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Physiotherapy for Postpartum Diastasis Recti Abdominis: A Systematic Review of Assessment Methods and Rehabilitation Outcomes

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 13 April 2025 and was last updated on 13 April 2025.

INTRODUCTION

Review question / Objective This systematic review aims to analyse the several physiotherapy treatments—including neuromuscular electrical stimulation (NMES)—and evaluate the several evaluation techniques applied in the management of postpartum Diastasis Recti Abdominis (DRA). By using the most successful rehabilitation techniques and most dependable and pragmatic evaluation instruments, this review aims to guide therapeutic practice.

Rationale Introduction- DRA is the abnormal separation of the rectus abdominis muscles along the linea alba, usually seen during pregnancy and postpartum. This illness affects women's functional capacity, appearance, and quality of life due to hormonal changes, mechanical stress, and increased intra-abdominal pressure during pregnancy. Postpartum DRA is prevalent, ranging from 30% to 68%, emphasizing its importance. DRA can cause core instability, reduced abdominal strength, postural changes, pelvic girdle pain, and pelvic floor dysfunction. These issues affect daily life and well-being, emphasizing the necessity for accurate assessment and effective treatment. The key sign of DRA is the inter-rectus distance (IRD) between the two rectus abdominis muscles. Ultrasound, magnetic resonance imaging, and computed tomography are used for assessment, as well as finger-width palpation and caliper measurement. Due to their real-time, non-invasive abdominal musculature imaging, ultrasonic waves are the most reliable method, Whereas Finger-width palpation is fast and frequent, although it is inconsistent. Caliper methods are more reliable due to their simplicity and cost effectiveness. IRD is usually measured above umbilicus, at the level of umbilicus, and below the umbilicus. Assessment methods vary, making treatment planning and evaluation challenging.
Many physiotherapeutic methods have been utilized to treat DRA, largely to increase core muscle activity and lower IRD. These therapies include core stability exercises, notably transverse abdominis ones, abdominal muscle strengthening

exercises, Neuromuscular electrical stimulation, manual therapy, kinesiotaping, abdominal binders, and posture correction. Neuromuscular electrical stimulation (NMES) is promising. NMES uses electrical impulses to exercise deep abdominal muscles that may be weak during pregnancy. A new meta-analysis found that exercise-based therapies, alone and with NMES, kinesiotaping, and supportive clothing, are beneficial. However, few direct comparisons exist in current research, thus the relative efficacy of these treatments is unknown. Standardized physiotherapy procedures are less, so it is unclear if integrated therapies minimize IRD and improve function better than single-modality treatments. Thus, a complete evaluation is needed to integrate evidence, specifically on NMES and other physiotherapy techniques' relative efficacy. Later, this research will examine how assessment methods affect treatment outcomes, directing clinician decisions and helping establish standardized postpartum DRA evaluation and rehabilitation programs.

Rationale-While physiotherapy for Diastasis Recti Abdominis is growing more popular, there is little data on the most effective treatment strategies and reliable evaluation methods. Given the range of techniques, measurement devices, and outcome criteria in existing studies, drawing conclusions or creating standard clinical practices is difficult. Exercise-based therapy has been evaluated in various systematic reviews, although they seldom compare NMES, kinesiotaping, or core stability training. The accuracy, practicality, and therapeutic effects of numerous inter-rectus distance measurement methods are undervalued. This systematic review must fill these gaps by pooling current knowledge on postpartum DRA physiotherapy-based rehabilitation strategies and evaluation measures. It will help clarify gaps in knowledge and current treatment efficacy. This data is crucial for inform future study, clinical practice, and postpartum women's optimal treatment.

Condition being studied DRA is a musculoskeletal condition that causes the rectus abdominis muscles to separate abnormally along the linea alba. Pregnant and postpartum women are most likely to experience it due to hormonal changes, abdominal wall strain, and greater intra-abdominal pressure. Some 30% to 68% of women experience postpartum DRA, which can linger for months. In addition to aesthetic issues, DRA causes lower back and pelvic pain, pelvic floor dysfunction, poor core stability, and poor posture. These factors can hinder a woman's ability to exercise, work, and live well after motherhood. The key DRA indicator is inter-rectus distance (IRD), which measures abdominal muscle separation.

