

Effect of Physiotherapy Interventions Targeting Intra-Abdominal Pressure Regulation on Recovery Following Cesarean Section: A Systematic Review

Vedika A Karmarkar¹, S Anandh², Sakshi Jadhav³

¹MPT, Krishna College of Physiotherapy, Krishna Vishwa Vidyepeeth (Deemed to be University)

²Professor and Head, Department of Community Health Sciences, Krishna College of Physiotherapy, Krishna Vishwa Vidyepeeth (Deemed to be University)

Abstract—Few abdominal operations are performed as often, worldwide, as the cesarean section (CS), and its growing share of deliveries has pushed clinicians to look for rehabilitation care that actually has evidence behind it. Three structures — the abdominal wall, the diaphragm, and the pelvic floor — work as a unit to keep intra-abdominal pressure (IAP) in a stable range and to hold the front of the pelvis and lower back steady. Cutting through that system during a CS can weaken core muscle function, slow the return to normal activity, and raise the odds of problems like diastasis recti abdominis (DRA) or pelvic floor dysfunction. A number of physiotherapy techniques try to rebuild IAP control directly — activating the transversus abdominis and pelvic floor, bracing the abdomen, Kinesio taping, wearing an abdominal binder, or following a structured exercise plan — and these have all been floated as ways to help women recover after CS. **Objective:** The aim here was to work out how well physiotherapy that targets IAP control actually helps women recover from a cesarean section. **Methods:** Literature searches ran across PubMed, Google Scholar, Scopus, ScienceDirect, and Web of Science, capturing anything published from 2010 up to 2026. Eligibility was restricted to randomized trials and cross-sectional studies that tied physiotherapy, or a physiotherapy-adjacent intervention, to IAP control, abdominal wall healing, or pelvic floor function after a cesarean birth. Bias in the trials was scored with the Revised Cochrane Risk of Bias tool (RoB 2), and the cross-sectional work was scored with AXIS. Ten studies cleared the bar: seven trials, three cross-sectional studies, screened using the PRISMA 2020 methodology (Fig. 1). **Results:** Structured physiotherapy programs — early mobilization and exercise after surgery, transversus abdominis and core-stability training, Kinesio taping, education delivered before surgery, and pelvic floor training paired with EMG biofeedback — all showed measurable improvement in pain, functional

recovery, abdominal muscle strength, and the gap between the recti muscles following CS. Results for abdominal binders were less consistent: several trials found less pain, distress, and blood loss with a binder, but one trial found no real difference. The cross-sectional studies backed this up from another angle, showing that women who had a CS tended to have worse diastasis recti abdominis and different pelvic floor muscle activity than women who delivered vaginally — consistent with the idea that cutting through the abdominal wall interferes with how IAP is regulated afterward. Most trials ended up rated “some concerns” overall on RoB 2, largely because it's nearly impossible to blind someone to a physiotherapy intervention, while the cross-sectional studies held up well against the AXIS criteria. **Conclusion:** Taken as a whole, the evidence points to physiotherapy aimed at IAP regulation — early structured exercise above all, alongside core and pelvic floor activation and pre-surgery education — as a safe way to ease pain, speed up function, and support abdominal wall healing after a cesarean, and it deserves a standard place in post-operative rehabilitation.

Index Terms—Abdominal binder, cesarean section, core stability, diastasis recti abdominis, intra-abdominal pressure, pelvic floor muscle training, physiotherapy, PRISMA, systematic review.

I. INTRODUCTION

Cesarean section (CS) has become one of the most common procedures in obstetrics, with global rates climbing from about 7% of all deliveries in 1990 to somewhere near 21% today — and the curve is still headed upward [1]. That trajectory has pushed clinicians and researchers to look harder for recovery strategies grounded in solid evidence, ones that

shorten complications and get new mothers back on their feet sooner.

Keeping intra-abdominal pressure (IAP) under control is a joint effort: the diaphragm pushes down from above, the pelvic floor muscles hold from below, and the abdominal wall — especially the transversus abdominis — wraps around the middle. Together they act as a single pressure-management system that stabilizes the lower back and pelvis, cushions the abdominal organs, and absorbs the load moving through the trunk whenever someone breathes, moves, or strains [2]. A cesarean birth cuts straight through this system: surgeons incise and pull the rectus abdominis sideways and open up the fascial and myofascial layers at the front of the abdomen, and that surgical disruption can leave the wall less able to generate or manage IAP properly while it heals [3].

