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REVIEW

Pelvic Floor Muscle Exercise for Low Anterior Resection Syndrome: A Systematic Review and Meta-analysis with GRADE

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Abstract

Introduction: Low Anterior Resection Syndrome (LARS) is a common postoperative complication following sphincter-preserving rectal cancer surgery, significantly impairing bowel function and quality of life. Pelvic floor muscle exercise (PFME) is widely recommended; however, its effectiveness in LARS remains uncertain. This study aimed to systematically evaluate the effect of PFME on functional outcomes in patients with LARS and to assess the certainty of evidence using the GRADE framework. **Materials and Methods:** A systematic review and meta-analysis were conducted following PRISMA guidelines. Literature searches were performed in Scopus, Cochrane Library, ScienceDirect, PubMed, Wiley, and Sage Journals for studies published between January 2015 and February 2026. Search terms included pelvic floor muscle exercise, pelvic floor muscle training, low anterior resection syndrome, rectal cancer, and randomized controlled trial. Ten controlled experimental studies involving 655 participants (318 intervention, 337 control) were included. Effect sizes were calculated using Mean Difference (MD) and Standardized Mean Difference (SMD) with inverse variance methods. Statistical heterogeneity was evaluated using the I^2 statistic, and the certainty of evidence was assessed using the GRADE framework. **Results:** Among 3,412 identified records, 10 studies met the inclusion criteria. The pooled analysis demonstrated no statistically significant effect of PFME on overall functional outcomes (SMD = −0.14; 95% CI −0.41 to 0.13; p = 0.30). Subgroup analyses suggested a potential improvement in LARS scores (MD = −3.31; 95% CI −4.82 to −1.80); however, these findings are based on a limited number of studies and should be interpreted as exploratory. The observed effect size, although statistically detectable in subgroups, may have limited clinical relevance. **Conclusion:** PFME does not demonstrate a clear clinical benefit as a standalone intervention for LARS. It may be considered as part of a multimodal rehabilitation approach, although the certainty of evidence remains low.

Keywords: colorectal surgery- Low Anterior Resection Syndrome- meta-analysis- pelvic floor muscle exercise

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Introduction

Low anterior resection (LAR) with coloanal anastomosis is the standard procedure for mid- and distal rectal cancer with the aim of preserving the anal sphincter. Although this approach avoids permanent colostomy, most patients still experience anorectal dysfunction after surgery. This condition is known as Low Anterior Resection Syndrome (LARS) [1, 2], a spectrum of disorders that includes faecal incontinence, urgency, fragmented defecation, increased bowel movement frequency, and difficulty emptying the bowels. Various reports indicate that approximately 60–80% of patients after rectal resection experience LARS symptoms of varying severity [3]. The impact is not limited to physical aspects but also involves psychosocial consequences such as anxiety, social activity restrictions, and a significant decline in quality of life.

Various LARS management strategies have been developed, including dietary modifications, pharmacological therapy, neuromodulation, biofeedback, and rehabilitative interventions [4]. Among these approaches, pelvic floor muscle exercise (PFME) has emerged as a relatively safe and easily implemented non-invasive intervention [5]. Theoretically, Pelvic floor muscle exercise (PFME) is a non-invasive

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rehabilitative intervention designed to improve anorectal function through neuromuscular strengthening and coordination. While PFME has demonstrated effectiveness in non-oncological populations, its role in LARS remains unclear due to structural and neurophysiological alterations following rectal resection [6- 8]. Therefore, PFME effectiveness in LARS requires evaluation within condition-specific clinical trials.

In the past decade, a number of randomised controlled trials (RCTs) have evaluated the role of PFME in reducing LARS scores and improving quality of life [9-18]. Existing research has yielded inconsistent findings, likely due to heterogeneity in intervention protocols, timing of initiation, and outcome measures. Furthermore, variation in instruments such as LARS score, Wexner score,Cleveland Clinic Faecal Incontinence Index (CCFI) and manomatry complicates interpretation [19].

Based on this background, this meta-analysis aims to comprehensively assess the effect of pelvic floor muscle exercise on reducing Low Anterior Resection Syndrome scores and related quality of life parameters, taking into account methodological heterogeneity and the certainty of available evidence.

Materials and Methods

Research Design

This study was conducted as a systematic review and meta-analysis in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. A completed PRISMA checklist is provided as supplementary material to ensure transparency and completeness of reporting. A study protocol was developed prior to data extraction to minimise bias and enhance methodological consistency. However, the protocol was not registered in the PROSPERO database, which is acknowledged as a limitation that may affect methodological transparency.

