

COMPARATIVE EFFECTS OF SUPERVISED VERSUS HOME-BASED
PELVIC FLOOR MUSCLE TRAINING ON FUNCTIONAL DISABILITY AND
QUALITY OF LIFE AMONG WOMEN WITH URINARY INCONTINENCE
IN THIRD TRIMESTER OF PREGNANCY: A RANDOMIZED
CONTROLLED TRIAL

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Abstract

Background: Urinary incontinence (UI) is common during pregnancy and may adversely affect physical functioning and quality of life. Pelvic floor muscle training (PFMT) is an established intervention; however, access to supervised physiotherapy may be limited. This study compared the effects of supervised and home-based PFMT on UI-related functional disability and quality of life among women in the third trimester of pregnancy.

Methods: In this randomized controlled trial, 34 pregnant women aged 25–35 years with UI were randomly allocated to supervised PFMT (n=17) or home-based PFMT (n=17) for 6 weeks. Outcomes were assessed using the King's Health Questionnaire (KHQ) and Incontinence Impact Questionnaire-7 (IIQ-7). Within- and between-group differences were analysed using appropriate parametric and non-parametric tests.

Results: Both groups demonstrated significant improvements following the intervention ($p < 0.001$). KHQ Severity Measures scores decreased from 37.25 ± 18.43 to 9.80 ± 11.50 in the supervised group and from 35.29 ± 13.35 to 22.55 ± 15.80 in the home-based group. A significant between-group difference was observed ($p = 0.002$). Similarly, IIQ-7 scores decreased from 56.58 ± 21.55 to 15.41 ± 14.54 in the supervised group and from 55.46 ± 16.49 to 33.33 ± 23.14 in the home-based group ($p < 0.001$ for both groups), with a significant between-group difference ($p = 0.002$). Significant between-group differences were also observed in KHQ domains including Incontinence Impact, Social Limitations, Personal Relationships, Sleep/Energy, and Severity Measures.

Conclusion: Six weeks of both supervised and home-based PFMT significantly improved UI-related quality of life and functional impairment in pregnant women during the third trimester. Supervised PFMT produced

greater improvements in overall outcomes and may provide additional benefits compared with home-based training.

1. INTRODUCTION

Urinary incontinence (UI), defined as involuntary leakage of urine, is a common problem among women that can adversely affect physical functioning, social participation, psychological well-being, and health-related quality of life [1,2]. Although generally not life-threatening, UI may cause embarrassment, reduced self-confidence, psychological distress, and limitations in daily activities [2,3]. Pregnancy increases the risk of UI because of hormonal and physiological changes, increased intra-abdominal pressure, and mechanical loading of the bladder and pelvic floor associated with the growing uterus [4,5]. The prevalence and severity of UI during pregnancy vary according to population characteristics, diagnostic criteria, gestational age, and assessment methods, with symptoms often becoming more pronounced as pregnancy progresses [4].

UI during pregnancy may restrict physical activity, social participation, personal relationships, and emotional well-being [4,5]. However, many women do not report urinary symptoms because leakage may be perceived as a normal consequence of pregnancy or because embarrassment, sociocultural concerns, and limited access to appropriate healthcare discourage disclosure [3,6]. These barriers may be particularly important where specialised women's health physiotherapy services are not readily available [6]. Maternal health and well-being are also influenced by knowledge, health-related perceptions, and access to appropriate information and support, highlighting the importance of comprehensive health education and supportive antenatal care during pregnancy [3]. During the third trimester, increasing uterine size and weight may further increase mechanical pressure on the bladder and pelvic floor, potentially worsening symptoms and their effects on daily functioning and quality of life [4,5]. Adequate nutrition and healthy dietary patterns are also important components of maintaining overall maternal health and well-being during pregnancy and should be considered

alongside physical activity and other antenatal health interventions [9]

Pelvic floor muscle training (PFMT) is an established conservative physiotherapy intervention for UI. Repeated voluntary contraction and relaxation of the pelvic floor muscles can improve muscle strength, endurance, coordination, and functional control, while providing a non-invasive and relatively low-cost treatment option [1,7]. The effectiveness of PFMT may, however, depend on how the programme is delivered. Supervised PFMT enables physiotherapists to provide individualised instruction, assess exercise technique, monitor adherence, correct errors, and provide ongoing motivation [1,7]. Evidence from systematic review and meta-analysis suggests that supervised PFMT may produce greater improvements in UI symptoms than unsupervised training [7].

