International Journal of Community Medicine and Public Health
Sohoni S et al. Int J Community Med Public Health. 2026 Jul;13(7):3781-3785
https://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20262283

Original Research Article

Effectiveness of Kinesio taping along with core strengthening exercises on diastasis recti abdominis following full term normal delivery in primiparous females: an experimental study

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Received: 11 May 2026
Revised: 21 June 2026
Accepted: 22 June 2026

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ABSTRACT

Background: Diastasis recti abdominis (DRA) is a common musculoskeletal condition in postpartum women which is characterized by separation of the rectus abdominis muscles due to stretching of the linea alba. It affects functional stability, posture, and quality of life. Conservative physiotherapy interventions such as core strengthening exercises and Kinesio taping (KT) have shown potential benefits. However, limited literature exists on their combined effect in primiparous females following normal vaginal delivery.
Methods: This experimental study included 33 primiparous females aged 18–35 years, in 4–6 weeks postpartum period following full-term normal delivery. The participants were selected using purposive sampling. Baseline diastasis recti abdominis was measured using Vernier calipers. All the participants underwent a 4-week intervention consisting of Kinesio taping along with progressive core strengthening exercises. Post-intervention measurements were recorded, and data were analyzed using the Wilcoxon signed rank test.
Results: The mean pre-intervention DRA value was 3.17±0.47 cm, which reduced to 2.79±0.38 cm post-intervention. Statistical analysis showed a significant reduction in the inter-recti distance ($W=465$, $p<0.001$), with a mean difference of 0.40 cm (95% CI: 0.35-0.50). The effect size was large ($r=1$), indicating strong clinical significance.
Conclusions: The combination of Kinesio taping and core strengthening exercises is effective in reducing diastasis recti abdominis in primiparous females following a full term normal vaginal delivery. This combined intervention can be recommended as a non-invasive and clinically effective approach for postpartum rehabilitation.

Keywords: Diastasis recti abdominis, Kinesio taping, Core strengthening, Postpartum, Primiparous females

INTRODUCTION

Pregnancy is a natural physiological process that brings about significant anatomical, hormonal, and biomechanical changes in a woman's body. These adaptations are essential for fetal development; however, they also impose considerable stress on various systems, particularly the musculoskeletal system. Among these changes, the abdominal wall undergoes substantial stretching due to the progressive enlargement of the uterus, leading to alterations in muscle length, strength, and function.[1] One of the most common musculoskeletal conditions associated with pregnancy and the postpartum period is diastasis recti abdominis (DRA). It is defined as the separation of the two rectus abdominis muscles along the linea alba, resulting in an increased inter-recti distance.[2,3] This condition develops primarily due to increased intra-abdominal pressure combined with hormonal influences such as relaxin, estrogen, and progesterone, which cause softening and reduced tensile strength of connective tissues.[2] DRA has a high prevalence during pregnancy and postpartum. Studies

have reported that it affects a large proportion of women during late pregnancy and persists in a significant percentage even after delivery.[4] Although mild separation may resolve spontaneously, many women continue to experience persistent diastasis beyond the early postpartum period.[4] Clinically, DRA is not merely a cosmetic concern but is associated with functional impairments. It may lead to reduced core stability, impaired trunk control, low back pain and pelvic floor dysfunction.[2,4] The integrity of the abdominal wall is crucial for maintaining lumbopelvic stability, and its compromise can affect daily activities and physical performance.[5] Conservative management remains the first-line approach for DRA, with physiotherapy playing a key role.[2] Core strengthening exercises, particularly those targeting the deep abdominal muscles such as the transversus abdominis, are widely recommended to restore muscle function and improve abdominal wall integrity.[6,7]

These exercises enhance neuromuscular coordination, improve intra-abdominal pressure regulation, and contribute to the approximation of the rectus abdominis muscles.[6] In addition to exercise-based interventions, non-exercise modalities such as Kinesio taping (KT) have gained attention in recent years.[8] KT is a therapeutic technique that involves the application of elastic adhesive tape to support muscles and joints without restricting movement.[8] It is believed to enhance proprioceptive feedback, improve circulation, reduce pain, and facilitate muscle activation.[8,9] In the context of DRA, KT may provide external mechanical support to approximate the rectus muscles and assist in functional recovery.[10] Previous studies have demonstrated the effectiveness of core strengthening exercises and KT individually in managing DRA.[6,7,10] However, there is limited literature exploring the combined effect of these interventions, particularly in Primiparous females following a full-term normal vaginal delivery.[11,12]

Considering that primiparous women represent a significant population in the postpartum period and early intervention may influence long-term outcomes, it becomes important to investigate effective and feasible rehabilitation strategies.[13] Furthermore, most existing studies focus either on exercise-based interventions or taping techniques independently, with relatively fewer studies evaluating their synergistic effect.[11,12] This highlights a gap in the current literature and underscores the need for research examining combined therapeutic approaches. Therefore, the present study aims to evaluate the effectiveness of KT combined with core strengthening exercises on Diastasis recti abdominis in primiparous females following a full-term normal vaginal delivery. The objective of present study was to study the effectiveness of KT along with core strengthening exercises on Diastasis recti abdominis in primiparous females following a full-term normal vaginal delivery using Vernier calipers over a period of 4 weeks.