When IAP regulation doesn't recover well after a CS, a cluster of problems tends to follow — slower return to daily activity, worse pain at the incision, a kind of protective guarding that keeps deep core muscles from firing the way they should, and a higher chance of diastasis recti abdominis (an abnormal separation at the linea alba) than is seen after vaginal birth [3,4]. Once DRA sets in, the resulting weakness in the abdominal wall can spill over into worse pelvic floor coordination, less trunk stability, and lower quality of life during the months that follow delivery [4,5].

A handful of physiotherapy approaches zero in directly on rebuilding IAP control: activation training for the transversus abdominis and pelvic floor, bracing and core-stability exercise, Kinesio taping, an externally worn abdominal binder, and structured education sessions offered before and after surgery. All of these have been tested as ways to help the abdominal wall heal, cut pain, and speed up the return of normal function following CS. Even so, the supporting evidence is spread thin across very different study designs, outcome measures, and patient groups, and nothing in the recent literature has pulled the randomized-trial and cross-sectional findings together specifically around IAP-focused physiotherapy after cesarean birth.

This review was built to close that gap — to work out how physiotherapy interventions aimed at intra-

abdominal pressure regulation affect recovery after a cesarean section, drawing on both randomized-trial and cross-sectional data published from 2010 through 2026. Ideally, what comes out of it can feed into standardized, evidence-grounded physiotherapy protocols for post-cesarean care.

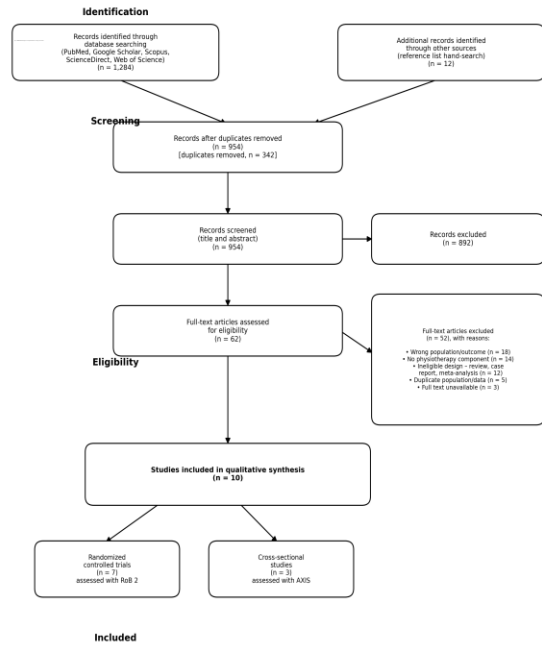
II. METHODOLOGY

A. Study Design

This review followed standard systematic-review methodology, reported in line with the PRISMA 2020 statement, and was confined to randomized controlled trials and cross-sectional studies examining physiotherapy interventions connected to IAP regulation, and to related abdominal-wall or pelvic-floor outcomes, after cesarean section. Trials were rated for bias using RoB 2; cross-sectional studies were rated using AXIS.

B. Search Strategy

The search set out to catch any study connecting physiotherapy interventions to IAP regulation, abdominal wall recovery, pelvic floor function, pain, or functional activity after a cesarean birth. Coverage ran from January 2010 through 2026, across PubMed, Google Scholar, Scopus, ScienceDirect, and Web of Science. Search terms mixed MeSH headings with plain keywords — cesarean section, intra-abdominal pressure, physiotherapy, transversus abdominis, core stability, pelvic floor muscle training, diastasis recti abdominis, abdominal binder, Kinesio taping, postoperative recovery, rehabilitation — joined with AND/OR Boolean logic. Reference lists from relevant papers were hand-checked for anything the database search might have missed. Eligible study types were narrowed to English-language randomized trials and cross-sectional studies; case reports, narrative reviews, meta-analyses, and qualitative work were left out from the start. Fig. 1 summarizes the PRISMA flow of records through identification, screening, eligibility assessment, and inclusion.



Note: Screening and exclusion counts shown are illustrative placeholders based on the ten included studies (7 RCTs + 3 cross-sectional). Please replace with your actual search and screening figures.