In contrast, home-based PFMT provides women with greater flexibility and may reduce barriers related to transportation, time, treatment costs, and limited availability of physiotherapy services [1,6]. Nevertheless, the absence of professional supervision may affect exercise technique, progression, and adherence [1,7]. Comparative evidence remains inconsistent. Mishra et al. reported improvements following both supervised and home-based PFMT, with greater effects observed in the home-based group [1]. Similarly, a randomised controlled trial among urban Omani women demonstrated that home-based PFMT could reduce stress UI symptoms and improve quality of life [8]. These findings indicate that home-based PFMT may represent a practical alternative, while supervised programmes may offer additional benefits through professional monitoring and technique correction.

Functional disability and quality of life are important outcomes when evaluating UI because urinary leakage can interfere with physical activity, household tasks, travel, sleep, social participation, and interpersonal relationships [4,5]. The King's Health Questionnaire (KHQ) is a disease-specific

instrument used to assess the impact of UI on health-related quality of life, with established reliability and validity in women with UI [10,11]. The Incontinence Impact Questionnaire-7 (IIQ-7) is another commonly used instrument for evaluating the effects of UI on daily functioning and activity-related impairment.

Although evidence supports PFMT as a conservative treatment for UI, uncertainty remains regarding the relative effects of supervised and home-based programmes specifically among women with UI during late pregnancy [1,7,8]. Existing studies have largely examined women with UI generally or evaluated PFMT without directly comparing these delivery approaches in the third trimester. This represents an important clinical gap because accessibility, adherence, exercise technique, and professional monitoring may influence treatment outcomes during late pregnancy.

Therefore, this randomised controlled trial compared the effects of supervised versus home-based PFMT on functional disability and quality of life among women with UI in the third trimester of pregnancy. The study further examined whether supervised training provided additional benefits through professional guidance, monitoring, and adherence support. Findings may assist physiotherapists and other healthcare professionals in selecting practical PFMT delivery strategies and support the integration of pelvic floor rehabilitation into antenatal care.

2. CRITICAL ANALYSIS OF PREVIOUS LITERATURE

Previous evidence broadly supports pelvic floor muscle training (PFMT) as an effective conservative approach for urinary incontinence (UI), although the magnitude of benefit appears to depend on training delivery, adherence, and patient characteristics. Mishra et al. [1] reported significant improvements in urinary incontinence and quality of life, with post-hoc findings favouring supervised PFMT over home-based training, suggesting that professional monitoring may improve exercise performance and adherence. However, evidence also indicates that PFMT

outcomes are not necessarily dependent on a specific exercise position. Borello-France et al. [15] found comparable benefits from supine and combined supine/upright training, with improvements in continence, pelvic floor muscle strength, and quality of life. Similarly, higher self-efficacy for performing pelvic floor exercises has been associated with fewer urinary symptoms, leakage episodes, and quality-of-life limitations, highlighting the importance of behavioural factors in treatment response [16]. Maintenance of treatment effects has also been demonstrated following intensive PFMT, although the optimal frequency of subsequent exercise remains uncertain [17]. Collectively, these findings support PFMT as an effective intervention but indicate that exercise adherence, self-efficacy, supervision, and programme structure may influence clinical outcomes.

