Original Article

Comparative Study on the Effects of K-Taping and Manual Mobilization on Cervical ROM Pain and Muscle Strength in Patients with Non-Specific Neck Pain

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ABSTRACT

Background: Non-specific neck pain (NNP) is a prevalent condition often linked to postural or mechanical causes, significantly impacting daily activities, work productivity, and overall quality of life. It is more common in industrialized countries and urban areas, particularly among middle-aged females.

Methods: The kinesiotape-taping (KT) group received k-taping applications to the cervical and upper trapezius regions by a trained therapist. The KT was applied with 30% stretch at the level of the neck to provide optimal support and facilitate neuromuscular activation. The manual mobilization group underwent a structured intervention consisting of joint mobilization and soft tissue manipulation techniques targeting the cervical spine.

Results: Paired t-test was performed to determine within the group difference in the outcome measures and the findings revealed that cervical ROM was significantly improved in both the group (pre-post) $p<0.001$. Besides that, pain and neck disability index was also found significantly reduced $p<0.001$ in both the group.

Conclusion: The findings of the study indicate that both K-taping and manual mobilization significantly improve cervical range of motion, reduce pain intensity, and decrease neck disability in patients with non-specific chronic neck pain. However, no significant difference was observed between the two intervention groups, suggesting that both approaches may be equally effective.

Keywords: Mobilization, Muscle stretching exercises, Neck pain, Range of motion.

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INTRODUCTION

Non-specific neck pain (NNP) is a prevalent condition often linked to postural or mechanical causes, significantly impacting daily activities, work productivity, and overall quality of life[1]. It is more common in industrialized countries and urban areas, particularly among middle-aged females[2]. With a lifetime prevalence of about 80% in the general adult population and an annual prevalence of 30–50%, NNP is associated with various risk factors, including cervical trauma, sedentary lifestyles, and psychological conditions such as depression and anxiety[3]. NNP can be categorized as acute (lasting less than 4 weeks), subacute (1–4 months), or chronic (persisting beyond 4 months)[4-5]. Diagnosis primarily relies on clinical evaluation, with imaging techniques like X-rays, MRI, and CT scans used to assess structural abnormalities when necessary. Conservative management is the cornerstone of NNP treatment, typically involving a combination of pharmacological interventions (e.g., NSAIDs, analgesics, and muscle relaxants) and physical

therapy[6]. Physiotherapy approaches, including manual therapy, targeted exercises, and instrumental physical therapies, are widely employed to alleviate pain, improve mobility, and address underlying postural or mechanical dysfunctions[7]. Despite the lack of a definitive therapeutic protocol, these conservative strategies are effective for most patients, emphasizing the importance of a multidisciplinary approach to managing NNP[8].

NNP is a common condition that can significantly impact daily life, and its management often involves a variety of non-pharmacological interventions[9]. Evidence-based treatments for NNP include manual therapy, joint mobilization, strengthening exercises, massage therapy, mobilization techniques, and Kinesio Taping (KT)[10-12]. These interventions aim to reduce pain, improve mobility, and address underlying musculoskeletal dysfunctions[12-13]. Among these, mobilization techniques have been widely recognized for their effectiveness in improving joint mobility, reducing muscle stiffness, and alleviating chronic neck pain[14]. Mobilization involves graded oscillatory movements applied to the cervical spine to enhance range of motion, decrease pain sensitivity, and restore normal joint mechanics[15]. Additionally, home-based self-exercise programs have been recommended for pain management, offering a practical and sustainable approach for individuals with NNP[16].

KT is another effective intervention for managing neck pain. This technique involves applying elastic therapeutic tape to the skin to support muscles and joints, improve circulation, and reduce pain. KT is easy to apply, non-invasive, and can be used independently, making it a convenient option for individuals seeking relief from neck pain[17-18]. Studies have demonstrated its effectiveness in reducing pain and improving function in patients with chronic neck pain[19]. When combined with other interventions, such as stretching exercises, KT may enhance therapeutic outcomes by providing additional support and promoting muscle relaxation[20].

While both mobilization and KT are effective individually, their comparative effectiveness has not been extensively studied, particularly in specific populations. However, mobilization techniques, which focus on restoring joint mobility and reducing stiffness, may offer distinct benefits compared to KT, which primarily provides structural support and pain relief[21]. When combined with conventional physical therapy, including ultrasound therapy, both interventions could enhance treatment outcomes for individuals with NNP. Mobilization may improve joint mechanics and neuromuscular control, while KT offers proprioceptive feedback and pain modulation[22]. Further research, including randomized controlled trials, is needed to determine the relative effectiveness of these approaches and to establish standardized protocols for their integration into NNP management.

