REVIEW

Nr 2023;13 (3):456-462

Physiotherapy Interventions and Assessment Methods for Diastasis Recti Abdominis in Postpartum Women: A Systematic Review Protocol

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DOI:
10.32098/mltj.03.2023.15

LEVEL OF EVIDENCE: 1

SUMMARY

Background. Diastasis recti (DR) or separation of the bulks of rectus abdominis muscle is often caused by pregnancy. Physiotherapy of DR includes exercise therapy, electrical stimulation (ES), kinesiotaping and bracing. Additionally, there are several measurement methods and levels for inter rectus distance (IRD) assessment, but their effects on the significance of the results following physiotherapy are unclear. This study aims to determine the effects of different physiotherapy interventions on DR in postpartum women, as well as reviewing the measurement method of DR, following physiotherapy.
Methods. Databases including Cochrane, Scopus, Pro Quest, PubMed, Embase, Web of Science, Google Scholar, and Magiran will be searched. The articles will be reviewed in terms of title, abstract and full text. The JBI quality assessment checklist and Cochrane Collaboration RoB 2.0 tool will be used by two independent assessors. Disagreements will be referred to the third assessor. The results will be analyzed using Review Manager software. The subgroups will be based on the type of measurement method and level, type of exercise, and the adjunct intervention.
Results. The findings of this study will probably determine the effects of different physiotherapy interventions on IRD and may also determine the most effective combination therapy. Furthermore, our findings may identify the most appropriate IRD measurement method to show the effectiveness of physiotherapy intervention.
Conclusions. This study is designed to promote postpartum women's health and assist physiotherapists in treatment of DR.
Study registration. This article is registered in PROSPERO with registration number CRD42022382998.

KEY WORDS

Exercise therapy; physiotherapy; adjunct intervention; inter rectus distance; caliper; ultrasonography.

INTRODUCTION

Diastasis recti (DR) is the separation of the two bulks of the rectus abdominis muscle in the midline due to the widening and thinning of the linea alba (1). Abdominal muscles play an important role in posture, trunk and pelvic stability, respiration, and abdominal visceral support (2). DR reduces the strength and endurance of the abdominal muscles; also, through its effect on the connective tissue and ligaments, it reduces the stability of the lumbar vertebrae and pelvic. Consequently, musculoskeletal problems such as low back pain and lumbopelvic pain may occur (3). There is a possibility of other complications, including activity limitation (1), pelvic organ prolapse (4), urinary incontinence (5), fecal incontinence (5), respiratory dysfunctions (6), and cosmetic problem (7) in patients with DR. These complications may affect a person's mood and reduce their quality of life (8). DR has different causes, but it is frequently seen in pregnant women due to the effects of hormonal changes on the connective tissue and biomechanical changes in pregnancy (9). The prevalence of DR in the third trimesters of gestation is 66-100% and 12 months after delivery is 36%. So, in 36% of the cases, recovery may not happen spontaneously and it needs to be treated (9).

The therapeutic methods for reducing IRD include surgery and physiotherapy (10, 11). The first step in the treatment of these patients is physiotherapy (11). Studies show that there is no adverse effects or recurrence in treating DR patients with physical therapy (12). However, if conservative treatment is not effective, surgery can be used (11). Surgery in these patients is open or laparoscopic and has different plication techniques (11). The surgical recurrence rate is also low, but this method is invasive, expensive for the patients, and it may have adverse effects such as seroma, sensory disorders in abdominal skin, and scarring (13). Physiotherapy interventions such as exercise therapy, electrical stimulation (ES), kinesiotape and brace are used in patients suffering from the DR (14). The results of previous systematic review studies showed that postpartum exercise therapy reduces IRD and symptoms in women with DR (15, 16). It is worth mentioning that in patients with DR who are unable to exercise and also to speed up the treatment process, the physiotherapy interventions such as ES, kinesiotape, and brace are used as an adjunct to exercise. The effect of these modalities has not been compared in previous reviews, to realize which one has better effectiveness in the treatment of DR. It is also unknown whether combining these modalities with exercise is more effective than exercise or not. So far, no specific protocol has been provided for the physiotherapy of these patients, therefore, determining the best modality and the best type of exercise will help therapists in treating this disorder.