Evidence from pregnancy and postpartum populations further supports PFMT and related exercise approaches, but methodological and clinical heterogeneity limits direct comparison between intervention strategies. Home-based pelvic floor stabilisation improved pelvic floor muscle strength, functional disability, and pain in postpartum women with stress UI and low back pain, suggesting that remotely performed programmes can be clinically useful where physiotherapy access is limited [18]. Yu et al. [19] similarly reported beneficial effects of core stabilisation exercises on urinary symptoms, pelvic floor muscle strength and endurance, voiding function, quality of life, and transversus abdominis function among pregnant and postpartum women. Khorasani et al. [20], in a systematic review and meta-analysis of 26 trials, found that physiotherapy and PFMT generally reduced the incidence or severity of pregnancy-related UI, although substantial heterogeneity was observed in pelvic floor muscle strength outcomes ($I^2=90.02\%$). Soave et al. [22] also identified beneficial effects of PFMT during pregnancy and postpartum, particularly in studies with clearer instructions, better compliance, larger samples, and follow-up. However, the methodological quality of the available evidence was variable. Ren

et al. [24] similarly concluded that PFMT may prevent pelvic floor dysfunction during late pregnancy and early postpartum, while emphasising the importance of regular practice and personalised programmes. More recent evidence from Abdelmohmoud et al. [21] suggests that PFMT may reduce postpartum UI and improve quality of life, but adherence remains an important determinant of effectiveness and supervised or technology-enhanced approaches may provide additional benefits. Conversely, Habib et al. [23] demonstrated the practical limitation of home-based training, reporting a 63.4% dropout rate associated with poor adherence, despite favourable continence outcomes among participants who completed follow-up.

Despite the generally positive evidence for PFMT, an important gap remains concerning the direct comparison of supervised and home-based PFMT specifically in women with UI during the third trimester of pregnancy. Existing studies have examined supervised versus home-based training in broader UI populations [1], investigated home-based PFMT or stabilisation programmes in pregnancy or postpartum populations [18,23], or evaluated PFMT as a general intervention without directly comparing delivery modes [19–24]. Furthermore, previous literature demonstrates inconsistency regarding whether supervision provides greater benefit, while adherence and self-efficacy appear to be important modifiers of treatment response [1,16,21,23]. Much of the available evidence also focuses on UI symptoms, pelvic floor muscle strength, or prevention of postpartum dysfunction rather than simultaneously examining functional disability and UI-specific quality of life during late pregnancy. Evidence from Pakistan is comparatively limited, particularly regarding supervised versus home-based PFMT in women with third-trimester UI. Therefore, the present randomised controlled trial was designed to address this gap by directly comparing six weeks of supervised and home-based PFMT and evaluating their effects on functional disability and quality of

life among women with UI in the third trimester of pregnancy.

AIM, OBJECTIVES AND HYPOTHESIS

The study aimed to compare the effectiveness of supervised versus home-based pelvic floor muscle training (PFMT) on urinary incontinence-related quality of life and functional impact among women in the third trimester of pregnancy. Specifically, it assessed changes in health-related quality of life using the King's Health Questionnaire (KHQ) and the impact of urinary incontinence on daily activities and functional limitations using the Incontinence Impact Questionnaire-7 (IIQ-7) before and after the intervention. The alternative hypothesis (H_1) stated that a significant difference would exist between supervised and home-based PFMT in terms of urinary incontinence-related quality of life and functional impact, whereas the null hypothesis (H_0) stated that no significant difference would exist between the two interventions.

3. MATERIALS AND METHODS

STUDY DESIGN AND PARTICIPANTS

A randomized controlled trial was conducted to compare supervised and home-based pelvic floor muscle training (PFMT) among pregnant women with urinary incontinence (UI). The study was conducted in the gynecology ward of Abdullah Hospital, Lahore, Pakistan, over a period of six months following approval of the research proposal. Each participant received the allocated intervention for six weeks. A total of 34 women were recruited using purposive sampling and randomly allocated into two equal groups, with 17 participants in each group. The sample size was calculated using G*Power version 3.1.9.7, with an alpha level of 0.05 and statistical power of 80%.

