Effect of Corrective Exercises versus Kinesiotaping on Postural Kyphosis in Lactating Women

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Abstract:

Background: Postural kyphosis is a common musculoskeletal issue in lactating women due to prolonged breastfeeding postures and hormonal changes. It can contribute to discomfort, impaired function, and long-term spinal complications if left untreated. **Purpose:** This study aimed to compare the effects of a corrective exercise program and Kinesio taping on thoracic kyphosis and pain levels in lactating women. **Subjects & Methods:** Fifty lactating women with postural kyphosis were randomly divided into two groups. Group A (n=25) received a structured corrective exercise program three times per week, while Group B (n=25) received Kinesio taping applications twice per week. Both interventions continued for 12 weeks. Thoracic kyphosis angle was measured using a digital inclinometer, and pain was evaluated using the Visual Analogue Scale before and after the intervention**. Conclusion:** Both interventions significantly improved postural kyphosis and reduced pain. However, corrective exercises produced superior outcomes in both parameters, supporting their use as a primary rehabilitation strategy for postpartum kyphosis in lactating women.

Keywords: corrective exercises; kinesiotaping; kyphosis; lactation; posture

INTRODUCTION

The postpartum period, also known as the puerperium, is a critical transitional phase marked by significant physiological, biomechanical, and emotional adaptations in women following childbirth. Among the most prevalent musculoskeletal complaints during this period is postural kyphosis—a condition characterized by an excessive curvature of the thoracic spine that is often exacerbated by breastfeeding postures and hormonal changes (1,2). The habitual slouched position adopted during lactation, often repeated multiple times daily, increases strain on the upper back and shoulder girdle, potentially leading to chronic discomfort and postural dysfunction (1,3).

During pregnancy, the maternal body undergoes numerous structural changes, including increased anterior pelvic tilt, lumbar lordosis, and compensatory thoracic kyphosis to counterbalance the anterior shift in the center of gravity (4,5). These biomechanical adaptations, coupled with elevated levels of relaxin, contribute to joint laxity and muscular imbalance, particularly within the axial skeleton. Postpartum, these alterations are further exacerbated by repetitive forward-leaning postures and increased thoracic load due to breast engorgement, especially in lactating women (6).

Thoracic hyperkyphosis, defined as a kyphosis angle exceeding 40°, can result in muscle imbalance, with tightness in the pectoralis major and upper trapezius and weakness in the lower trapezius and deep cervical flexors (7,8). These changes promote forward shoulder posture and impair scapular kinematics, potentially narrowing the subacromial space and increasing the risk of shoulder dysfunction (9,10).

Conservative interventions such as corrective exercises and Kinesio taping (KT) have been widely explored for managing postural abnormalities. Corrective exercises aim to restore muscular balance, enhance spinal alignment, and improve proprioceptive control through targeted stretching and strengthening routines (11,12). On the other hand, KT is a non-invasive modality that offers proprioceptive feedback, reduces muscle tension, and facilitates postural correction by lifting the skin and promoting lymphatic flow (13,14). While both methods have demonstrated clinical benefits in diverse populations, there remains a paucity of research comparing their effectiveness specifically among lactating women suffering from postural kyphosis.

Given the functional demands and ergonomic challenges of the postpartum period, identifying optimal management strategies for postural kyphosis in lactating women is crucial. This study was therefore conducted to compare the effects of a structured corrective exercise program versus Kinesio taping on thoracic kyphosis angle and pain levels in lactating women, with the aim of guiding evidence-based clinical practice.

MATERIALS AND METHODS

2.1 Study Design

This study employed a prospective, randomized, comparative, pre–post controlled trial design to evaluate the effectiveness of corrective exercises versus Kinesio taping on postural kyphosis in lactating women. The study was conducted over a 12-week period between January and March 2024 at New Cairo Hospital, Police Academy. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Physical Therapy, Cairo University (Approval No. 012/003769), and all procedures conformed to the Declaration of Helsinki.

2.2 Participants

Fifty postnatal lactating women diagnosed with postural kyphosis were recruited and randomly allocated into two equal groups (n=25 per group). Inclusion criteria were: age between 20 and 30 years, sedentary lifestyle, nonsmoking status, at least six months postpartum, and body mass index (BMI) ≤ 30 kg/m². Participants were required to have a confirmed diagnosis of postural kyphosis by a licensed orthopedic specialist. Women were excluded if they had a history of spinal fracture, inflammatory musculoskeletal disease, thoracic surgery, malignancy, fibromyalgia, or dermatological conditions that could interfere with taping application.