The measurement index of DR is inter rectus distance (IRD), that may show different values depending on the measurement site, patient position, and measurement method (9). IRD is measured with clinical methods such as finger width (FW) and caliper, and imaging methods such as ultrasonography (US), magnetic resonance imaging (MRI) and computed tomography (CT-scan) (17). MRI and CT-scan are very expensive, and MRI in people with pacemakers or platinum and people with claustrophobia, and CT-scan in pregnant women is not applicable (18). US has been used as non-invasive technique for real time imaging of the abdominal muscles and evidence shows that is the golden standard in the evaluation of DR and has good to excellent reliability. This method application is not easy, images can be difficult to interpret and requires experienced operators or radiologists, and also is operator and equipment dependent (17, 19). FW technique is an easy method to measure IRD, but it is not a reliable method (20). On the other hand, the caliper method has good reliability and its application is simple and cheap (10, 21). It is unknown whether the use of all these methods will show the same results during assessment or not. Therefore, the diversity of DR measurement methods, make it difficult to draw a strong conclusion. Indeed, comparing different measurement method on the significance of results following treatment of DR, shows therapists whether the choice of measurement method is important or not, and helping them to speed up the assessment and treatment process of DR. IRD has been measured at above, below and umbilical levels in different studies (19). However, according to the previous studies, the evaluation of the above umbilicus is more reliable (19), but the effect of treatment at different levels has not been compared yet, and the amount of improvement of DR at different levels is unclear. Therefore, the comparison of different levels could show therapists which level is more responsive to treatment and helping them choose the best level for assessment of IRD.

A recent meta-analysis by Berg-Poppe *et al.* (22) explored the effects of exercise and companion modalities on DR in postpartum women and included 14 studies. The intervention group (exercise or exercise + other intervention) was compared with the control group (no intervention), and only 4 studies were included in the meta-analysis. The results showed that exercise therapy alone and in combination with other non-invasive modalities reduces IRD and improves the quality of life after pregnancy. In this review, the effectiveness of exercise alone has not been compared with combination therapy. Also, they have not compared the effect of ES, kinesiotape, and corset in these patients, and it is unclear which of these modalities is more effective in reducing IRD. Although there are many studies in this field, an ideal physiotherapy protocol for patients with DR has not been deter-

mined, and some aspects of the treatment of these patients have not yet been clearly elucidated. Therefore, the proposed systematic review will focus on the comparison among exercise and exercise in combination with adjunct interventions, comparison among the effect of kinesiotape, ES, and brace, and the comparison between different measurement methods and levels in postpartum women with DR following physiotherapy.

MATERIALS AND METHODS

This study has been approved by the ethics committee of Tabriz University of Medical Sciences with approval ID IR.TBZMED.REC.1400.241 - Date of approval: May 31, 2021.

Review objectives

Main objectives

- Comparing the effects of exercise therapy alone and combination therapy (exercise therapy in addition to kinesiotape, brace, and ES) on IRD in postpartum women.
- Comparing the effect of ES, kinesiotape and brace in combination with exercise therapy on IRD in postpartum women.
- Comparing different measurement methods in determining the effectiveness of the results.
- Comparing different measurement levels in determining the effectiveness of the results.
- Comparing the effects of exercise therapy compared to non-intervention on IRD in postpartum women.

Secondary objectives

- Determining the effects of exercise therapy on low back and pelvic pain in postpartum women with DR.
- Determining the effects of exercise therapy on disability based on ODI in postpartum women with DR.
- Determining the effects of exercise therapy on pelvic floor dysfunction in postpartum women with DR.
- Determining the effects of exercise therapy on abdominal muscle strength, endurance, and power in postpartum women with DR.
- Determining the effects of exercise therapy on quality of life in postpartum women with DR.

Inclusion criteria

Types of studies

In this systematic review study, only RCT studies evaluating the effects of exercise therapy on DR will be searched and included. According to the level of evidence hierarchy, systematic reviews of RCTs have the highest level among studies.

Types of participants

In this review, studies considering postpartum women with DR will be included.

Exclusions:

- Women with neurological, respiratory, and heart diseases.
- The recent pelvic, spinal cord, and abdominal surgery except for cesarean.

Types of intervention(s)

All studies using any type of physiotherapy intervention will be included, such as:

- Abdominal exercises.
- Core stability exercises.
- Pelvic floor exercises.
- Upper and lower extremity exercises.
- Electrical stimulation.
- Kinesiotape.
- Brace or corset.