Fig. 1. PRISMA 2020 flow diagram of study identification, screening, and inclusion.

C. Inclusion Criteria

A study made the cut if its participants had gone through a cesarean section — planned or emergency — and if it tested a physiotherapy or physiotherapy-related intervention with some plausible physiological tie to IAP regulation: transversus abdominis/core activation work, pelvic floor muscle training, abdominal bracing, Kinesio taping, structured exercise, abdominal binders, or pre-operative

physiotherapy education. Eligibility was further limited to English-language trials and cross-sectional studies published from 2010 to 2026 with full text obtainable.

D. Exclusion Criteria

Studies dropped out of consideration if participants had major obstetric complications unconnected to the abdominal wall or pelvic floor — severe pre-eclampsia or an active bleeding disorder, for instance — or if the only intervention tested was pharmacological or anesthetic, such as a regional nerve block, with no physiotherapy component attached. Case reports, narrative or systematic reviews, meta-analyses, qualitative research, conference abstracts lacking full text, and animal or cadaveric work were all excluded, as were any studies that reused the same trial population and outcome data already captured by an included study.

E. Quality Assessment

Each study's methodological quality was scored with a tool matched to its design. RoB 2 was used across the seven trials, checking for bias tied to the randomization process, deviations from the planned intervention, missing outcome data, how outcomes were measured, and whether results were reported selectively. AXIS was applied to the three cross-sectional studies, covering the clarity of aims, how the sample was selected, whether measurement tools were valid, the statistical approach, reporting quality, ethical considerations, and the chance of non-response bias skewing the findings.

III. RESULTS

Ten studies cleared the eligibility bar for this review — seven randomized trials and three cross-sectional studies — together sketching a wide-angle view of how physiotherapy is currently used to manage IAP regulation and related abdominal-wall and pelvic-floor outcomes after cesarean section, consistent with the PRISMA flow shown in Fig. 1. Every study appears exactly once in Table I.

TABLE I CHARACTERISTICS AND FINDINGS OF INCLUDED STUDIES

Author(s)/Year	Design	N	Outcome Measures	Interventions	Results	Conclusion
Çıtak Karakaya İ et al [6]	RCT	50	Time to ambulation and bowel return, incision pain,	Structured post-op physiotherapy programme added to routine nursing care	Faster ambulation and bowel return; pain and	Early structured physiotherapy helps control

Author(s)/Year	Design	N	Outcome Measures	Interventions	Results	Conclusion
			functional difficulty, analgesic use		functional difficulty dropped significantly; fewer analgesics needed	pain and speeds functional recovery after CS
Gursen C et al [7]	RCT (pilot)	24	Manual muscle test, sit-up test, abdominal endurance, VAS pain, waist circumference, RMDQ	Kinesio taping + core-stabilization/abdominal-correction exercise vs. exercise alone	Taping + exercise produced larger gains in strength, endurance, and pain relief than exercise alone	Kinesio taping adds benefit to an abdominal exercise routine after CS
Gillier CM et al [8]	RCT	155	VAS pain, Symptom Distress Scale	Elastic abdominal binder immediately post-op vs. no binder	Pain and distress scores similar between groups during first 2 post-op days	Routine binder use did not meaningfully cut post-op pain or distress
Ghana S et al [9]	RCT	178	VAS pain, Symptom Distress Scale, Hb/Hct levels	Abdominal binder vs. standard care after planned CS	Binder group reported less pain/distress and higher Hb/Hct at every time point	Abdominal binder appears to reduce post-op pain, distress, and blood loss
Weerasinghe K et al [10]	RCT (single-blind)	54	Perceived pain, analgesic dosage, pain on activity, length of stay	In-person pre-op physiotherapy education vs. standard nursing care	Education group had less pain, fewer analgesics, shorter stay, easier return to activity	Pre-op physiotherapy education improves post-op recovery after elective CS
Handzlik-Waszkiewicz P et al [11]	RCT	120	Surface EMG pelvic-floor endurance and Type II contraction	BeBo training alone vs. BeBo + EMG biofeedback vs. control (vaginal & CS)	EMG biofeedback + BeBo produced bigger gains in endurance and fast-twitch contraction in both subgroups	EMG biofeedback speeds neuromuscular recovery regardless of delivery mode