ELIGIBILITY CRITERIA

Women were eligible if they were aged 25–35 years, pregnant in the third trimester, diagnosed with UI by a gynaecologist, able to understand and perform PFMT, willing to participate and provide informed consent, and had moderate UI-related

functional and quality-of-life impairment according to the selected outcome measures. Women were excluded if they had contraindications to exercise during pregnancy, previous treatment for UI, neurogenic bladder or other neurological conditions affecting bladder function, a history of miscarriage or pregnancy complications contraindicating exercise, or any medical condition preventing participation in the exercise programme.

VARIABLES AND OUTCOMES

The independent variable was the mode of PFMT delivery, comprising supervised PFMT and home-based PFMT. The primary outcome domains were UI-related functional impact and health-related quality of life. These were assessed using the Incontinence Impact Questionnaire-7 (IIQ-7) and King's Health Questionnaire (KHQ), respectively, before and after the six-week intervention.

OUTCOME MEASUREMENT TOOLS AND SCORING CRITERIA

Two standardised outcome measurement tools were used to assess the effects of the intervention. The King's Health Questionnaire (KHQ) was used to evaluate urinary incontinence-related health-related quality of life. It is a 21-item, condition-specific questionnaire comprising nine domains: general health perception, incontinence impact, role limitations, physical limitations, social limitations, personal relationships, emotions, sleep/energy, and severity measures. Each domain is scored on a 0–100 scale, with 0 representing the least impact and 100 representing the greatest impact of urinary incontinence. Therefore, a higher KHQ score indicates poorer quality of life and greater impairment. The KHQ was completed at baseline and after the six-week intervention [25]. The Incontinence Impact Questionnaire-7 (IIQ-7) was used to assess the effect of urinary incontinence on daily activities and functional and psychosocial well-being. The questionnaire contains seven items covering four domains: physical activity (items 1–2), travel (items 3–4), social relationships (item 5), and emotional health (items 6–7). Each item is scored from 0 to 3, where

0 = not at all, 1 = slightly, 2 = moderately, and 3 = greatly. The item scores are summed to obtain the overall raw score, with higher scores indicating a greater negative impact of urinary incontinence on daily functioning and quality of life. The IIQ-7 was administered before and after the intervention [26].

For interpretation of the IIQ-7 in the present study, the reported scoring criteria were <50 = good quality of life, 50–70 = moderate quality of life, and >70 = poor quality of life. Thus, a reduction in the IIQ-7 score following treatment represented a reduction in the functional and psychosocial impact of urinary incontinence and an improvement in quality of life [26].

Both instruments have demonstrated satisfactory reliability and validity for evaluating the impact of urinary incontinence. The KHQ has reported Cronbach's alpha values above 0.85 across most domains, with evidence of validity through correlations with SF-36 domains; reported sensitivity for detecting subjective cure ranged from 63% to 100%, with specificity of 82%–88% [25]. The IIQ-7 has demonstrated good internal consistency (Cronbach's alpha 0.87–0.90) and test-retest reliability (ICC 0.79–0.91), with additional evidence supporting its construct validity [26].

RANDOMISATION AND BLINDING

Following eligibility screening and baseline assessment, participants were randomly allocated in a 1:1 ratio using a computer-generated random sequence to either Group A (supervised PFMT) or Group B (home-based PFMT). The outcome assessor was blinded to group allocation to minimise assessment bias. Participants were aware of their assigned exercise programme but were not involved in outcome assessment or data analysis.

DATA COLLECTION AND INTERVENTION PROCEDURE

Following ethical approval and written informed consent, eligible participants underwent demographic assessment and completed the KHQ and IIQ-7 at baseline. Both groups received standardised education regarding UI, pelvic floor

muscle function, correct muscle contraction, breathing and relaxation, and the importance of adherence. The intervention was delivered for 6 weeks, twice weekly, with each session lasting approximately 30 minutes and including 1-2-minute rest periods after every 10 minutes of exercise. Post-intervention assessment was performed using the same outcome measures.

