mobilization- cephalic
direction and over the
spinous processes at the symptomatic spinal levels

Repetitions-4 sets with 6-7 repetitions
Conventional Treatment- Hot moist pack,
Knee to chest, Straight leg raises, Bridging, Back
Extension.
Total time – 15min

GROUP B – [Maitland's mobilization along with conventional therapy]
No. of subjects 27
Patients Position-Prone lying.
Therapist Position- Stand on the patient's right side, with
the ulnar border of the hand between the pisiform and
hook of hamate directly over the spinous process.
Direction of Mobilization- posteroanterior direction.
Repetitions- 4 sets of 30 second mobilization with
30-second rest in between.
Conventional Treatment- Hot moist pack, Knee to chest,
Straight leg raises, Bridging, Back extension.
Total time – 15min

4. RESULTS

Demographic for Group A, there are 27 individuals in total. Out of these, 8 are male, which represents 29.63% of the group, while 19 are female, making up 70.37%. This shows that females are the majority in Group A.

Demographic for Group B, there are a total of 27 individuals. Of these, 12 are male, making up 44.44% of the group, while 15 are female, accounting for 55.56% of the total. This indicates a slightly higher representation of females in Group B.

The mean age in Group A is 26.04 years with a standard deviation of 15.02, indicating a wider variation in ages within the group. In contrast, Group B has a slightly higher mean age of 26.70 years, but with a much smaller standard deviation of 1.46, suggesting that the ages in Group B are more closely clustered around the average.

Table no.4 Mean distribution of outcome measures for group A

Outcome		Time Point	Mean	S.D.	p-value
NPRS		Pre	6.93	0.78	3.49616E-18
		Post	3.22	0.85	
MODI		Pre	27.22	4.17	2.00343E-14
		Post	12.30	3.79	
LUMBAR	Flexion	Pre	28.52	5.88	2.39384E-11
		Post	60.37	13.58	
	Extension	Pre	11.00	1.44	5.42771E-15
		Post	20.41	3.14	

In group A the outcome measures show significant improvements from pre- to post-intervention across all parameters. For NPRS (Numeric Pain Rating Scale), the mean score decreased from 6.93 (±0.78) before the intervention to 3.22 (±0.85) afterward, with a highly significant p-value of 3.49616×10^{-18}, indicating a substantial reduction in pain. Similarly, MODI (Modified Oswestry Disability Index) scores dropped from a pre-intervention mean of 27.22 (±4.17) to 12.30 (±3.79) post-intervention, with a p-value of 2.00343×10^{-14}, reflecting marked improvement in functional disability.

In terms of lumbar mobility, flexion increased from a mean of 28.52° (±5.88) pre-intervention to 60.37° (±13.58) post-intervention, with a p-value of 2.39384×10^{-11}. Lumbar extension also showed improvement, rising from a pre-intervention mean of 11.00° (±1.44) to 20.41° (±3.14) post-intervention, and this change was statistically significant with a p-value of 5.42771×10^{-15}. Overall, these results indicate highly significant positive outcomes following the intervention.

Table no.5 Mean distribution of outcome measures for group B

Outcome		Time Point	Mean	S.D.	p-value
NPRS		Pre	6.85	0.82	7.70437E-22
		Post	2.67	0.62	
MODI		Pre	27.78	4.01	1.28039E-18
		Post	10.63	3.01	
LUMBAR	Flexion	Pre	32.48	5.54	8.8153E-20
		Post	69.44	8.81	
	Extension	Pre	15.00	3.43	9.33341E-10
		Post	24.26	3.81	

In group B the results demonstrate significant improvements across all outcome measures following the intervention. For the NPRS (Numeric Pain Rating Scale), the mean score decreased from 6.85 (±0.82) before the intervention to 2.67 (±0.62) afterward, with a highly significant p-value of 7.70437×10^{-22}, indicating a notable reduction in pain levels. The MODI (Modified Oswestry Disability Index) also showed considerable improvement, with scores dropping from a mean of 27.78 (±4.01) pre-intervention to 10.63 (±3.01) post-intervention, supported by a significant p-value of 1.28039×10^{-18}.

Regarding lumbar mobility, flexion increased substantially from a pre-intervention mean of 32.48° (±5.54) to 69.44° (±8.81) after the intervention, with a highly significant p-value of 8.8153×10^{-20}. Similarly, lumbar extension improved from 15.00° (±3.43) to 24.26° (±3.81), with a p-value of 9.33341×10^{-10}. These results collectively indicate statistically significant and clinically meaningful improvements in pain, disability, and lumbar range of motion.