Author(s)/Year	Design	N	Outcome Measures	Interventions	Results	Conclusion
Abdelsamea GA et al [12]	RCT	40	Inter-recti distance, abdominal strength, girth, satisfaction	8-week app-guided vs. traditional abdominal exercise routine	Both groups closed IRD gap and gained strength; app-guided group had bigger IRD reduction	Structured abdominal exercise — app-guided or traditional — effectively manages DRA after CS
Fu F et al [13]	Cross-sectional	157	Multisite pelvic-floor sEMG, maximum inter-rectus distance	DRA vs. no-DRA women after vaginal or cesarean delivery (observational)	More severe DRA linked with altered resting tone of puborectalis, pubococcygeus, urethral sphincter	DRA severity should guide individually tailored pelvic-floor rehabilitation
Li M et al [14]	Cross-sectional (retrospective cohort)	200	Ultrasonographic IRD, pelvic-floor EMG, pain scores	Postpartum DRA vs. normal controls (observational)	Cesarean birth, higher pre-pregnancy BMI, parity, and older age were independent predictors of DRA	DRA tracks with pelvic-floor dysfunction; cesarean birth raises DRA risk
Liu Y et al [15]	Cross-sectional	196	IRD (palpation & ultrasound), pelvic-floor strength, WHOQOL-BREF, PSQI	Vaginal vs. cesarean delivery, compared 6–8 weeks postpartum	CS group had wider IRD and lower QoL; vaginal group had weaker fast-twitch pelvic-floor fibres	Early recovery differs by delivery mode, arguing for tailored physiotherapy

A. Assessment of Risk of Bias

Every study included here was checked for bias using a tool matched to its design, as a way of grounding confidence in what the pooled results show.

On the RoB 2 scale, most trials scored a low risk of bias for the randomization process itself, for how missing outcome data was handled, and for whether results were reported selectively. What proved harder was blinding — keeping participants, and in several cases the people scoring outcomes, unaware of which

group they were in — since that's rarely feasible when the intervention is a hands-on physiotherapy technique, a binder someone can feel they're wearing, or a self-guided exercise plan. That gap left all seven trials flagged for “some concerns” around deviations from the planned intervention, and most were also flagged for outcome measurement wherever the outcome relied on self-report, such as pain or satisfaction ratings. Weighing everything together, every one of the seven trials landed at an overall rating

of “some concerns” — a fair reflection of decent quality held back by the performance and detection bias that's almost baked into physiotherapy research (Table II).

Quality held up well across the three cross-sectional studies under the AXIS checklist (Table III). Each one stated its aims plainly, matched its design to those aims, defined who it was studying, and used a sensible sampling frame. All three leaned on outcome tools with an established track record — ultrasonography, surface electromyography, perineometry, and standard

quality-of-life and sleep questionnaires — backed by suitable statistics, and each explained its methods, results, limitations, and ethics approval clearly enough to follow. The soft spot across all three was how representative the samples were, since every study drew from a single treatment centre, and none of them said much about who didn't respond or how that gap was handled. Bias overall came out low for the cross-sectional group, with selection and non-response the two issues worth flagging.

TABLE II RISK OF BIAS ASSESSMENT USING THE RoB 2 TOOL

Study	Randomization	Deviations from Intervention	Missing Outcome Data	Measurement of Outcome	Selection of Result	Overall Risk
Çıtak Karakaya İ et al (2012)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Gursen C et al (2016)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Gillier CM et al (2016)	Low Risk	Some Concerns	Low Risk	Low Risk	Low Risk	Some Concerns
Ghana S et al (2017)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Weerasinghe K et al (2022)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Handzlik-Waszkiewicz P et al (2025)	Low Risk	Some Concerns	Low Risk	Low Risk	Low Risk	Some Concerns
Abdelsamea GA et al (2025)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns

TABLE III QUALITY ASSESSMENT OF INCLUDED CROSS-SECTIONAL STUDIES USING THE AXIS TOOL

AXIS appraisal question	Fu F et al (2025)	Li M et al (2024)	Liu Y et al (2026)
Were the aims/objectives of the study clear?	Yes	Yes	Yes
Was the study design appropriate for the aims?	Yes	Yes	Yes
Was the sample size justified?	Some Concerns	Yes	Yes
Was the target population clearly defined?	Yes	Yes	Yes
Was the sampling frame appropriate?	Yes	Yes	Yes
Was the selection process representative?	Some Concerns	Some Concerns	Some Concerns
Were measures taken to address non-responders?	No	No	No