METHODOLOGY

Study Design

This study employed a randomized controlled trial (RCT) design to compare the effects of K-taping and manual mobilization on cervical range of motion (ROM), pain, and muscle strength in patients with NNP. Participants were randomly allocated into two intervention groups to ensure an unbiased comparison of outcomes.

Study Setting

The study was conducted in an outpatient physical therapy clinic or rehabilitation center in Islamabad that is equipped with the necessary facilities for assessment and intervention. The setting provided a controlled environment, ensuring consistency in applying interventions and data collection.

Target Population

The target population included adults aged 18–65 years diagnosed with non-specific neck pain (NNP) lasting more than three months (chronic NNP). Participants were recruited from outpatient clinics, community health centers, and through public advertisements.

Sample Size

A total of 30 participants were recruited, with 15 participants allocated to each of the two intervention groups. This sample size was determined based on previous studies tilted as: “Effect of dynamic taping on neck pain, disability, and quality of life in patients with chronic non-

specific neck pain: a randomized sham-control trial". Taking the mean value of VAS (follow-up) 3.28±0.95 and 4.5±1.35 at 95% of CI the sample size of n=30 was estimated using following formula:

$$n = (Z_{\alpha/2} + Z_{\beta})^2 * 2 * \sigma^2 / d^2$$

Inclusion and Exclusion Criteria

The inclusion criteria required participants to be adults male and female aged 18–65 years with a diagnosis of chronic non-specific neck pain lasting more than three months, a pain intensity of 3 or higher on the Visual Analog Scale (VAS), and willingness to participate and provide informed consent. Participants were excluded if they had a history of cervical spine surgery or trauma, presence of red flags such as infection, tumor, or neurological deficits, severe osteoporosis or spinal deformities, contraindications to K-taping or manual mobilization such as skin allergies or fractures, or if they were participating in other neck pain treatment programs during the study period.

Interventional Strategies

Participants were randomly assigned to one of two groups. Those in the K-taping group received KT applications to the cervical and upper trapezius regions by a trained therapist. Before the application of the tape, minor stretching exercises were performed to prepare the muscles, followed by five minutes of ultrasound therapy at a frequency of 1 MHz and an intensity of 1.0 W/cm². The KT was then applied with 30% stretch at the level of the neck to provide optimal support and facilitate neuromuscular activation[23].

For taping, an "I-tape" technique was used for the cervical extensors, applied from the upper thoracic spine (T1–T2) to the occiput along the paraspinal muscles to provide postural support. An "H-tape" technique was applied over the upper trapezius region, with two parallel strips extending from the acromion to the base of the skull and a horizontal strip across the cervical spine to reduce muscle tension and enhance proprioception[23]. The tape was reapplied every 2 days for eight weeks, and participants were instructed to perform self-stretching and strengthening exercises daily at home. The prescribed exercises included chin tucks, upper trapezius stretches, cervical isometric exercises, and resistance band exercises for neck strengthening.

The manual mobilization group underwent a structured intervention consisting of joint mobilization and soft tissue manipulation techniques targeting the cervical spine. Joint mobilization was performed using graded oscillatory movements based on Maitland's mobilization techniques, ranging from Grade I to Grade IV, depending on the patient's pain tolerance and mobility restrictions[24]. Mobilization techniques were applied to the cervical facet joints to improve segmental mobility, reduce stiffness, and enhance overall cervical range of motion. Additionally, soft tissue manipulation techniques were employed to release muscular tension, improve blood circulation, and alleviate trigger points in the cervical musculature. This included myofascial release, deep tissue massage, and stretching techniques applied to the upper trapezius, levator scapulae, sternocleidomastoid, and suboccipital muscles, administered twice weekly for eight weeks by a physical therapist. Similar to the K-taping group, these participants also received five minutes of ultrasound therapy before manual mobilization to enhance tissue elasticity and reduce muscle stiffness. Following the mobilization, participants engaged in a structured exercise regimen consisting of cervical range of motion exercises, deep neck flexor strengthening, and postural correction exercises. These exercises were aimed at improving mobility, reducing pain, and enhancing muscle endurance. Both groups were given intervention for 2 days a week for eight weeks.

Outcome Measures

Primary and secondary outcomes were assessed at baseline and eight weeks. The primary outcomes included cervical range of motion (ROM), measured using a goniometer[25]; pain intensity, assessed using the Visual Analog Scale (VAS)[26] and neck disability, measured using the Neck Disability Index (NDI)[27].