Participants allocated to Group A received a standardised pelvic floor muscle training (PFMT) programme under the direct supervision of a qualified physiotherapist. The same PFMT exercises were prescribed to both intervention groups to ensure consistency, with supervision being the primary difference in delivery. Participants performed Kegel exercises by voluntarily contracting the pelvic floor muscles as if attempting to stop the flow of urine or faeces, holding each contraction for 3-5 seconds followed by 3-5 seconds of relaxation, with 10-15 repetitions performed per set. The duration of contraction was progressively increased according to individual tolerance and ability. Participants also performed quick flicks involving rapid contraction and relaxation of the pelvic floor muscles, with each contraction maintained for approximately 1-2 seconds. Pelvic floor muscle activation was additionally practised during functional activities, including sitting, standing, walking, and other daily functional movements. Diaphragmatic and controlled breathing exercises were incorporated to facilitate appropriate breathing patterns and pelvic floor muscle relaxation. The exercise programme was progressively intensified according to each participant's tolerance and functional capacity. Throughout the supervised sessions, the physiotherapist monitored exercise technique, corrected inappropriate muscle activation, and provided verbal feedback and guidance to promote correct performance and adherence [27,28].

Participants allocated to Group B received the same standardised PFMT programme following initial instruction by a qualified physiotherapist; however, all subsequent exercises were performed independently at home without direct supervision.

The type of exercises, number of repetitions, contraction and relaxation duration, and progression criteria were identical to those used in Group A. Participants performed Kegel exercises consisting of 3-5-second pelvic floor muscle contractions followed by 3-5 seconds of relaxation, with 10-15 repetitions per set and progressive increases in contraction duration according to tolerance. Quick flicks were performed through rapid pelvic floor muscle contractions and relaxations, with each contraction maintained for approximately 1-2 seconds. Participants were also instructed to activate the pelvic floor muscles appropriately during functional activities such as sitting, standing, walking, and other daily movements. Diaphragmatic and controlled breathing exercises were included to promote relaxation and appropriate coordination between respiration and pelvic floor muscle activity. The home-based programme was progressively advanced using the same criteria applied to the supervised group. Participants received written instructions and maintained an exercise diary to record their adherence to the prescribed programme [29,30].

INTERVENTION SCHEDULE

The intervention lasted six weeks, with two sessions per week and approximately 30 minutes per session. A 1-2-minute rest period was provided after each 10 minutes of exercise. The supervised group completed the programme under physiotherapist supervision, whereas the home-based group independently performed the prescribed exercises at home.