2.3 Measurement Procedures

Baseline demographic data including age, weight, height, and BMI were recorded. Pain intensity was assessed using the 10-cm Visual Analogue Scale (VAS), with endpoints labeled “no pain” and “unbearable pain.” Thoracic kyphosis angle was measured using a digital inclinometer placed over the spinous processes of T1–T2 and T12–L1 while the participant stood in a relaxed posture. The kyphosis angle was calculated as the sum of readings from both landmarks. These measurements were repeated after the 12-week intervention period.

2.4 Treatment Procedures

Group A received a structured corrective exercise program, administered three times per week for 12 weeks. Each session lasted 30–40 minutes and included a warm-up (5 minutes), a main exercise phase (20–30 minutes), and a cool-down (5 minutes). Exercises targeted core stability, spinal mobility, and postural muscle strengthening, including supine transversus abdominis activation, quadruped arm/leg lifts, side-lying thoracic rotation, wall push-ups, and thoracic extension stretches.

Group B received Kinesio taping twice weekly for 12 weeks. The tape was applied from the C6 level down to T12 in a paravertebral "V" configuration, with participants maintaining an upright seated posture during application. The goal of taping was to promote proprioceptive feedback and spinal alignment.

All participants were advised to maintain their usual physical activity and breastfeeding routines during the study. Treatment adherence was monitored, and all

assessments were conducted by blinded evaluators.

2.5 Statistical analysis

Unpaired t-test was conducted for comparison of subject characteristics between groups. Normal distribution of data was checked using the Shapiro-Wilk test. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. Mixed MANOVA was conducted to investigate the effect of treatment on kyphosis angle and VAS. Post-hoc tests using the Bonferroni correction were carried out for subsequent multiple comparison. The level of significance for all statistical tests was set at $p < 0.05$. All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

RESULTS

3.1 Subject characteristics:

Table (1) shows the subject characteristics of group A and B. There was no significant difference between groups in age, weight, height and BMI ($p > 0.05$).

Table 1. Comparison of subject characteristics between the group A and B:

	Group A	Group B			
	Mean ±SD	Mean ±SD	MD	t- value	p-value
Age (years)	26.24 ± 3.17	25.96 ± 2.76	0.28	0.33	0.74
Weight (kg)	73.84 ± 6.12	74.24 ± 4.56	-0.4	-0.26	0.79
Height (cm)	166.28 ± 3.95	165.16 ± 3.94	1.12	1.01	0.32
BMI (kg/m²)	26.68 ± 1.57	27.22 ± 1.38	-0.54	-1.29	0.20

SD, Standard deviation; MD, mean difference; p value, Probability value

3.2 Effect of treatment on kyphosis angle and VAS:

Mixed MANOVA revealed a significant interaction effect of treatment and time ($F = 27.43$, $p = 0.001$). There was a significant main effect of treatment ($F = 4.32$, $p = 0.01$). There was a significant main effect time ($F = 538.42$, $p = 0.001$).

Within group comparison

There was a significant decrease in kyphosis angle and VAS post treatment in both groups compared with that pre treatment ($p < 0.001$). The percent of change of kyphosis angle and VAS of group A was 11.35 and 53.67% respectively and that in group B was 6.56 and 37.78 respectively. (Table 2).

Between group comparison

There was no significant difference between groups pre treatment ($p > 0.05$). There was a significant decrease in kyphosis angle and VAS of group A compared with that of group B post treatment ($p < 0.001$). (Table 2).