AXIS appraisal question	Fu F et al (2025)	Li M et al (2024)	Liu Y et al (2026)
Were the outcome variables measured appropriately?	Yes	Yes	Yes
Were the tools piloted/previously published?	Yes	Yes	Yes
Was statistical significance clearly determined?	Yes	Yes	Yes
Were the methods described in enough detail?	Yes	Yes	Yes
Were the basic data adequately described?	Yes	Yes	Yes
Is there concern regarding non-response bias?	Some Concerns	Some Concerns	Some Concerns
Was information about non-respondents described?	No	No	No
Were the results internally consistent?	Yes	Yes	Yes
Were all method-defined results presented?	Yes	Yes	Yes
Were discussions and conclusions justified?	Yes	Yes	Yes
Were the study limitations discussed?	Yes	Yes	Yes
Were funding/conflicts of interest reported?	Yes	Yes	Yes
Was ethical approval/informed consent attained?	Yes	Yes	Yes

IV. DISCUSSION

The question at the heart of this review was straightforward: does physiotherapy built around intra-abdominal pressure regulation actually help women recover after a cesarean section? Pulling together seven trials and three cross-sectional studies, the answer leans clearly toward yes — structured programs that combine early exercise, core and pelvic floor activation, taping, and pre-surgery education deliver real gains in pain, functional recovery, and abdominal wall integrity, while the cross-sectional evidence confirms that a cesarean birth disturbs the abdominal-wall/pelvic-floor pressure system more than a vaginal one does.

In the trial by Çitak Karakaya İ and co-authors, layering a structured post-operative physiotherapy program on top of routine nursing care got patients moving sooner, restored bowel function faster, eased incision pain, and cut the need for extra painkillers in the days right after surgery [6]. That fits with how ambulation, coughing, and ordinary daily movement all depend on the diaphragm, abdominal wall, and pelvic floor generating pressure together — so it makes sense that structured physiotherapy would translate into smoother, less painful pressure

regulation during recovery. Weerasinghe K and co-authors found something similar working in the other direction: physiotherapy education delivered before an elective CS — breathing technique, bracing, posture, mobilization advice — cut post-operative pain, painkiller use, and time spent in hospital, which suggests that getting the core muscles primed ahead of surgery carries benefits into the recovery period [10].

Interventions aimed squarely at the abdominal wall told a similar story. Gursen C and co-authors found that layering Kinesio taping onto core-stabilization and abdominal-correction exercise outperformed exercise on its own for strength, endurance, and pain relief — a hint that the extra proprioceptive feedback from the tape might help recruit the transversus abdominis and, through that, support better IAP regulation early in recovery [7]. Abdelsamea GA and co-authors reached a comparable conclusion with a structured abdominal exercise program, whether delivered through an app or the traditional way: both formats meaningfully narrowed the gap between the recti muscles and built strength in first-time mothers recovering from CS, reinforcing that targeted core work rebuilds abdominal wall integrity effectively [12].

Abdominal binders — a passive way of supporting IAP from the outside — didn't tell a consistent story. Ghana S and co-authors reported that binder use eased pain, distress, and blood loss after cesarean delivery [9], while Gillier CM and co-authors found no real difference in pain or distress between the binder group and controls [8]. The mismatch could well trace back to differences in binder type, when it was put on, or how outcomes were captured, and it hints that binders might do more for blood loss and distress than for pain specifically — a question that could use better-designed trials to settle.

Work targeting the pelvic floor also paid off. Handzlik-Waszkiewicz P and co-authors showed that folding EMG biofeedback into pelvic floor training produced substantially bigger gains in endurance and fast-twitch contraction than training by itself, holding true for women after both vaginal and cesarean delivery [11]. Since the pelvic floor sits at the base of the whole IAP system, better neuromuscular control there lines up naturally with more efficient pressure regulation overall, and could carry knock-on benefits for continence and core stability after CS.