METHODS

Search strategy Multiple web databases were searched comprehensively in order to find research assessing physiotherapy therapies and assessment techniques for postpartum Diastasis Recti Abdominis (DRA). Included among the databases searched were PubMed, Cochrane Library, Scopus, Embase, Web of Science, ProQuest, PEDro (Physiotherapy Evidence Database), and Google Scholar. The search covered primarily the following ideas:
Population:
"Diastasis recti", "Diastasis rectus abdominis", "Rectus diastasis", "Postnatal women", “Pregnancy"
Interventions:
"Exercise therapy", "Abdominal exercises", "Transverse abdominis exercises", Neuromuscular electrical stimulation "Core stability exercises", "Pelvic floor exercises", "Noble technique", "kinesiotaping", "Resistance training", "Endurance training", "Physiotherapy", "Rehabilitation", "Physical activity”
Adjunctive Therapies:
"Taping", "Manual therapy", "Postural training", "Corset", "Brace", "Splint", "Support garment", "Adjunct intervention”
Outcomes and Assessment Methods:
"Inter-rectus distance", "Diastasis recti width", "Pelvic floor dysfunction", "Pain", "Quality of life", "Ultrasonography", "Caliper", “Palpation"
Every database was searched applying customized techniques depending on its interface and indexing system.

Participant or population This comprehensive analysis sought postpartum Diastasis Recti Abdominis (DRA) diagnosis. The included group consisted of adult females (18 years and older) who had vaginal or cesarean birth and were postpartum between six weeks and two years. These patients had clinical or imaging-based DRA diagnoses based on inter-rectus distance (IRD) assessment utilizing ultrasonicography, calipers, or finger-width palpation.
Mixed populations—pregnant and postpartum women, or women with and without DRA—were only included if the postpartum DRA subgroup results were published separately. The study was discontinued if subgroup data could not be gathered to maintain population homogeneity and interpretability. Participants with simultaneous abdominal wall hernias, severe musculoskeletal disorders unrelated to pregnancy, neurological

problems, or post-surgical core musculature issues were excluded unless DRA-specific data were precisely documented in the main trial.

Intervention This comprehensive analysis examined physiotherapy-based interventions for postpartum women with Diastasis Recti Abdominis (DRA). Conservative, non-surgical therapies reduced inter-rectus distance (IRD) and improved core stability, function, and quality of life.
Major Interventions: Exercise Therapy, Core stability and transverse abdominis activation/ targeted abdominal exercises, Pelvic floor muscle training (PFMT), Progressive opposition or endurance-based core training, Noble or deep core re-education methods, NMES, neuromuscular electrical stimulation, engaging deep abdominal muscles with electrical impulses, especially in those with poor voluntary control Used alone or with exercise.
The manual therapy approach aims to improve tissue mobility, fascial release, and neuromuscular control. Kinesiotaping, abdominal binder, Postural Corrective Education and Functional Re-learning programs attempt to improve posture and biomechanical alignment for functional tasks. DRA-specific outcomes were required for interventions combining the above modalities, such as exercise and NMES or manual therapy and taping.

Comparator Comparator Types Considered:
• No Intervention or Wait-list Control: These groups served as baselines to evaluate the natural progression of DRA and to assess the added benefits of targeted physiotherapy over standard postpartum care or general advice.
• Active Comparator Groups: Studies that directly compared different physiotherapeutic modalities—such as exercise therapy versus NMES, manual therapy, or kinesiotaping—were included to assess the relative efficacy of commonly used rehabilitation strategies.
• Specific Comparisons Included:
o NMES versus structured exercise programs
o Exercise alone versus exercise combined with adjunctive therapies (e.g., abdominal binders, kinesiotape)
o Pelvic floor muscle training versus core stabilization exercises
o Standard postpartum care or no intervention versus structured physiotherapy protocols
Comparisons involving surgical interventions (e.g., abdominoplasty) or non-physiotherapy complementary therapies (e.g., acupuncture, herbal medicine) without separate physiotherapy-related outcomes were excluded. Similarly, mixed-population studies that did not report separate subgroup data for postpartum women with DRA were omitted to preserve homogeneity.
Wherever possible, subgroup analyses were conducted to stratify findings based on comparator type (e.g., active versus passive control) and intervention characteristics, allowing for a more nuanced interpretation of treatment efficacy.

Study designs to be included This review primarily focused on randomized controlled trials (RCTs) due to their methodological rigor and ability to support causal inferences regarding physiotherapy interventions for postpartum Diastasis Recti Abdominis (DRA). To ensure comprehensive evidence synthesis and avoid review gaps, the following secondary study designs were also considered if they met quality and relevance criteria:• Non-randomized controlled clinical trials• Quasi-experimental studies• Prospective and retrospective cohort studies with comparison data• Case series involving standardized physiotherapy proto.