Table no. 6 Mean comparison between group A and group B

Outcome		Group	Mean	S.D.	p-value
NPRS		A	3.22	0.85	0.0041
		B	2.67	0.62	
MODI		A	12.30	3.79	0.0398
		B	10.63	3.01	
LUMBAR	Flexion	A	60.37	13.58	0.0026
		B	69.44	8.81	
	Extension	A	20.41	3.14	8.44713E-05
		B	24.26	3.81	

Table no.6 shows the comparison between Group A and Group B reveals that both groups experienced improvements, though Group B consistently showed slightly better outcomes across all measured parameters. In terms of pain reduction, Group B had a lower mean NPRS (Numeric Pain Rating Scale) score of 2.67 (±0.62) compared to 3.22 (±0.85) in Group A, with a statistically significant p-value of 0.0041, indicating greater pain relief in Group B. For disability, measured by the MODI (Modified Oswestry Disability Index), Group B again outperformed Group A with a lower mean score of 10.63 (±3.01)

versus 12.30 (±3.79), and a significant p-value of 0.0398, suggesting improved functional outcomes in Group B.

Lumbar range of motion also favored Group B. Lumbar flexion was higher in Group B, with a mean of 69.44° (±8.81) compared to 60.37° (±13.58) in Group A, supported by a p-value of 0.0026. Similarly, lumbar extension was greater in Group B, averaging 24.26° (±3.81), while Group A had a mean of 20.41° (±3.14). This difference was highly significant, with a p-value of 8.44713×10^{-5}. Overall, Group B demonstrated superior outcomes in pain reduction, disability improvement, and lumbar mobility compared to Group A.

5. DISCUSSION

Among healthcare workers, chronic non-specific low back pain (CNSLBP) is still a major cause of occupational disability, especially for nurses who regularly perform physically taxing duties like lifting, bending, and extended standing. The purpose of this study was to evaluate how well Maitland's and Mulligan's mobilizations reduced pain and disability in hospital ward nurses who had CNSLBP. Although manual therapy has made extensive use of both approaches, little is known about how they compare directly, particularly when it comes to a population as specialized as hospital ward nurses.

According to the study's findings, during the intervention period, both the Maitland and Mulligan groups experienced a significant decrease in pain. Nonetheless, the Mulligan group experienced a marginally higher decrease in pain scores after the intervention, which is consistent with earlier research indicating that Mulligan's mobilization had immediate hypoalgesic effects because it was painless and involved the patient actively.

The present findings demonstrate that both interventions produced statistically and clinically significant reductions in pain levels, as assessed by the Numeric Pain Rating Scale (NPRS). In the first group, the mean NPRS score decreased from 6.93 ± 0.78 pre-intervention to 3.22 ± 0.85 post-intervention ($p = 3.49616\times10^{-18}$). Similarly, in the second group, the score declined from 6.85 ± 0.82 to 2.67 ± 0.62 ($p = 7.70437\times10^{-22}$).

While both interventions achieved highly significant outcomes, the second group exhibited a slightly greater absolute reduction in pain scores ($\Delta = 4.18$) compared to the first group ($\Delta = 3.71$). Furthermore, the lower post-intervention mean score and reduced variability (standard deviation of ±0.62 vs. ±0.85) in the second group suggest both increased efficacy and greater consistency of response among participants.

These results indicate that although both approaches are effective for pain management, the group B intervention offer enhanced benefits in terms of both magnitude and uniformity of pain relief. Future studies may explore underlying factors contributing to this differential effect, including intervention components, patient characteristics, or treatment duration.

Another study conducted to find the immediate effects of Maitland mobilization and mulligan techniques on flexion and extension range of motion in patients with chronic non-specific low back pain: a randomized pilot study were Eighteen volunteers with NSCLBP were randomly divided into three groups: Posteroanterior (PA) mobilization, SNAG, and Sham SNAG. The PA mobilization techniques (Grade III) were performed on prone lying position (four sets of four repetitions; last 30 seconds for each technique). The SNAG techniques were performed accompanying with active flexion in sitting position (four sets of six repetitions). The sham SNAG technique was applied in sitting position while therapist touched gently patients' backs (three sets of four repetitions). Flexion and extension Range of Motions (ROMs) were measured before and immediately after applied interventions (by inclinometer). The revealed increased flexion ROM following the SNAG technique and increased extension ROM after Maitland PA mobilization[17].

Both groups experienced a significant improvement in functional disability as determined by the Modified Oswestry Disability Index (MODI). This development implies that both mobilization strategies may be useful supplements to CNSLBP treatment. The Mulligan group's greater improvement might be related to the mobilization process's functional aspect. Because Mulligan's MWM necessitates active engagement, it may improve neuromuscular control, proprioception, and movement confidence—all of which are critical in work environments where nurses must move and interact with patients on a regular basis.

Modified Oswestry Disability Index:

The results of this study indicate that both interventions were highly effective in reducing pain and disability, as measured by the Numeric Pain Rating Scale (NPRS) and the Modified Oswestry Disability Index (MODI), respectively. Significant improvements were observed across both measures, with statistical evidence supporting the efficacy of each intervention.

substantial improvements were observed in functional disability. The MODI scores in the first group decreased from 27.22 ± 4.17 to 12.30 ± 3.79 ($p = 2.00343\times10^{-14}$), while the second group exhibited a more pronounced reduction from 27.78 ± 4.01 to 10.63 ± 3.01 ($p = 1.28039\times10^{-18}$). Again, the group B demonstrated a greater absolute improvement ($\Delta = 17.15$ vs. $\Delta = 14.92$) and lower post-intervention variability, reinforcing the impression of enhanced effectiveness.