Types of outcomes measured

In this review, RCT studies evaluating the following outcomes will be included:

Primary:

- IRD (measurement method including US, caliper, FW, MRI).

Secondary:

- Low back and pelvic pain (evaluation by visual analog scale (VAS)).
- Pelvic floor dysfunctions (evaluation by pelvic floor disability index (PFDI)).
- Disability (evaluation by Oswestry disability index (ODI)).
- Abdominal muscles strength, endurance and power (evaluation by manual muscle test (MMT), isokinetic, dynamometer).
- Quality of life (evaluation by physical functioning scale (PFS) or ODI).

Search strategy

The databases such as Cochrane, PubMed, Scopus, Embase, ProQuest, Web of Sciences, Google Scholar, and Magiran will be searched by a medical librarian. Also, references of the related articles will be manually searched. There will be no time limitation and the search will include all Persian and English RCT studies conducted until the end of 2022.

The search strategy includes a combination of Mesh and entry keywords based on PICO: "Diastasis recti" OR "Diastasis rectus abdominis" OR "Rectus diastasis" OR "Pregnancy" OR "Postnatal women" AND "Exercise Therapy"

OR "Abdominal Exercises" OR "Transverse Exercises" OR "Core stability exercises" OR "Pelvic floor exercises" OR "Noble technique" OR "Strength training" OR "Resistance training" OR "Endurance training" OR "Physiotherapy" OR "Rehabilitation" AND "Taping" OR "Neuromuscular electrical stimulation" OR "Manual therapy" OR "Postural training" OR "Physical activity" OR "Splint" OR "Corset" OR "Brace" OR "Adjunct intervention" AND "Diastasis recti width" OR "Inter rectus distance" OR "Pelvic floor dysfunction" OR "Quality of life" OR "Pain" OR "Caliper" OR "Ultrasonography".

Study selection

The studies will be reviewed in two stages in terms of title and abstract and then full text. Studies that meet the inclusion criteria will be included in the study.

The whole processes of the systematic review will be conducted by two authors independently in terms of electronic database searching, screening of the retrieved articles, data extraction, and critical appraising. The reviewers discussed until they came to an agreement to settle any differences in various research sections. In case of remained ambiguous points, there will be a communication with the author of the related paper. Finally, any disagreements will be resolved by the third author.

Assessment of methodological quality

The selected studies will be critically appraised by two independent reviewers for methodological quality using the JBI checklists that approved by JBI International Scientific Committee. For the inter-rater agreement of this checklist, kappa is 0.714 and this checklist is a suitable guide for quality assessment (23). Also, JBI checklist has more questions compared to checklists such as Pedro, and examines more details in RCT studies. The risk of bias (ROB) will be assessed by using the revised Cochrane Collaboration RoB 2.0 tool (24). Any disagreements between the reviewers will be resolved through discussion or referred to a third reviewer. Following the critical appraisal, the studies that do not earn certain quality will be excluded.

Data extraction

The data from the articles included in this review will be extracted using the standardized data extraction instrument from the JBI by two independent reviewers. The extracted data will include specific details about the interventions, populations, measurement methods, assessment levels, and duration of intervention based on the review questions and objectives. In addition, the adverse events mentioned in the included studies will be extracted and reported. In case of remained ambiguous points, there will be a communication with the author of the related paper. Any disagreements between the reviewers will be resolved through discussion or referred to a third reviewer. The extracted data will be summarized in the extraction table by Excel software. Authors of the papers will be contacted to request the missing or additional data where required.

Data synthesis

If the studies are homogeneous and it is possible to combine the results, RevMan (Review Manager) software will be used for meta-analysis. The random effect will be used to reduce possible heterogeneity and a Funnel plot will be drawn to examine the selection bias of the studies. Then the results will be reported using a Forest plot. In this systematic review, if possible, the meta-analysis will be performed for any of the following parameters:

- Comparing the effects of exercise therapy and combination therapy (exercise therapy + adjunct intervention) on IRD.
- Comparing the effect of ES, kinesiotape, and brace on IRD.
- Comparing the measurement methods of IRD.
- Comparing the measurement levels of IRD.
- Comparing the effects of exercise therapy and non-intervention on IRD.
- Evaluation of the effects of exercise therapy on low back pain, ODI, pelvic floor dysfunction, abdominal muscle function, and the quality of life in women with DR.