Data Analysis

Statistical analysis was performed using SPSS. Descriptive statistics summarized baseline characteristics. Paired t-test was performed to determine changes in outcome over eight week of intervention and compare changes in outcomes between groups over time independent t-test was

performed. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

All participants provided written informed consent before participation. Participant data were anonymized and securely stored to maintain confidentiality. Participants had the right to withdraw from the study at any time without penalty. Adverse events related to interventions were monitored and reported promptly to ensure safety.

RESULTS

The study had included a total on n=30 participants divided into two groups K-taping group and manual mobilization group. The mean age of the participants collectively in the two group were 45.63±2.36 whereas male and female composition were n=20 (66.66%) male and n=10 (33.33%) female. Baseline characteristics of the participants were shown in Table-1:

Table-1 Demographic abd Baseline Characteristics of the Recruited Participants

Variables	Kinesio-Taping *Mean±SD*	Manual Mobilization *Mean±SD*	p-value
Age	45.63±2.36	46.12±2.31	0.86
Cervical ROM			
Flexion	33.56±3.87	33.75±2.45	0.74
Extension	36.23±3.21	35.56±3.11	0.71
Lateral Flexion *(Right Side)*	19.24±2.11	20.12±3.2	0.87
Lateral Flexion *(Left Side)*	19.11±2.09	19.26±2.23	0.86
Rotation *(Right Side)*	56.34±1.45	55.67±2.11	0.67
Rotation *(Left Side)*	55.14±2.45	55.66±3.01	0.5
Pain (VAS)	7.36±1.34	7.77±1.54	0.6
NDI	23.45±2.24	24.23±1.88	0.7

Paired t-test was performed to determine within the group difference in the outcome measures and the findings revealed that cervical ROM was significantly improved in both the group (pre-post) p<0.001. Besides that, pain and neck disability index was also found significantly reduced p<0.001 in both the group (Table-2).

For between the groups comparison independent t-test was performed that revealed no significant mean difference in the outcome measures of the participants. The mean pain value after eight weeks of intervention in KT group was 3.26±1.2 and in manual mobilization group was 3.45±1.9 (p=0.07), similarly on neck disability index the value in KT group was 10.23±1.45 and in manual mobilization group was 11.01±1.33 (p=0.06). Additionally on cervical range of motion no significant difference in the mean values were observed (p>0.05) (Table-3).

DISCUSSION

The findings of the study indicate that both the KT and manual mobilization interventions significantly improved cervical range of motion (CROM), reduced pain levels, and decreased neck disability index (NDI) scores in patients with non-specific chronic neck pain. The within-group analysis using the paired t-test demonstrated a statistically significant improvement (p<0.001) in all outcome measures post-intervention, suggesting that both techniques were effective in enhancing cervical mobility and reducing pain and disability. However, the between-group comparison using the independent t-test revealed no significant differences between the two interventions (p>0.05) in any of the measured parameters, including CROM, pain, and NDI. These results suggest that while both KT and manual mobilization are beneficial for managing non-specific chronic neck pain, neither technique proved superior to the other in terms of effectiveness. In a study investigating the effects

Table-2 Paired Test (Within The Group Comparison)

Variables	Pre *Mean±SD*	Post *Mean±SD*	t-test	t-critical	p-value
Kinesio-Taping					
CROM Flexion	33.56±3.87	41.23±3.22	3.45	1.34	<0.001
CROM Extension	36.23±3.21	40.22±2.56	4.44		<0.001
CROM Lateral Flexion *(Right Side)*	19.24±2.11	29±2.33	3.46		<0.001
CROM Lateral Flexion *(Left Side)*	19.11±2.09	31.23±3.11	5.21		<0.001
Rotation *(Right Side)*	56.34±1.45	76.12±2.33	4.1		<0.001
Rotation *(Left Side)*	55.14±2.45	78.11±2.1	3.21		<0.001
Pain	7.36±1.34	3.26±1.2	1.1		<0.001
NDI	23.45±2.24	10.23±1.45	2.21		<0.001
Manual Mobilization					
CROM Flexion	33.75±2.45	42.23±2.43	3.21	1.34	<0.001
CROM Extension	35.56±3.11	41.22±1.98	4.15		<0.001
CROM Lateral Flexion *(Right Side)*	20.12±3.2	28.19±1.65	3.22		<0.001
CROM Lateral Flexion *(Left Side)*	19.26±2.23	32.11±2.99	5.14		<0.001
Rotation *(Right Side)*	55.67±2.11	74.41±1.67	4.17		<0.001
Rotation *(Left Side)*	55.66±3.01	79.01±1.34	3.1		<0.001
Pain	7.77±1.54	3.45±1.9	1.09		<0.001
NDI	24.23±1.88	11.01±1.33	2.13		<0.001

Table-3 Independent T-Test Test (Between the Group Comparison)