This is consistent with results from earlier research, including Vicenzino et al. (1996) and Kaltenborn (2005), who observed improvements in function after MWM in chronic musculoskeletal disorders. Furthermore, it is important to remember that

increases in nurses' disability scores have a big impact on their professional productivity and lower absenteeism rates in addition to their personal health. The participants' occupational role is a significant contextual factor in this study. Because they perform repetitive and demanding manual tasks, nurses are known to have high biomechanical loads on their lumbar spines. Interventions aimed at reducing pain and restoring normal joint mechanics are therefore especially beneficial in this population[25].

The present study findings imply that Maitland's method may enable nurses to more effectively self-manage their symptoms while at work by encouraging pain-free mobility and self-mobilization. This may be particularly important in high-stress settings where it may not always be possible to schedule regular physiotherapy appointments. On the other hand, Mulligan's method might work better in controlled clinical settings where passive mobilization can be used regularly. It is thought that both methods work by influencing neurophysiological pathways. Maitland's oscillations promote central modulation of pain through the dorsal horn by stimulating mechanoreceptors in the soft tissues and joint capsule. The pain-spasm-pain cycle that is frequently seen in chronic conditions may be lessened as a result.

In the present study it showed the comparison between Group A (mulligan's mobilization) and Group B (Maitland's mobilization) reveals that both groups experienced improvements, though Group B consistently showed slightly better outcomes across all measured parameters. In terms of pain reduction, Maitland's Group showed a lower mean NPRS (Numeric Pain Rating Scale) score of mean value of 2.67 (±0.62) compared to 3.22 (±0.85) in Group A, with a statistically significant p-value of 0.0041, indicating greater pain relief in Group B. For disability, measured by the MODI (Modified Oswestry Disability Index), Group B again outperformed Group A with a lower mean score of 10.63 (±3.01) versus 12.30 (±3.79), and a significant p-value of 0.0398, suggesting improved functional outcomes in Group B.

Lumbar Range of Motion:

Lumbar range of motion also favored Group B. Lumbar flexion was higher in Group B, with a mean of 69.44° (±8.81) compared to 60.37° (±13.58) in Group A, supported by a p-value of 0.0026. Similarly, lumbar extension was greater in Group B, averaging 24.26° (±3.81), while Group A had a mean of 20.41° (±3.14). This difference was highly significant, with a p-value of 8.44713×10^{-5}. Overall, Group B demonstrated superior outcomes in pain reduction, disability improvement, and lumbar mobility compared to Group A.

Chronic pain has a psychological component that should not be undervalued. High levels of stress and burnout are common among nurses, which can worsen or prolong pain symptoms. A positive psychological response, such as increased self-efficacy and decreased fear-avoidance behavior, may have been advantageous for the Mulligan group because of the active and painless nature of the treatment. The marginally better results seen with Mulligan's mobilization in this study may be explained by these psychological factors, which are important in the rehabilitation of chronic pain. In terms of adherence and long-term results, patient perceptions of control, safety, and efficacy are crucial.

In order to manage CNSLBP in hospital ward nurses, this study supports the clinical application of both Maitland's and Mulligan's mobilization techniques. Maitland's method, however, might be better in terms of quicker pain relief and functional improvements, especially when patient involvement and confidence in movements are essential. When choosing the right technique, clinicians should take into account the unique characteristics of each patient, such as their movement patterns, psychological preparedness, and work demands. The most long-lasting effects might be obtained by integrating these mobilizations into a more comprehensive rehabilitation program that includes core strengthening, ergonomic education and cognitive-behavioral techniques.

CONCLUSION

The present study concludes that Group A, Maitland's Mobilization Technique with conventional therapy exercise and Group B Mulligan's Mobilization Technique with conventional therapy exercise are effective in the treatment of chronic non-specific low back pain. These techniques showed clinical and statistically significant effectiveness on these parameters. The study is intended to compare the effectiveness between Mulligan's Mobilization Technique with Conventional therapy exercise and Maitland's Mobilization Technique with Conventional therapy exercise in the treatment of chronic non-specific low back pain. According to the scores, both groups' range of motion has increased, their instability has decreased, and their pain has decreased. Patients in both groups report an improvement in their functional activities. It shows that there is a clinically significant improvement of patient's complaints in both groups. But the statistical inference shows that Maitland's mobilization technique is more effective when compared to the Mulligan's mobilization technique in improving range of motion pain and instability. That is Maitland's Mobilization technique with conventional therapy exercise is more effective in the treatment of chronic non-specific low back pain.

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