Research Question and PICO Framework

The study focused on adult patients who underwent low anterior resection due to rectal cancer. The intervention studied was pelvic floor muscle exercise or pelvic floor muscle training, either performed independently or with supervision or biofeedback. The comparison group consisted of standard care, no intervention, or rehabilitation therapy other than PFME. The primary outcome was the change in LARS score, while the secondary outcome was faecal incontinence. The PICO framework was used to ensure that the focus of the research question was clear and clinically relevant.

Literature Search Strategy

A systematic literature search was conducted using the Scopus, Cochrane, Science Direct, PubMed, Wiley, and SAGE Journal databases. The publication period is limited to the period from 1 January 2015 to 28 February 2026 in order to obtain the most recent evidence. Keywords were combined using Boolean operators, including the terms (“pelvic floor muscle exercise”OR “pelvic floor muscle training”) AND (“low anterior resection syndrome” OR “rectal cancer”) AND (“randomised AND controlled trial”). In addition to electronic searches, manual searches were also conducted on the reference lists of relevant articles to identify additional studies.

Inclusion and Exclusion Criteria

The studies included were randomised controlled trials involving adult patients after low anterior resection for rectal cancer and evaluating PFME interventions. Studies had to report quantitative data related to LARS outcomes in order to be statistically analysed. Articles in English were included to maintain consistency of interpretation. Observational studies, quasi-experimental studies, case reports, articles without numerical data, and duplicate publications were excluded from the analysis. The selection process was conducted to ensure the homogeneity of the study design and the validity of the quantitative synthesis.

Study Selection Process

Study selection was conducted in two stages. First, titles and abstracts were screened to identify potentially relevant studies. Second, full-text articles were assessed for eligibility based on predefined inclusion and exclusion criteria. The selection process was performed independently by three reviewers. Any disagreements were resolved through discussion and consensus. Inter-reviewer agreement was assessed using Cohen’s kappa coefficient, indicating substantial agreement ($\kappa > 0.82$). The study selection procedure is presented in Figure 1 using a PRISMA flow diagram to ensure transparency and reproducibility.

Data Extraction

Data extraction was performed independently by three reviewers using a standardised data collection form. Extracted variables included study characteristics, participant demographics, intervention details, comparator groups, outcome measures, and follow-up duration. Discrepancies were resolved through re-evaluation and consensus.

Risk of Bias Assessment

The methodological quality of the studies was assessed using the Cochrane Risk of Bias Tool 2 (ROB-2). The assessment included randomisation, allocation concealment, participant blinding, outcome assessor blinding, completeness of data, selective reporting, and other potential biases. Each domain was classified as low risk, some concerns, or high risk. The assessment was conducted independently by three researchers to enhance objectivity. The assessment results were used in interpreting the strength of evidence.

Statistical Analysis

The meta-analysis was conducted using Review Manager (RevMan) version 5.4.1. Continuous outcomes were analysed using the Mean Difference (MD) or Standardised Mean Difference (SMD) with a 95%

confidence interval. A random-effects model was selected as the primary analytical approach due to the anticipated clinical and methodological heterogeneity among the studies. A fixed-effects model was used for sensitivity analysis. Heterogeneity was assessed using the I^2 statistic, with values above 50% indicating substantial heterogeneity. Due to conceptual differences between LARS score (syndrome-specific), Wexner score (fecal incontinence severity), and CCFI, these outcomes were not pooled together in a single meta-analysis. Instead, subgroup analyses were conducted based on outcome type to preserve construct validity.

Subgroup and Sensitivity Analyses

Pre-specified subgroup analyses were conducted based on outcome measures (LARS scores, Wexner scores and CCFI). This approach was used to address variability in the definition of outcomes, rather than as a post hoc analytical decision. Sensitivity analyses were conducted by excluding studies with a high risk of bias in order to assess the robustness of the findings.

Publication Bias Assessment

Potential publication bias is assessed using a funnel plot if the number of studies is sufficient. Plot asymmetry is analysed to detect possible selective publication. This assessment is important to ensure that effect estimates are not influenced by a tendency to publish positive results.

Evidence Quality Assessment

The overall quality of evidence is assessed using the GRADE approach, which considers risk of bias, consistency of results, precision of estimates, directness, and publication bias. The level of evidence quality is classified as high, moderate, low, or very low. This assessment is used to determine the strength of clinical recommendations from meta-analysis results.

Results

PRISMA

Meta-Analysis Results

Based on a meta-analysis of 10 studies (Table 1) involving 655 participants (318 in the intervention group and 337 in the control group), no statistically significant differences were observed between groups. Using the Standardized Mean Difference (SMD) with a random-effects model (Table 2), the pooled effect size was −0.14 (95% CI: −0.41 to 0.13; p = 0.30), indicating a small and non-significant effect because the confidence interval crossed zero. Analysis with a fixed-effect model (Table 3) produced similar findings (SMD = −0.09; 95% CI: −0.25 to 0.06; p = 0.23), confirming the absence of a significant difference between the intervention and control groups.