Variables	Kinesio-Taping	Manual Mobilization	t-test	t-critical	p-value
CROM Flexion	41.23±3.22	42.23±2.43	-1.32	2.33	0.9
CROM Extension	40.22±2.56	41.22±1.98	0.98		0.07
CROM Lateral Flexion *(Right Side)*	29±2.33	28.19±1.65	-1.31		0.9
CROM Lateral Flexion *(Left Side)*	31.23±3.11	32.11±2.99	0.76		0.1
Rotation *(Right Side)*	76.12±2.33	74.41±1.67	1.65		0.7
Rotation *(Left Side)*	78.11±2.1	79.01±1.34	0.21		0.6
Pain	3.26±1.2	3.45±1.9	1.8		0.07
NDI	10.23±1.45	11.01±1.33	1.2		0.06

of KT, McConnell taping, and manual therapy on pain and function in patients with subacromial impingement syndrome, similar findings were observed in terms of treatment effectiveness[28]. The study reported a significant reduction in pain and improvement in functional activity levels in all treatment groups compared to the pre-treatment period ($p<0.05$). However, when comparing the treatment groups to each other, no significant differences were found in terms of pain reduction and functional improvement ($p>0.05$)[28]. These results align with the findings of our study, which examined the effects of KT and manual mobilization on cervical range of motion, pain, and NDI in patients with non-specific chronic neck pain. Our study also demonstrated a significant improvement within each group ($p<0.001$) but no significant differences between the two treatment modalities ($p>0.05$). Both studies suggest that while taping techniques and manual therapy are effective interventions for pain relief and functional improvement, no single technique proves to be

superior over the other in terms of overall outcomes. In another study comparing the immediate effects of single-session KT and instrument-assisted soft tissue mobilization (IASTM) on pain and proprioception in patients with chronic neck pain, both interventions were found to be effective in reducing pain and improving proprioception. The study reported significant improvements in Visual Analog Scale (VAS) scores and proprioception levels within both groups post-treatment (P≤0.001)[29]. However, no statistically significant difference was observed between the two groups in the post-treatment measurements (P > .05), indicating that neither KT nor IASTM was superior to the other. In another study comparing the effects of KT and conventional physiotherapy in addition to home exercises for chronic neck pain, significant improvements were observed in depression scores, muscle endurance, and patient satisfaction in favor of the KT group (p=0.021, p=0.029, p=0.009, respectively). The study concluded that KT can enhance muscle endurance in the short term and improve treatment satisfaction when combined with conventional physiotherapy[30].

This study employed a rigorous RCT design, which is considered the gold standard for assessing the effectiveness of interventions, reducing selection bias, and ensuring a robust comparison between the KT and manual mobilization groups. The structured intervention protocols for both groups, including standardized taping techniques, mobilization methods, and adjunct ultrasound therapy, enhanced the reproducibility of the study. Additionally, the use of validated outcome measures such as CROM, VAS, and NDI strengthened the study's reliability. The within-group analysis demonstrated statistically significant improvements in cervical ROM, pain reduction, and disability scores over the eight-week period, indicating the efficacy of both interventions in managing non-specific chronic neck pain.

However, the study had certain limitations. The small sample size (n=30) reduces the generalizability of findings to a larger population. While both interventions were effective within groups, the lack of a significant difference between the groups suggests that K-taping and manual mobilization may have comparable effects, limiting the ability to determine superiority. The study was conducted in a controlled clinical setting, which may not fully reflect real-world conditions where adherence to home exercises and therapist guidance could vary. Furthermore, long-term follow-up data were not collected, restricting the understanding of the sustained benefits of these interventions beyond the eight-week study period.

CONCLUSION

The findings of the study indicate that both K-taping and manual mobilization significantly improve cervical range of motion, reduce pain intensity, and decrease neck disability in patients with non-specific chronic neck pain. However, no significant difference was observed between the two intervention groups, suggesting that both approaches may be equally effective. While the study highlights the potential benefits of these interventions, further research with a larger sample size and long-term follow-up is necessary to determine their comparative effectiveness and sustainability in clinical practice.

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None.

Author Contributions
Abdul Moiz Khan contributed to conceptualization, study design, and manuscript writing. **Muhammad Kamran** handled methodology, statistical analysis, and manuscript review. **Aimen Khan** conducted the literature review and assisted in data interpretation. **Waqas Shaukat** supervised the study and critically revised the manuscript. **Azka Hafeez** assisted with data collection, participant recruitment, and formatting. **Muhammad Omer** contributed to data analysis and final approval of the manuscript.

Ethical Approval
This study received approval from the Institutional Ethical Review Committee (HU-IRB-2024-032) of Hamdard University.

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None.

Conflict of Interests
None.

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