Table 2. Mean kyphosis angle and VAS pre and post treatment of group A and B:

	Pre treatment	Post treatment			
	Mean ±SD	Mean ±SD	MD	% of change	p value
Kyphosis angle (degrees)					
Group A	46.16 ± 2.51	40.92 ± 2.31	5.24	11.35	0.001
Group B	46.32 ± 2.75	43.28 ± 2.53	3.04	6.56	0.001
MD	-0.16	-2.36			
	p = 0.83	***p = 0.001***			
VAS					
Group A	7.08 ± 0.64	3.28 ± 0.98	3.8	53.67	0.001
Group B	7.20 ± 1.08	4.48 ± 1.33	2.72	37.78	0.001
MD	-0.12	-1.2			
	p = 0.63	***p = 0.001***			

SD, Standard deviation; MD, Mean difference; p value, Probability value

DISCUSSION

This study evaluated the comparative effectiveness of a 12-week corrective exercise program versus Kinesio taping (KT) on thoracic kyphosis and pain levels in lactating women. The results showed that both interventions significantly improved kyphosis angle and reduced pain intensity; however, the corrective exercise group demonstrated markedly superior outcomes in both domains. These findings highlight the therapeutic value of active rehabilitation strategies in the management of postpartum postural disorders.

The substantial improvement in thoracic kyphosis angle observed in Group A (mean reduction of 5.24°, 11.35%) is consistent with prior evidence supporting the use of structured corrective exercises for postural alignment. Mousavi et al. (2019) (11) demonstrated that targeted exercises focusing on spinal extensors, deep core stabilizers, and scapular muscles effectively reduced thoracic curvature and improved

balance. The exercise protocol used in the present study emphasized these same muscle groups—particularly the transversus abdominis, multifidus, and lower trapezius—which play a critical role in spinal posture and trunk control. Furthermore, including thoracic mobility drills and diaphragmatic breathing likely enhanced neuromuscular coordination and reduced postural stiffness, a strategy supported by Jang et al. (2022) (15), who found that combining breathing techniques with corrective exercises provided significant improvements in thoracic posture and pain.

Pain reduction followed a similar trend, with Group A achieving a 53.67% decrease in VAS scores compared to 37.78% in Group B. This difference can be attributed to the mechanisms underlying corrective exercise, which include improved muscular balance, decreased joint strain, and activation of endogenous analgesic pathways through regular movement and stretching. Exercise is known to increase blood flow, reduce inflammatory mediators, and trigger endorphin release, all of which contribute to pain relief (15,16). The pain-alleviating effects observed may also reflect improved breastfeeding posture due to greater awareness and muscular support for spinal alignment.

While KT also produced statistically significant improvements, the magnitude of change was notably less than that of corrective exercise. This finding aligns with Tangpakkakul et al. (2024) (17), who reported that elastic taping can facilitate proprioceptive awareness and postural cueing, but its effects are typically transient and passive. In the present study, KT was applied in a standard V-shape along the thoracic spine to promote extension and alignment. Though this method may offer temporary structural support and sensory stimulation, it does not actively engage postural musculature or address muscular imbalances. As a result, KT may be more appropriate as a supportive or adjunct intervention rather than a standalone treatment.

The study's relevance is amplified by the unique demands of the postpartum period. Breastfeeding, infant handling, and prolonged sitting often lead to forward-flexed postures, placing increased stress on the thoracic spine. Compounded by hormonal laxity, fatigue, and altered core stability (due to factors such as diastasis recti), these postural habits contribute to the

development and persistence of kyphotic deformities (3,6). Therefore, therapeutic strategies that actively retrain spinal posture and restore muscular balance are critical. The greater effect of corrective exercises in this study supports their use as a frontline approach in postpartum rehabilitation.

Additionally, the inclusion of functional and accessible exercises—many of which could be performed at home—addresses the logistical challenges faced by new mothers, such as time constraints and limited access to physiotherapy facilities. This highlights the practicality and feasibility of implementing such programs on a wider scale in postpartum care protocols.

Furthermore, these findings may have implications beyond postural correction. Improved posture is associated with enhanced respiratory function, reduced fatigue, and better psychosocial health. Poor posture has been linked with negative emotional states and low self-esteem, particularly in postpartum women experiencing body image changes and mood fluctuations (18). Therefore, improvements in postural alignment through corrective exercise may yield secondary benefits in maternal well-being and quality of life.

Several limitations must be acknowledged. First, the relatively short follow-up period (12 weeks) does not allow assessment of long-term postural maintenance or recurrence. Second, the study sample included only sedentary, healthy postpartum women, limiting the generalizability to populations with comorbidities or older mothers. Third, adherence to home-based postural habits and breastfeeding ergonomics was not objectively monitored, which may have influenced outcomes.