When analyzed using Mean Difference (MD), the random-effects model showed an effect estimate of −0.55 (95% CI: −1.63 to 0.53; p = 0.32), while the fixed-effect model produced −0.37 (95% CI: −0.85 to 0.11; p = 0.13).

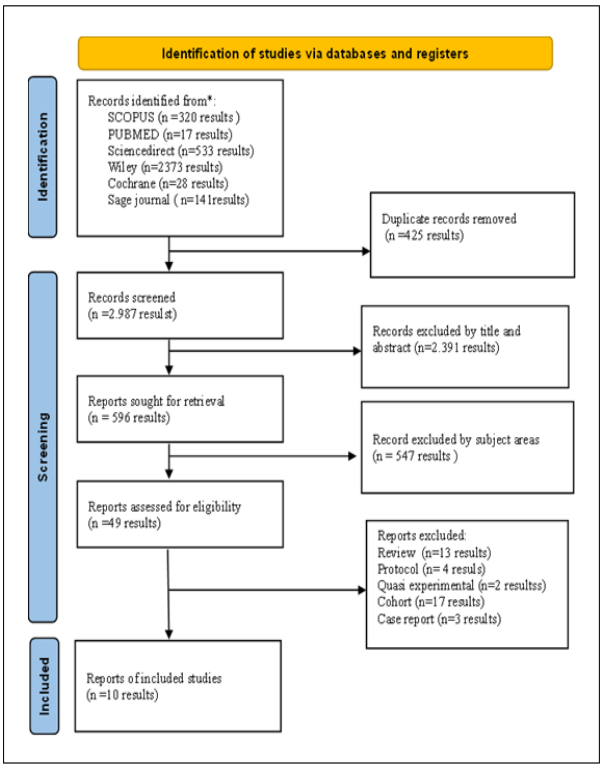


Figure 1. PRISMA Flow Diagram

Both analyses consistently indicated that the intervention did not produce a statistically significant improvement compared with standard care.

Moderate to high heterogeneity was observed across studies (I^2 = 66–70%), suggesting variability in study populations, intervention protocols, follow-up periods, and outcome measurement instruments related to Low Anterior Resection Syndrome after surgery for Rectal Cancer. Due to this heterogeneity, the random-effects model was considered more appropriate. Overall, the findings suggest that the intervention shows a small effect size but has not demonstrated a statistically significant benefit compared with the control group.

Subgroup analysis

Subgroup analysis based on LARS scores (Table 4) from three studies (98 experimental groups and 101 control groups) showed a statistically significant difference between the two groups, with a Mean Difference (MD) of -3.31 (95% CI: -4.82 to -1.80; p < 0.0001). The negative value indicates that the experimental group had a lower LARS score, which means better anorectal function compared to the control group. Despite moderate heterogeneity (I^2 = 64%), these results overall indicate that the intervention in the experimental group was associated with a meaningful improvement in LARS score. Although subgroup analysis showed a statistically significant improvement in LARS scores, this finding should be interpreted as exploratory rather than confirmatory due to the small number of studies and limited statistical power.

Subgroup analysis of the Wexner score (Table 5), which included three studies (106 experimental group and 121 control group), showed no significant difference between the two groups, with a Mean Difference (MD) of