METHODS

This experimental study was conducted in hospitals in Pune, Maharashtra, India, over a duration of 6 months (from April 2025 to October 2025). The study protocol was approved by the Institutional Ethical prior to commencement. Written informed consent was obtained from all participants before inclusion in the study. A total of 33 Primiparous females who had undergone a full-term normal vaginal delivery were recruited using purposive sampling. Participants were selected based on predefined inclusion and exclusion criteria. Primiparous females aged between 18-35 years, who had delivered via normal vaginal delivery and were in the early postpartum period (4-6 weeks), were included. Participants who were not regularly performing core strengthening exercises were considered eligible. Multiparous females, those who had undergone cesarean section (LSCS), females above 35 years of age, females with a history of abdominal surgeries or pregnancy-related complications, and those with any skin conditions or infections that could interfere with taping were excluded from the study.

Outcome measure

The primary outcome measure was inter-recti distance (IRD), assessed using Vernier calipers. This method has demonstrated high reliability for both resting and active measurements (ICC=0.93-0.95). Measurements were taken at standardized anatomical landmarks along the linea alba. Participants were positioned supine with hips and knees flexed at 90 degrees. They were instructed to perform a head lift to facilitate palpation of the medial borders of the rectus abdominis muscles. The caliper jaws were placed on the medial edges, and IRD was recorded.

Procedure

Baseline assessment of DRA was performed prior to the intervention. Following this, participants underwent the 4-week intervention program. Post-intervention measurements were recorded using the same standardized procedure. The difference between pre and post intervention values was calculated.

Intervention protocol

All participants received an intervention of KT and core strengthening exercises for a duration of 4 weeks.

KT technique

Kinesio tape was applied in an interlocking pattern over the abdominal region. The length of the tape was adjusted according to the extent of diastasis. Two or more “I” strips were applied across the abdomen with approximately 25% stretch. The anchors were placed along the lower rib cage, and the tape was directed across the umbilical region in a crisscross manner to approximate the rectus muscles. Taping was performed in

a supine position and replaced twice weekly. Proper application ensured comfort and unrestricted movement.

Core strengthening exercises

A progressive exercise protocol was followed. During the first two weeks, exercises included heel slides, glute bridges, diaphragmatic breathing, cat-camel, and bent knee fallouts. Each exercise was performed for 10 repetitions with 3 sets, with appropriate rest intervals. In the subsequent two weeks, advanced exercises such as bird-dog and elevated bent knee marching were added to enhance core stability and neuromuscular control. All the exercises focused on activation of deep abdominal muscles, and were performed under supervision to ensure correct technique.

Statistical analysis

The data collected was analyzed using Microsoft Excel and appropriate statistical methods. Descriptive statistics including mean, standard deviation, median, minimum, and maximum were calculated. Normality of data was assessed using the Shapiro–Wilk test, which indicated non-normal distribution ($p<0.05$). Therefore, the Wilcoxon signed rank test was used for comparing pre and post intervention values.

RESULTS

Data were analyzed using appropriate statistical methods. Descriptive statistics including mean, standard deviation, V median, minimum, and maximum were calculated. Normality of data was assessed using the Shapiro–Wilk test, which indicated non-normal distribution ($p<0.05$). Therefore, the Wilcoxon signed rank test was used for comparing pre and post intervention values.

A p value of less than 0.05 was considered statistically significant. A total of 33 primiparous females who met the inclusion criteria were enrolled in the study and completed the 4-week intervention protocol. The mean age of the participants was 26.5±2.08 years, indicating a relatively homogeneous young adult population. Normality of the data was assessed using the Shapiro–Wilk test (Table 1). Both pre-intervention ($W=0.869$, $p<0.001$) and post-intervention ($W=0.923$, $p=0.023$) values were found to be non-normally distributed, indicating the use of non-parametric statistical methods for further analysis. The Wilcoxon signed rank test was applied to compare pre and post intervention DRA values. The results revealed a statistically significant reduction in inter-recti distance following the intervention ($W=465$, $p<0.001$), as shown in Table 2. The mean reduction observed was 0.40 cm, with a 95% confidence interval ranging from 0.35 cm to 0.50 cm, indicating a precise and reliable estimate of change. Furthermore, the effect size calculated using rank biserial correlation was 1.0, which represents a large clinical effect. This suggests that the intervention had a substantial impact on reducing DRA among the participants.

Table 1: Normality test (Shapiro-Wilk).

Variables	N	W	P value
Pre DRA	33	0.869	<0.001
Post DRA	33	0.923	0.023

Note: $p<0.05$ indicates non-normal distribution.

Table 2: Wilcoxon signed rank test for pre-post DRA values.