Future research should include a longer follow-up period to evaluate the sustainability of intervention effects. Studies should also explore combining KT with corrective exercises to assess potential synergistic effects. Additionally, larger and more diverse sample populations are needed to improve the external validity of the findings.

Both corrective exercises and Kinesio taping are effective in reducing thoracic kyphosis and associated pain in lactating women. However, corrective exercises demonstrated significantly greater improvements, supporting their use as a primary therapeutic modality. KT may still serve as a useful adjunct for short-term

support and symptom relief, particularly in early postpartum recovery or when exercise is not feasible.

References

1. Desai R. Prevalence of scapular dyskinesis in primipara and multipara lactating mothers. 2024;
2. Finlayson K, Crossland N, Bonet M, Downe S. What matters to women in the postnatal period: A meta-synthesis of qualitative studies. PloS One. 2020;15(4):e0231415.
3. Bullock JE, Kahn AS, Gruber W. Musculoskeletal adaptations of postpartum women: Implications for therapy. J Women's Health Phys Ther. 2010;34(1):24–30.
4. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. Cardiovasc J Afr. 2016;27(2):89–94.
5. Moore KL, Dalley AF, Agur AMR. Clinically oriented anatomy. 7th, editor. Lippincott Williams & Wilkins; 2015.
6. Kulkarni SS, Yardi SS, Apte SP. Effects of corrective postural exercise and ergonomic education on postural deviation in lactating mothers: A pilot study. Int J Health Sci Res. 2022;12(5):34–40.
7. Page P, Frank CC, Lardner R. Assessment and treatment of muscle imbalance: The Janda approach. Human Kinetics; 2010.
8. Sahrmann SA. Diagnosis and treatment of movement impairment syndromes. Elsevier Health Sciences; 2011.
9. Lee D, Park H, Lee T, Kim M. The relationship between forward head posture and scapular upward rotation during shoulder flexion. J Phys Ther Sci. 2015;27(5):1443–5.
10. Ha SM, Kwon OY, Cynn HS, Lee WH, Kim SJ, Park KN. Effects of passive correction of scapular position on pain and scapular kinematics during shoulder elevation in subjects with forward shoulder posture. Man Ther. 2012;17(6):548–54.
11. Mousavi SE, Hosseini S, Bakhtiyari M, Mohammadi A, Isfeedvajani MS, Arani AM, et al. Comparing the Effectiveness of the Unified Protocol Transdiagnostic and Mindfulness-based Stress Reduction Program on Anxiety and Depression in Infertile Women Receiving In Vitro Fertilisation. 2019 Mar;7(2):44–51.
12. Elpeze G, Usgu G. The effect of a

comprehensive corrective exercise program on kyphosis angle and balance in kyphotic adolescents. Healthcare. 2022;10(12):2478.

13. Kase K, Wallis J, Kase T. Clinical therapeutic applications of the Kinesio Taping method. 3rd, editor. Kinesio Taping Association; 2013.
14. Aguilar-Ferrándiz ME, Castro-Sánchez AM, Matarán-Peñarrocha GA, García-Ríos MC, Moreno-Lorenzo C, Sánchez-Labraca N. Effects of kinesio taping on disability, pain, muscle function, and quality of life in patients with knee osteoarthritis: A randomized clinical trial. Pain Physician. 2018;21(1):E19–28.
15. Jang HJ, Kim K, Lee S. Effect of adding diaphragmatic breathing to corrective exercises on thoracic kyphosis, thoracic pain, and quality of life in postmenopausal women: A randomized controlled trial. Physiother Res Int. 2022;27(3):e2100.
16. Zhang Y, Chen L, Liu H. A feasibility study on home-based kyphosis-specific exercises on hyperkyphosis and physical performance in older adults. BMC Geriatr. 2023;23:112.
17. Tangpakkakul S, Manimmanakorn N, Manimmanakorn A, Vichiansiri R, Hamlin MJ. Effects of elastic taping on kyphosis and body balance in the elderly: A randomized crossover study. Sci Rep. 2024;14:1428.
18. Saharoy R, Potdukhe A, Wanjari M, Taksande AB. Postpartum Depression and Maternal Care: Exploring the Complex Effects on Mothers and Infants. Cureus. 2023;15(7):e41381.