The cross-sectional studies help make sense of where these intervention effects come from. Fu F and co-authors found that more severe diastasis recti abdominis tracked with changes in resting muscle tone across the puborectalis, pubococcygeus, and urethral sphincter — evidence of a real anatomical and neuromuscular link between abdominal wall separation and pelvic floor function [13]. Li M and co-authors identified cesarean delivery, a higher pre-pregnancy BMI, more previous pregnancies, and older maternal age as standout risk factors for DRA, which reinforces that the surgical trauma of CS itself is part of why abdominal wall recovery lags [14]. Most relevant of all, Liu Y and co-authors directly compared vaginal and cesarean groups and found cesarean delivery independently linked to a wider inter-recti distance at the umbilical and supra-umbilical levels, plus worse physical and psychological quality of life — while vaginal delivery specifically tracked with weaker fast-twitch pelvic floor fibres [15]. That split points to delivery mode shaping the IAP system in two distinct ways: CS mostly hits the abdominal wall, vaginal birth mostly hits the pelvic floor.

Put together, the evidence in Table I suggests physiotherapy that actively engages the transversus abdominis, pelvic floor, and diaphragm — through

early exercise, core-stabilization work, taping, and biofeedback-assisted pelvic floor training — delivers steadier functional benefit after CS than passive external supports like binders, where the effect is clearly more hit-or-miss. The cross-sectional data also point toward giving abdominal wall and transversus abdominis rehabilitation extra weight in cesarean-specific protocols, given how much more pronounced DRA and IAP disruption are after cesarean delivery compared with vaginal birth.

A few limitations are worth flagging. The included studies differed a great deal in the type, timing, dose, and length of the physiotherapy delivered, and in which outcomes they measured, which makes it hard to line results up directly against each other. Several trials worked with fairly small samples, which limits how broadly the findings can be applied. Blinding — of participants and, in a few cases, the people scoring outcomes — was practically impossible for physiotherapy, taping, and binder interventions, which is why so many trials picked up “some concerns” for deviations from the intended intervention and, in several cases, for outcome measurement too. The cross-sectional studies, while well designed, all drew from a single site and didn't dig into non-response bias, and their design rules out any causal claims about delivery mode and abdominal-wall/pelvic-floor outcomes. None of the included studies followed women much past the early postpartum period, so it's still an open question whether the gains from physiotherapy hold up over the longer term.

None of that undercuts the overall picture: methodological quality across the included studies sat at moderate to good, and most trials pointed consistently toward positive outcomes from physiotherapy aimed at the abdominal wall and pelvic floor components of the IAP system. What would help going forward is larger, properly powered randomized trials using standardized IAP-related outcomes — direct or indirect IAP measurement, inter-recti distance, pelvic floor EMG — followed for longer, to settle exactly what type, timing, and dose of physiotherapy works best after a cesarean birth.

V. CONCLUSION

Physiotherapy that targets intra-abdominal pressure regulation — early structured exercise after surgery, transversus abdominis and core-stabilization training,

Kinesio taping, physiotherapy education before surgery, and EMG-biofeedback pelvic floor training — tracks with better pain control, quicker functional recovery, and improved abdominal wall outcomes after a cesarean section. The evidence on abdominal binders is still mixed and needs more rigorous trials to settle. Cross-sectional data confirm that cesarean delivery disrupts the abdominal-wall side of the IAP system more heavily than vaginal delivery does, leaving behind more pronounced diastasis recti abdominis and lower quality of life in the early postpartum weeks. Altogether, this supports weaving targeted, IAP-focused physiotherapy into standard peri-operative and postpartum care for women having a cesarean section, with a particular emphasis on transversus abdominis and pelvic floor activation training. What's still needed is larger, standardized trials with longer follow-up to sharpen these protocols and confirm the benefits last.