Table 1. Characteristics of Included Randomized Controlled Trials

Author (Year)	Country	Sample Size (I/C)	Mean Age (years)	Male (%)	Time After Surgery	PFME Protocol (Frequency / Duration)	Control	Outcome Measures	Follow-up
Asnong et al. (2022) [9]	Belgium	42 / 42	63.4	64	3 months post-surgery	Supervised PFME 3 sessions/week + home exercise daily for 12 weeks	Standard postoperative care	LARS score, bowel function	6 months
Van der Heijden et al. (2022) [11]	Netherlands	36 / 45	65.2	60	After stoma closure	Pelvic floor rehabilitation program with physiotherapy twice/week for 12 weeks	Usual care	Wexner score	6 months
Bosch et al. (2024) [10]	Netherlands	40 / 46	64.7	62	3–6 months post-surgery	Supervised PFME + home exercise daily for 12 weeks	Conventional care	Wexner score, bowel symptoms	6 months
Yuanyuan et al. (2023) [18]	China	32 / 32	59.1	58	1 month post-surgery	PFME daily (3 sets/day, 10 contractions/set) for 8 weeks	Routine nursing care	LARS score, psychological status	3 months
Ye et al. (2023) [14]	China	30 / 30	60.3	55	After stoma closure	PFME guided by 3D animation education, daily training for 8 weeks	Standard health education	LARS score, adherence	3 months
Liu et al. (2019) [15]	China	25 / 25	61.8	57	2 months post-surgery	Biofeedback + pelvic floor muscle training twice/week	Routine postoperative care	Wexner score	6 months
Hung et al. (2016) [16]	Taiwan	28 / 28	58.9	53	After stoma closure	Home-based PFME program daily for 12 weeks	Standard care	QoL, fecal continence	6 months
Lin & Yang (2015) [12]	Taiwan	22 / 22	57.6	52	After ileostomy closure	PFME training daily for 10 weeks	Conventional rehabilitation	Fecal incontinence score	3 months
Oftuoglu et al. [13]	Turkey	28 / 30	62.7	59	3 months post-surgery	Structured physiotherapy PFME twice/week for 12 weeks	Standard care	CCFI score, QoL	6 months
Giri (2022) India [17]		35 / 37	61.5	61	Postoperative follow-up period	Pelvic floor rehabilitation exercises daily for 12 weeks	Routine follow-up	Bowel function outcomes	6 months

-0.14 (95% CI: -0.78 to 0.50; p = 0.67). The confidence interval crossed zero, indicatingthat the results are not statistically significant. Heterogeneity was very low (I^2 = 0%), indicating consistency between studies, so that overall the intervention had no significant effect on Wexner scores.

The CCFI subgroup analysis (Table 6) involving two studies (52 experimental groups and 51 control groups) showed no significant difference between the two groups, with a Mean Difference (MD) of -0.48 (95% CI: -2.08 to 1.13; p = 0.56). The confidence interval crossing zero indicates that the results are not statistically significant,

with very low heterogeneity ($I^2 = 0\%$), so that overall the intervention had no significant effect on CCFI scores.

Risk of bias graph

Overall, the risk of bias assessment indicates that the methodological quality of the included RCT studies is low to moderate (Figure 2). The majority of domains are at low risk of bias, particularly in terms of randomisation, outcome assessment, and data completeness. These findings support the reliability of the estimated intervention effects. However, there are several inherent methodological limitations, particularly in the blinding domain, which need to be considered when interpreting the meta-analysis results.

Risk of Bias Domain

Random Sequence Generation (Selection Bias)

Most studies showed a low risk of bias, indicating that randomisation procedures were adequately performed such as computer-generated random numbers. This reduces the possibility of systematic differences in baseline characteristics between groups. The risk of effect distortion due to initial imbalances between groups is relatively small.

Allocation Concealment (Selection Bias)

This domain shows a low to moderate risk of bias, with some studies not detailing the concealment mechanism. However, there is no strong indication of allocation manipulation. Potential selection bias exists, but the likelihood of it having a major impact on the effect estimate is considered low.

Blinding of Participants and Personnel (Performance Bias)

The majority of studies are at high risk of bias due to the absence of blinding, which is practically difficult to avoid in non-pharmacological interventions such as pelvic floor muscle training. The absence of blinding may lead to overestimation of the intervention effect, especially on subjective outcomes such as LARS scores and perception of defecation function. The observed effects likely reflect a combination of the physiological effects of the intervention and non-specific effects.

Blinding of Outcome Assessment (Detection Bias)

Most studies showed a low risk of bias, with outcome assessment performed using standardised instruments or blinded assessors. The risk of bias in outcome measurement is relatively small, so internal validity at the outcome evaluation stage is maintained.

Incomplete Outcome Data (Attrition Bias)

Almost all studies have a low risk of bias, with balanced drop-out rates between groups and intention-to-treat analysis or clear reporting of reasons for data loss. Data loss is not expected to significantly affect the direction or magnitude of the effect estimate.

Selective Reporting (Reporting Bias)

Most studies reported outcomes according to the initial protocol, although there was some uncertainty regarding the reporting of secondary outcomes. The risk of reporting bias existed but was limited and not strong enough to threaten the main conclusions.

Other Bias

Some studies show unclear to low risk, related to variations in intervention intensity, therapist experience, and patient exercise compliance. This variability may contribute to heterogeneity of effects, but does not systematically lead to a particular one-sided bias.