Comparison	N	Statistic (w)	Mean difference (cm)	95% CI (lower-upper)	P value	Effect size (rank biserial R)
Pre vs. Post DRA	33	465	0.4	0.35-0.50	<0.001	1

Table 3: Descriptive statistics of pre- and post-DRA values.

Variables	N	Mean±SD	Median	Minimum	Maximum
Pre DRA (cm)	33	3.17±0.47	3	2.5	4.2
Post DRA (cm)	33	2.79±0.38	2.7	2.2	3.5

Descriptive statistics of DRA values before and after intervention are presented in Table 3. The mean pre-intervention inter-recti distance was 3.17±0.47 cm, whereas the mean post-intervention value reduced to 2.79±0.38 cm, demonstrating a clear reduction following the intervention. The median values also showed a decrease from 3.0 cm to 2.7 cm, indicating a consistent reduction across the sample. Additionally, the range of values shifted towards lower measurements post-intervention (minimum: 2.5 to 2.2 cm; maximum: 4.2 to 3.5 cm), suggesting improvement across both lower and higher baseline DRA values. Overall, the findings demonstrate a statistically significant and clinically meaningful reduction in Diastasis recti abdominis following a 4-week intervention of KT combined with core strengthening exercises in primiparous females after a full-term normal vaginal delivery.

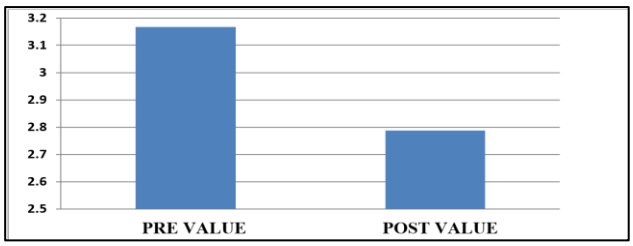

Figure 1: Pre and post DRA values descriptive graph.

DISCUSSION

The present study evaluated the effectiveness of KT in combination with core strengthening exercises on DRA in primiparous females following a full-term normal vaginal delivery. The findings demonstrated a statistically significant reduction in inter-recti distance after a 4-week intervention protocol, indicating that the combined therapeutic approach was effective in improving abdominal muscle approximation.

The reduction in DRA observed in this study is consistent with previous literature reporting the beneficial effects of physiotherapy interventions in postpartum women.[6,7,14] Core strengthening exercises, particularly those targeting deep abdominal muscles, play a crucial role in restoring lumbopelvic stability and improving neuromuscular control.[6,7]

KT, used as an adjunct intervention in this study, may have contributed to the observed improvements through multiple mechanisms. The elastic properties of the tape provide continuous external support to the abdominal wall while allowing functional movement. It enhances proprioceptive input, improves circulation, and facilitates muscle activation.[8,9] Additionally, the corrective application technique used in this study may have assisted in approximating the rectus abdominis muscles, thereby promoting structural and functional recovery.[10] Previous studies have demonstrated that Kinesio Taping alone can reduce DRA and improve functional outcomes in postpartum women.[10,15] Similarly, research on deep core stability exercises has shown significant improvements in inter-recti distance and quality of life.[6] The findings of the present study align with these reports, suggesting that a combined approach may yield enhanced benefits due to the synergistic effects of active muscle strengthening and passive external support.[11,12]

An important factor that may have influenced the positive outcomes in this study is the inclusion of primiparous females. The severity and persistence of DRA are generally greater in multiparous women due to repeated stretching of the abdominal wall.[13] Therefore, early intervention in primiparous females may facilitate better recovery and prevent long-term complications. Additionally, all participants had undergone normal vaginal delivery, which is associated with faster recovery compared to cesarean section, potentially contributing to improved responsiveness to physiotherapy interventions.[16]

The progressive nature of the exercise protocol used in this study may have also contributed to the effectiveness of the intervention. By gradually increasing the intensity and complexity of exercises, optimal activation of the core muscles was achieved without overloading the healing tissues. This approach is consistent with principles of postpartum rehabilitation and supports safe and effective recovery.[7,14] Despite the positive findings, certain limitations of the study must be acknowledged.

Limitations

Factors such as body mass index, lifestyle, and adherence to home exercise programs were not monitored, which may influence the outcomes. The relatively small sample size and short duration of intervention may also limit the generalizability of the results.

CONCLUSION

KT combined with core strengthening exercises significantly reduces Diastasis recti abdominis in primiparous females following a full-term normal vaginal delivery. This combined physiotherapy approach is an effective conservative intervention for improving abdominal muscle approximation in the postpartum period.

ACKNOWLEDGEMENTS

The support and guidance provided by the institutional authorities and the Institutional Ethics Committee for granting permission to conduct the study are sincerely acknowledged. The participants are gratefully acknowledged for their cooperation and willingness to take part in the study. The support of the faculty members and colleagues, who provided valuable suggestions and encouragement during the conduct of the research, is also acknowledged.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Sohoni S, Patil P. Effectiveness of Kinesio taping along with core strengthening exercises on diastasis recti abdominis following full term normal delivery in primiparous females: an experimental study. Int J Community Med Public Health 2026;13:3781-5.