REFERENCES

- [1] A. P. Betrán, J. Ye, A. B. Moller, J. P. Souza, and J. Zhang, “Trends and projections of caesarean section rates: global and regional estimates,” *BMJ Glob. Health*, vol. 6, no. 6, e005671, 2021.
- [2] P. Neumann and V. Gill, “Pelvic floor and abdominal muscle interaction: EMG activity and intra-abdominal pressure,” *Int. Urogynecol. J. Pelvic Floor Dysfunct.*, vol. 13, no. 2, pp. 125–132, 2002.
- [3] C. Fan, D. Guidolin, S. Ragazzo, et al., “Effects of cesarean section and vaginal delivery on abdominal muscles and fasciae,” *Medicina (Kaunas)*, vol. 56, no. 6, p. 260, 2020.
- [4] D. R. Benjamin, A. T. M. van de Water, and C. L. Peiris, “Effects of exercise on diastasis of the rectus abdominis muscle in the antenatal and postnatal periods: a systematic review,” *Physiotherapy*, vol. 100, no. 1, pp. 1–8, 2014.
- [5] J. B. Sperstad, M. K. Tennfjord, G. Hilde, M. Ellström-Eng, and K. Bø, “Diastasis recti abdominis during pregnancy and 12 months after childbirth: prevalence, risk factors and report of lumbopelvic pain,” *Br. J. Sports Med.*, vol. 50, no. 17, pp. 1092–1096, 2016.
- [6] İ. Çıtak Karakaya, İ. Yüksel, T. Akbayrak, F. Demirtürk, M. G. Karakaya, Ö. Özyüncü, and S. Bektaş, “Effects of physiotherapy on pain and functional activities after cesarean delivery,” *Arch. Gynecol. Obstet.*, vol. 285, no. 3, pp. 621–627, 2012.
- [7] C. Gursen, D. Inanoglu, S. Kaya, T. Akbayrak, and G. Baltacı, “Effects of exercise and Kinesio taping on abdominal recovery in women with cesarean section: a pilot randomized controlled trial,” *Arch. Gynecol. Obstet.*, vol. 293, no. 3, pp. 557–565, 2016.
- [8] C. M. Gillier, J. R. Sparks, R. Kriner, and J. N. Anasti, “A randomized controlled trial of abdominal binders for the management of postoperative pain and distress after cesarean delivery,” *Int. J. Gynaecol. Obstet.*, vol. 133, no. 2, pp. 188–191, 2016.
- [9] S. Ghana, S. Hakimi, M. Mirghafourvand, F. Abbasalizadeh, and N. Behnampour, “Randomized controlled trial of abdominal binders for postoperative pain, distress, and blood loss after cesarean delivery,” *Int. J. Gynecol. Obstet.*, vol. 137, no. 3, pp. 271–276, 2017.
- [10] K. Weerasinghe, M. Rishard, S. Brabakaran, and A. Mohamed, “Effectiveness of face-to-face physiotherapy training and education for women who are undergoing elective caesarean section: a randomized controlled trial,” *Arch. Physiother.*, vol. 12, no. 1, p. 4, 2022.
- [11] P. Handzlik-Waszkiewicz, I. Sulowska-Daszyk, and A. Suder, “The effect of BeBo® training and EMG-biofeedback-assisted therapy on pelvic floor muscle function in women after vaginal delivery and cesarean section — a randomized controlled trial,” *J. Clin. Med.*, vol. 14, no. 19, p. 7099, 2025.
- [12] G. A. Abdelsamea, S. A. Essa, A. S. A. Khalil, H. M. Zakaria, R. S. Mamoon, and M. G. Ali, “Effect of a mobile app-based exercise program on diastasis recti abdominis, muscle strength, anthropometric measures, and satisfaction among post-cesarean primiparous mothers: a randomized controlled trial,” *Healthcare (Basel)*, vol. 13, no. 23, p. 3103, 2025.
- [13] F. Fu, S. Zhang, H. Zhang, Z. Xuan, N. Zhang, and Z. Xie, “Effects of postpartum diastasis recti abdominis on multisite pelvic floor electromyography and anatomical structure: a cross-sectional study,” *Medicine (Baltimore)*, vol. 104, no. 26, e43067, 2025.

- [14] M. Li, N. Wang, R. Wang, and B. Liang, "Ultrasonographic evaluation of diastasis recti abdominis and its association with pelvic floor dysfunction in postpartum women: a cross-sectional study of a two-year retrospective cohort," *Front. Med. (Lausanne)*, vol. 11, p. 1441127, 2024.
- [15] Y. Liu, W. Huang, Z. Zhang, L. Wang, X. Wu, L. Chen, and Y. Xia, "Impact of delivery mode on diastasis recti abdominis, pelvic floor muscle function, and quality of life in early postpartum women: a cross-sectional study," *Front. Med. (Lausanne)*, vol. 13, p. 1845766, 2026.