Risk of bias summary

General Interpretation of Risk of Bias (study level)

Based on the RoB matrix per study, the methodological quality of the included RCTs showed a low to moderate risk of bias profile, with consistent patterns across all key domains (Figure 3). In general, the greatest threat to internal validity came from performance bias, while

Table 2. Random Effect Model

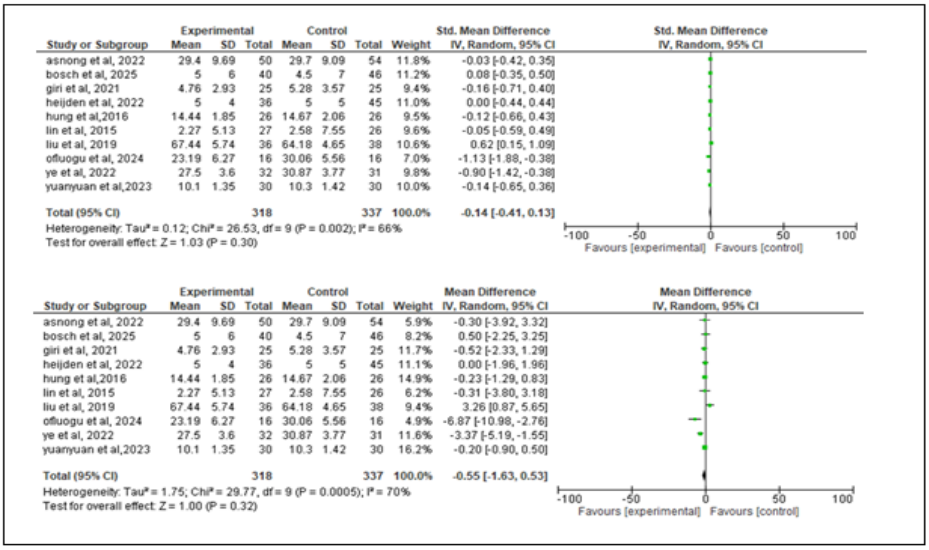
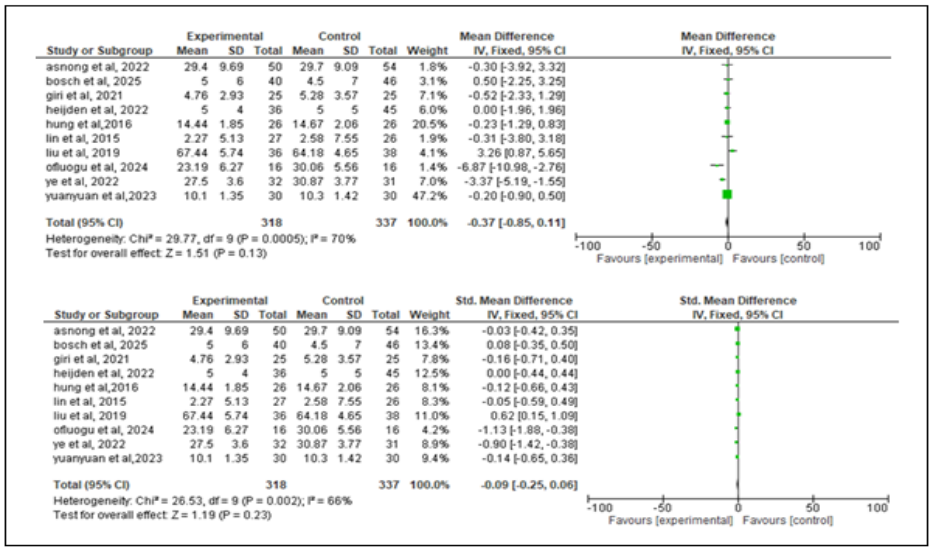


Table 3. Fixed-effect Model



other domains were relatively well controlled. This interpretation is realistic and unbiased, as it considers the limitations of non-pharmacological intervention (PFME) designs without reducing the weight of the available evidence.

Summary of Interpretation per RoB Domain

Random Sequence Generation (Selection Bias)

Most studies showed a low risk of bias, indicating adequate randomisation procedures (e.g. computer-generated randomisation). The risk of imbalance in baseline characteristics between groups is low; effect estimates are not distorted by initial selection bias.

Allocation Concealment (Selection Bias)

The majority of studies are at low risk, although some do not describe the concealment mechanism in detail. Residual selection bias is possible, but it is small and non-systematic.

Blinding of Participants and Personnel (Performance Bias)

Nearly all studies show a high risk of bias, as blinding is not possible in pelvic floor muscle training interventions. It is highly likely that the effects of the intervention are overestimated, especially for subjective outcomes (LARS score, urgency, frequency of bowel movements). The reported effects likely include components of the expectancy effect and attention bias, in addition to the pure physiological effects of PFME.

Blinding of Outcome Assessment (Detection Bias)

Most studies were at low risk of bias, as they used standardised instruments (LARS score, Wexner) and/or separate assessors. The risk of measurement bias was low; results were relatively stable even without participant blinding.