Eligibility criteria This review applied the PICOS framework to ensure methodological consistency and relevance.
• Population: Postpartum women (≥18 years), 6 weeks to 2 years postpartum, with DRA confirmed by clinical or imaging-based inter-rectus distance (IRD) measurement.
• Exclusions: Studies involving pregnant women, men, individuals without DRA, or those receiving surgical interventions. Mixed-population studies were included only if postpartum DRA subgroup data were reported separately.
• Intervention: Physiotherapy-based treatments including:
o Core/abdominal strengthening
o Pelvic floor muscle training
o Neuromuscular electrical stimulation (NMES)
o Manual therapy
o Kinesiotaping
o Abdominal binders/splints
o Postural and functional re-education
Studies combining physiotherapy with complementary therapies (e.g., acupuncture, herbal medicine) were included only if physiotherapy outcomes were reported independently.
• Comparators:
o No intervention or waitlist control
o Usual postpartum care
o Other physiotherapy or active treatment modalities
• Outcomes:
o Primary: Reduction in IRD

o Secondary: Core strength, pelvic floor function, pain, posture, quality of life, and the validity/ reliability of IRD assessment methods (e.g., ultrasound, calipers, palpation)
Studies without post-intervention data or relevant outcomes were excluded.
• Study Designs Included:
o Randomized controlled trials
o Controlled trials and quasi-experimental designs
o Prospective/retrospective cohort studies
o Case series with systematic physiotherapy and standardized outcome reporting
Excluded: qualitative studies, cross-sectional designs, editorials, abstracts, incomplete case reports, and studies without pre- and post-treatment results.
• Language & Date Restrictions:
Only full-text, peer-reviewed articles in English published through December 31, 2024 were included. No restriction was placed on the earliest publication date. Grey literature was excluded unless indexed and peer-reviewed.
• Setting:
No restrictions. Both clinical and home-based interventions under professional supervision were eligible.

Information sources A comprehensive search strategy was employed across multiple electronic databases and supplementary sources to ensure a thorough and unbiased collection of relevant literature for this systematic review.
Databases Searched (inception to December 31, 2024):
• PubMed (MEDLINE)
• EMBASE (Elsevier)
• Cochrane Central Register of Controlled Trials (CENTRAL)
• Scopus
• Web of Science
• ProQuest Dissertations & Theses Global
• PEDro (Physiotherapy Evidence Database)
• Google Scholar (for grey literature and recent non-indexed publications)
Additional Sources:
• Conference abstracts and clinical trial registries were reviewed to identify ongoing or unpublished studies.
• Grey literature, such as indexed dissertations and theses, was included only if full-text access was available and inclusion criteria were met.

Main outcome(s) The primary outcome was a reduction in inter-rectus distance (IRD), measured via ultrasound, calipers, palpation, or finger-width methods at consistent sites along the linea alba. Secondary outcomes included improvements in core strength, pelvic floor function, pain (VAS/ NRS), postural stability, and quality of life (e.g., SF-36, WHOQOL-BREF). Studies also reported adverse effects, dropout rates, and compliance.

Additional outcome(s) Additional outcomes included adherence to intervention protocols, patient satisfaction, practicality of assessment tools, resource use, and long-term maintenance of treatment effects. These supported the evaluation of intervention feasibility and clinical utility.

Data management A structured data management plan ensured consistency and transparency throughout the review process. Deduplicated records were imported into Zotero/ EndNote, and two independent reviewers screened titles, abstracts, and full texts based on predefined eligibility criteria. Disagreements were resolved through consensus or consultation with a third reviewer.
Data extraction was performed using a standardized form MS Excel, collecting details on study design, population characteristics, intervention type and duration, comparator, outcomes, adverse events, and dropout rates.
Review Manager (RevMan) or R software was used for data synthesis, including meta-analyses and subgroup or sensitivity analyses. PRISMA 2020 flow diagrams documented study selection, and audit trails were maintained to enhance reproducibility.

Quality assessment / Risk of bias analysis
Methodological quality was assessed using:
• RoB 2 for randomized controlled trials
• ROBINS-I for quasi-experimental and cohort studies
These tools evaluated domains such as randomization, deviations from interventions, missing data, measurement bias, and reporting bias. Each domain was rated as low risk, some concerns, or high risk.
The GRADE approach was applied to assess the overall certainty of evidence for each outcome, considering risk of bias, inconsistency, indirectness, imprecision, and publication bias. GRADE pro GDT was used to generate Summary of Findings (SoF) tables. This dual approach ensured comprehensive evaluation of both study-level and outcome-level quality.