Subgroup analysis

In this review study, subgroup analysis will also be performed, and the studies will be reviewed in more detail than in previous studies (16, 22). Subgroups will be performed based on:

- Measurement method.
- Measurement level.
- Adjunct intervention.
- Type of exercise.

Results from the intention-to-treat analysis and, if not reported, those from the per-protocol analysis will be used for meta-analysis. In this study, mean and standard deviation will be employed for analysis both before and after the intervention along with quantitative variables. These indices will be derived from the median and interquartile range in the absence of access. To determine MD change with a 95% confidence interval, mean changes and standard deviation in each group following the intervention compared to baseline will be employed. The fallow up mean will be used to calculate the mean change from the baseline mean subtraction for this purpose. Standard deviation change will be calculated from the previously reported formula (25).

The I^2 index will be used to assess the degree of heterogeneity among the outcomes of the included studies. If the index is greater than 50%, it implies high heterogeneity and a random effect will be used to present the meta-analysis. This index shows the percentage of variability between studies. The fixed-effect model will be utilized for analysis when the degree of heterogeneity is less than 50%. If there are at least two POOL articles for that outcome, a forest plot will be utilized to display the meta-analysis results.

DISCUSSION

This protocol of a systematic review deals with the multidimensional investigation of DR through physiotherapy perspective, including its treatment methods, measurement methods and levels.

DR affects at least two-thirds of women after pregnancy has various complications, and reduces the quality of life of the women (9). Studies have shown that there is a significant negative correlation between DR and abdominal flexor muscle strength in postpartum women (26, 27), and they have weaker abdominal muscles compared to women without DR (28). Studies suggest that the activation of transverse abdominis muscle increases the tension and decreases the distortion of the linea alba and removes the force from the midline (29). Therefore, therapeutic exercises of abdominal muscles and their synergists such as the diaphragm, multifidus, and pelvic floor muscles may reduce the IRD, pain, and pelvic floor dysfunctions and improve the quality of life (30, 31).

However, exercise therapy is one of the most common physiotherapy interventions to cure these patients, but some patients may not be able to exercise. Thus, it is important to determine the effectiveness of other non-invasive interventions such as ES, kinesiotape and braces in people with DR. ES is the application of electrical current to increase muscle contraction recruitment which induces higher loads on the muscles and results in stronger contractions of the abdominal muscles in patients with DR. Kinesioape is also used to increases abdominal and core muscle function, proprioception, joints support and reduces discomfort in these patients (32). As well, using corsets or braces increases the intra-abdominal pressure and the abdomen becomes firm like a cylinder, which stabilizes the spine, improves muscle strength, and reduces IRD (33). Currently, there is a lack of information about this issue. Therefore, in this review study, the comparison among the effects of kinesiotape, ES, and brace and the combination of these modalities with exercise therapy may be beneficial to help the physiotherapists facilitate treatment and choose the best type of interventions in the treatment of women with DR.

Another important issue in these patients is the necessity of performing a systematic review of the evaluation methods. Despite the numerous studies in this field, assessment methods to determine the severity of DR are not equivalent and this variety of assessment methods and levels of IRD may make judgment and final conclusions difficult. This is an issue that has not been investigated yet. Therefore, standardization in this field seems necessary and this study may be helpful in this regard and speed up the process of evaluating patients.

It seems that, the findings from this systematic review will add to previous literature in the field of DR and may be valuable to promote postpartum women's health, assist physiotherapists in the treatment of DR and researchers in the assessment of this disorder. As formerly mentioned, this disease can cause many secondary complications for women after childbirth, and the lack of the definite protocol led to confuse of patients and therapists.

CONCLUSIONS

In this systematic review, the effects of therapeutic interventions will be investigated and presented from different aspects. Physiotherapists are likely to be able to use the evidence from this study in the evaluation and treatment of women with DR, and enhance the outcomes of their treatment and increase the quality of life of the patients.

FUNDINGS

This proposal has been supported by Tabriz University of Medical Sciences.

DATA AVAILABILITY

The search has been performed and the data are available. Also, the study selection has been performed.

CONTRIBUTIONS

ES, HA: conceptualization, design. HSP, FGh: search study. ES, TGh: study selection. ES, HA: writing – original draft; writing – review & editing.

ACKNOWLEDGMENTS

The authors would like to thank Tabriz University of Medical Sciences for financial support for the present study.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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