Incomplete Outcome Data (Attrition Bias)

The majority of studies show low risk, with low and balanced drop-out rates, as well as clear reporting of reasons for data loss. Data loss is not expected to significantly affect the direction or magnitude of the effect.

Selective Reporting (Reporting Bias)

Most studies reported outcomes according to protocol, although some secondary outcomes were less explored. The risk of reporting bias exists but is limited; the main conclusions remain valid.

Other Bias

Most studies showed low risk, with the exception of variations in PFME intensity, therapist experience, and patient compliance. These variations contributed to clinical heterogeneity, not systematic bias.

Additional Assessment: Publication Bias

The number of RCTs available is relatively limited, namely 10 studies, so the funnel plot and Egger's test do not have sufficient statistical power. However, the available studies include positive and non-significant results and involve independent research centres. There is no strong evidence of publication bias, but moderate uncertainty remains due to the limited sample size of the

Table 4. Subgroup LARS Score

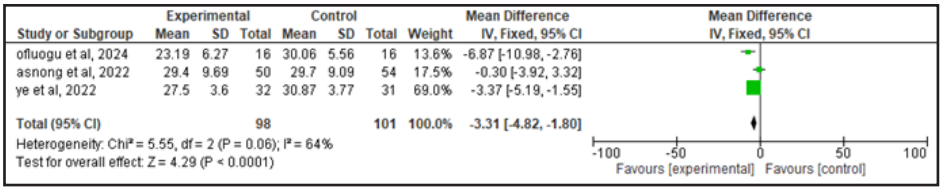


Table 5. Subgroup Wexner Score

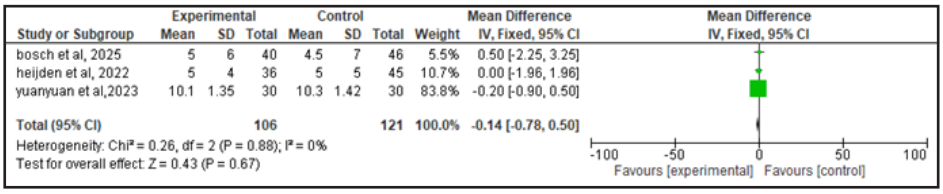
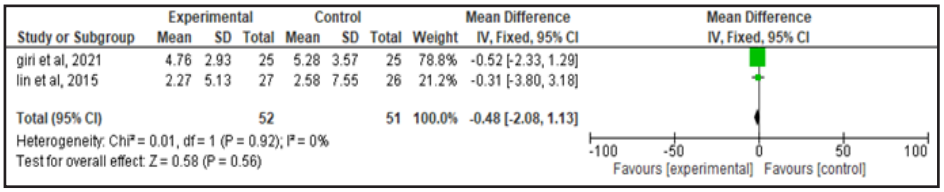


Table 6. Subgroup Cleveland clinical fecal incontinence



literature. The potential for over-representation of studies with positive results cannot be completely ruled out, so the interpretation of effect sizes should be conservative (Table 7).

Overall, the certainty of evidence for the effectiveness of PFME in patients with LARS is low to very low, depending on the type of outcome used. Although there is a trend towards a beneficial effect of PFME on some parameters, methodological limitations, outcome variability, and imprecision of results limit the strength of conclusions that can be drawn. Therefore, these findings support the use of PFME as an adjunct intervention in a multimodal rehabilitation approach, but emphasise the need for large-scale RCTs with primary outcome measures of LARS scores, standardised PFME protocols, and long-term follow-up to improve the certainty of evidence in the future.

Discussion

Interpretation of Findings

This meta-analysis indicates that PFME is associated with a small and statistically non-significant combined effect on functional outcomes in patients LARS. These findings suggest that, when evaluated as a standalone intervention, PFME may have limited efficacy in improving bowel function following rectal cancer surgery.

Several factors may explain the moderate and non-significant combined effect observed. Firstly, LARS is a multifactorial condition involving not only pelvic floor dysfunction but also changes in rectal compliance, reservoir dysfunction, and autonomic nervous system dysfunction [20-22]. Importantly, several oncological and surgical factors may significantly influence LARS outcomes, including neoadjuvant radiotherapy, anastomotic height, type of reconstruction, and temporary stoma formation. These variables were not consistently controlled across studies and may confound the observed effects of PFME. Thus, targeting a single physiological component via PFME alone may not be sufficient to produce clinically meaningful improvements. Secondly, variations in the timing of intervention initiation (early versus late rehabilitation) may influence outcomes, as neuromuscular adaptation and recovery trajectories differ across postoperative phases [23].