Strategy of data synthesis Both narrative and quantitative synthesis methods were pre-defined to ensure comprehensive analysis of physiotherapy interventions and assessment methods for postpartum Diastasis Recti Abdominis (DRA).
• Narrative Synthesis was employed when meta-analysis was not feasible due to heterogeneity in

study design, interventions, or outcomes. Key findings were organized in descriptive tables, grouped by intervention type (e.g., NMES, core exercises, kinesiotaping), and analyzed for trends, consistency, and contextual factors (e.g., treatment duration, postpartum stage).

• Meta-analysis was conducted using RevMan or R when two or more studies presented comparable data.

o Continuous outcomes (e.g., IRD, pain, core strength) were analyzed using mean difference (MD) or standardized mean difference (SMD), with 95% confidence intervals.

o Dichotomous outcomes (e.g., pelvic floor dysfunction, treatment satisfaction) were synthesized using risk ratios (RR) or odds ratios (OR).

o Ordinal outcomes (e.g., adherence, quality of life) were converted to appropriate formats when possible.

• Heterogeneity was assessed using the I^2 statistic (low 75%) and Chi-square test ($p < 0.10$). A random-effects model was applied unless heterogeneity was minimal.

• Missing Data were addressed by contacting study authors. Complete-case analysis was conducted when data could not be obtained, and sensitivity analyses were used to test the robustness of findings.

• Advanced Analyses: Where applicable, indirect or network meta-analyses were considered to compare multiple interventions. Treatment efficacy rankings were presented using SUCRA or P-scores.

Subgroup analysis Subgroup analyses were planned to explore sources of heterogeneity and better interpret the effectiveness of physiotherapy interventions for postpartum Diastasis Recti Abdominis (DRA).

Predefined subgroups included:

• IRD measurement method: Ultrasound, caliper, or palpation

• Measurement location: Above, at, or below the umbilicus

• Intervention type: Core rehabilitation alone vs. combined with kinesiotaping, NMES, or binders

• Exercise classification: Transverse abdominis training, core stabilization, or pelvic floor exercises

• Study design approach: Intention-to-treat vs. per-protocol analyses

Continuous outcomes (e.g., IRD, pain) were analyzed using mean differences (MD) with 95% confidence intervals. When only medians and interquartile ranges (IQR) were reported, conversions to mean and standard deviation (SD) were performed using established statistical methods.

Heterogeneity was assessed using the I^2 statistic:

• $I^2 > 50\%$: Random-effects model applied

• $I^2 < 50\%$: Fixed-effect model used

Where at least two studies reported comparable outcomes, forest plots were generated to illustrate pooled effect sizes.

This structured subgroup analysis aimed to identify variables influencing treatment response and provide more individualized, evidence-based clinical guidance.

Sensitivity analysis Sensitivity analyses were conducted to assess the robustness and reliability of the review's findings by examining the impact of key methodological decisions.

Predefined analyses included:

• Exclusion of high-risk studies: Studies identified as high risk of bias (via RoB 2 or ROBINS-I) were removed to evaluate their influence on effect estimates.

• Study design restriction: Analyses were repeated using only randomized controlled trials to assess the effect of study design.

• Handling of missing data: Sensitivity analyses were performed excluding studies with imputed data (e.g., estimated means or SDs) to assess potential conversion bias.

• Model selection comparison: Where heterogeneity was moderate ($I^2 \approx 50\%$), findings were compared using both fixed-effect and random-effects models.

• Sample size consideration: Analyses excluding small-sample studies (e.g., $n < 20$ per group) were conducted to determine their influence on pooled outcomes.

Consistency across sensitivity analyses strengthened confidence in the results. Any substantial shifts in effect estimates were documented and interpreted accordingly.

Language restriction Yes. The selected articles were restricted to articles in English only.

Country(ies) involved This systematic review is being conducted in India.

Keywords Diastasis Recti Abdominis; Postpartum Women; Physiotherapy; Core Strengthening; Neuromuscular Electrical Stimulation; Inter-rectus Distance; Ultrasound Assessment; Rehabilitation Outcomes.

Dissemination plans This systematic review will be presented at national and international physiotherapy, women's health, and rehabilitation conferences and published in a peer-reviewed journal. Doctors, researchers, and legislators may receive the findings through institutional seminars,

research forums, and professional social media. To guide future research on postpartum Diastasis Recti Abdominis assessment and physiotherapy management and inform evidence-based clinical practice.

Contributions of each author

Author 1 - Amrit kaur - Conceived and designed the review; performed literature search; drafted and revised the protocol; coordinated the review process.
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