Comparison with Previous Evidence

The findings of this review are consistent with previous studies reporting heterogeneous and often inconclusive results regarding the effectiveness of PFME in the management of LARS. Although some individual clinical trials have demonstrated improvements in continence scores, these effects have not been consistently replicated across studies.

This inconsistency may reflect differences in intervention protocols, including exercise intensity, supervision, duration, and monitoring of adherence. Furthermore, previous reviews have also highlighted that

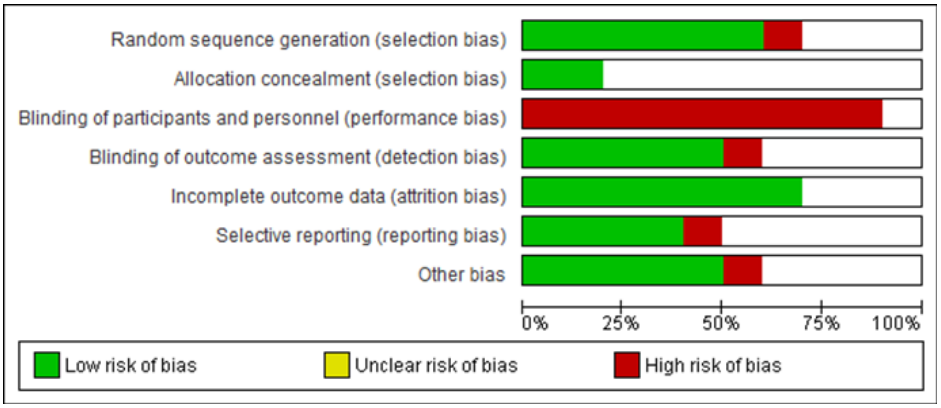


Figure 2. Risk of Bias Graph

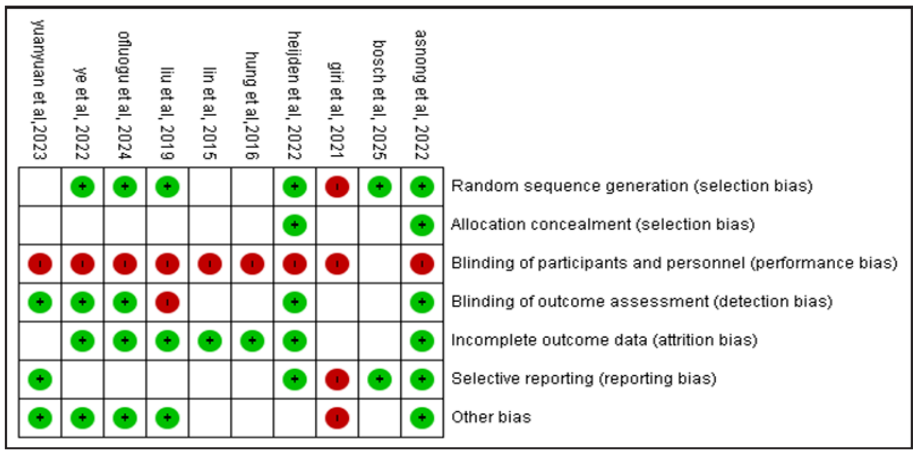


Figure 3. Risk of Bias Summary

PFME tends to show greater benefits when integrated with other rehabilitation strategies rather than when administered in isolation [24].

Heterogeneity and Methodological Considerations

Considerable heterogeneity was observed among the included studies, which may have contributed to the non-significant pooled estimates. This heterogeneity likely stems from several sources.

Clinical heterogeneity is evident in the variation in patient characteristics, including age, severity of LARS, type of surgery, and the presence of a temporary or permanent stoma. Methodological heterogeneity is also present, particularly in outcome measures such as the LARS score, the Wexner score and CCFI each of which captures different dimensions of bowel dysfunction [24-26].

Furthermore, differences in the implementation of interventions including supervised versus unsupervised PFME, session frequency, and duration of follow-up may further contribute to the variability in outcomes . These factors limit the comparability of the studies and reduce the precision of the pooled estimates.

Clinical Implications

Given the limited and non-significant combined effects, PFME should not be interpreted as a definitive standalone treatment for LARS. Rather, these findings suggest that PFME may be more appropriately regarded as one component within a broader multidisciplinary rehabilitation framework.

A multimodal approach combining PFME with dietary modifications, pharmacological therapy, biofeedback, and patient education may be more effective in addressing the complex and multifactorial nature of LARS [27-29]. In this context, PFME can contribute to improved function if integrated into a comprehensive care pathway, rather than being applied in isolation.

Crucially, the role of healthcare professionals, including nurses, should be viewed within this multidisciplinary framework, with a focus on patient education, behavioural support, and facilitating adherence, rather than as the sole determinant of the intervention's success [30].

Strengths and Weaknesses

This study has several strengths, including the use of a systematic methodology, inclusion of randomised controlled trials, and adherence to PRISMA guidelines. However, several limitations must be acknowledged.

First, the overall certainty of evidence was low, primarily due to risk of bias, inconsistency, and imprecision. Second, the small number of included studies limits the statistical power of the meta-analysis and precludes robust assessment of publication bias. Third, heterogeneity in outcome measures and intervention protocols reduces comparability across studies. These limitations suggest that the findings should be interpreted with caution.

Overall, compliance with PFME is not solely the responsibility of patients, but rather the result of educational and therapeutic interactions between patients and healthcare professionals. Nurses, through their roles as educators, technique facilitators, motivators, evaluators, and care coordinators, have a significant contribution in

Table 7. Quality of Evidence Assessment (GRADE)

Outcome	Number of Studies (RCT)	Participants (I/C)	Main Effect	Heterogeneity	Certainty (GRADE)
LARS score	3	98/101	Not significant, direction supports	64%	⊕⊕◯◯ Low
Wexner score	3	106/121	Not significant	0%	⊕⊕◯◯ Low
CCFI	2	52/51	Not significant	0%	⊕⊕◯◯ Low
FIQL	1	26/26	Limited improvement	NA	⊕◯◯◯ Very Low
MSKCC score	1	36/38	Not significant	NA	⊕◯◯◯ Very Low

Legenda GRADE: ⊕⊕⊕⊕ = High , ⊕⊕⊕◯ = Moderate, ⊕⊕◯◯ = Low, ⊕◯◯◯ = Very Low

optimising the implementation of PFME. With systematic and continuous support strategies, the potential benefits of PFME in reducing LARS symptoms can be maximised, even though the current evidence of effectiveness still has a low level of certainty.

In conclusion, this systematic review and meta-analysis demonstrated that pelvic floor muscle exercise (PFME) is associated with a small and statistically non-significant effect on functional outcomes in patients with low anterior resection syndrome (LARS). These findings suggest that PFME, when delivered as a standalone intervention, does not provide clear clinical benefit based on the current body of evidence.

The limited effectiveness observed may be explained by the multifactorial nature of LARS, which involves complex interactions between structural, neurological, and functional impairments that are unlikely to be adequately addressed by a single therapeutic approach. Furthermore, the presence of substantial clinical and methodological heterogeneity across studies reduces the precision and generalisability of the pooled estimates.

In light of these findings, PFME should not be regarded as a definitive treatment for LARS. Rather, it may be considered as a complementary component within a broader multidisciplinary rehabilitation strategy, incorporating dietary management, pharmacological interventions, and behavioural approaches.

The overall certainty of the evidence remains low, and therefore the findings should be interpreted with caution. Future research should prioritise well-designed, adequately powered randomised controlled trials with standardised intervention protocols and consistent outcome measures, as well as investigations evaluating PFME within multimodal rehabilitation frameworks.

Recommendations

Further research should focus on developing standardised PFME protocols in terms of intensity, frequency, duration, and supervision methods to reduce heterogeneity between studies. Clinical trials with larger sample sizes and long-term follow-up are essential to improve the precision of effect estimates. The use of objective outcomes such as anorectal manometry or electromyographic assessment may also strengthen the validity of findings.

In clinical practice, PFME is recommended as part of a multimodal rehabilitation programme rather than as a single intervention. An integrated approach with bowel behaviour education and lifestyle modification is likely to be more effective in addressing the complexity of LARS.

For the nursing profession, there is a need to develop evidence-based clinical guidelines on the implementation of PFME in patients after low anterior resection. Training programmes for nurses on supervision techniques and strategies to improve patient compliance are also recommended to ensure the quality of intervention implementation in the field.

With improvements in research methodology and optimisation of clinical implementation, the contribution of PFME to the rehabilitation of LARS patients can be evaluated more accurately and has the potential to provide more meaningful clinical impact in the future.

Declaration of Interest

There is no conflict of interest in this study.

Declaration on generative AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to improve the English language, grammar, readability, and writing style. All scientific content, interpretation of the findings, study design, data analysis, and conclusions were developed and verified by the authors. The authors carefully reviewed and edited all AI-generated suggestions and take full responsibility for the final content of this manuscript.

Originality Declaration for Figures

All figures included in this manuscript are original and have been created by the authors specifically for the purposes of this study. No previously published or copyrighted images have been used. The authors confirm that all graphical elements, illustrations, and visual materials were generated from the data obtained in the course of this research or designed uniquely for this manuscript.

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