STATISTICAL ANALYSIS

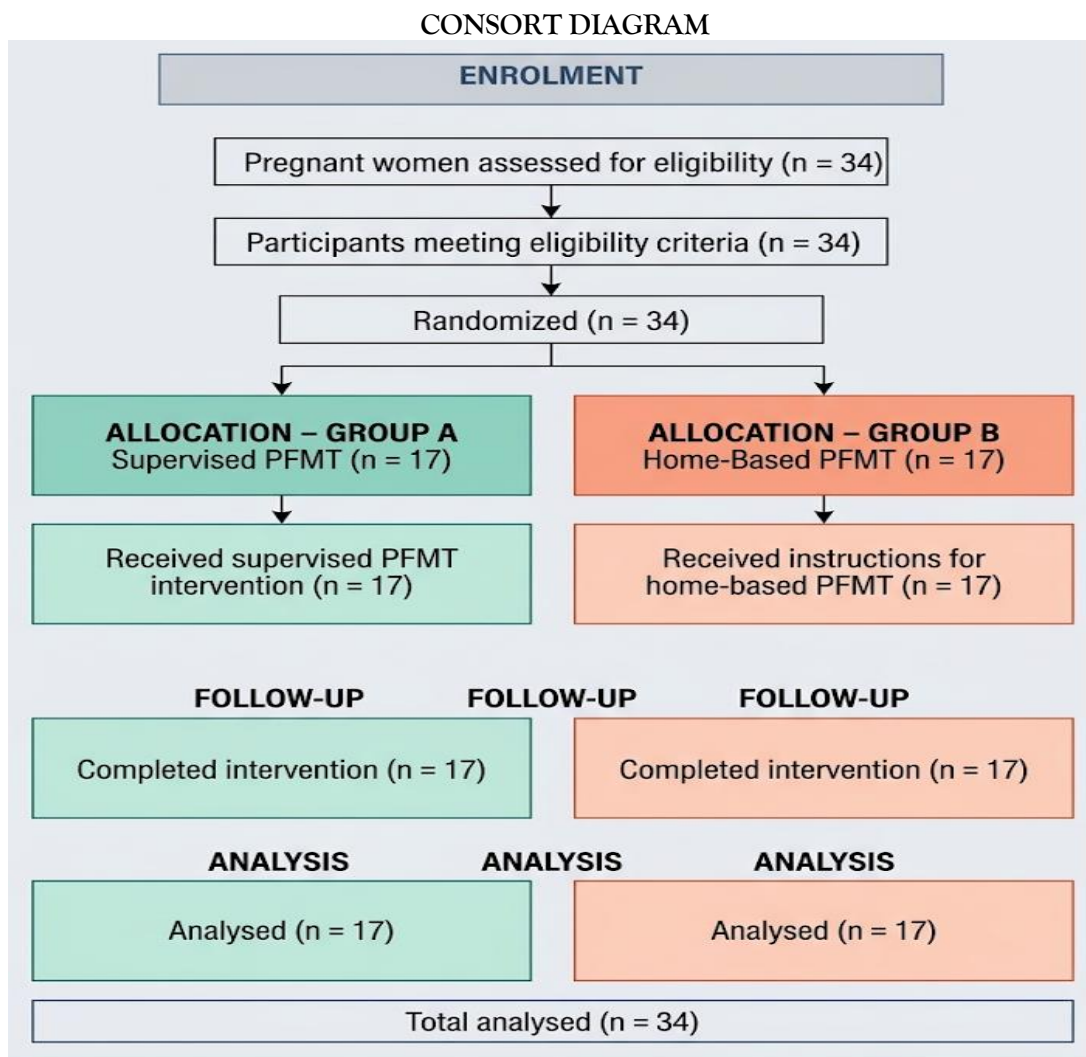
Data were analysed using SPSS. Continuous variables were summarised as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequencies and percentages. Normality was assessed using the **Shapiro-Wilk test**. For normally distributed data, paired-samples *t*-tests were used for within-group pre- and post-intervention comparisons, while independent-samples *t*-tests were used for between-group

comparisons. A p -value ≤ 0.05 was considered statistically significant.

ETHICAL CONSIDERATIONS

Institutional Review Board approval was obtained before commencement of the study. All participants received information regarding the study purpose, procedures, potential benefits, and

possible risks and provided written informed consent. Participant confidentiality and privacy were maintained throughout the study, and collected information was used solely for research purposes. Participation was voluntary, and participants were informed of their right to withdraw from the study at any time without consequence.



4. RESULTS

Table 1. Baseline Demographic and Clinical Characteristics of Participants

Variable	Supervised PFMT (n=17)	Home-based PFMT (n=17)
Age, years	29.76 ± 2.73	29.53 ± 2.87
Gestational age, weeks	33.12 ± 1.83	33.35 ± 1.54

Pre-pregnancy BMI, kg/m ²	27.74 ± 3.35	28.65 ± 4.51
Gravidity, median (IQR)	2.00 (2.00)	2.00 (1.00)
Parity, median (IQR)	2.00 (2.00)	1.00 (1.00)
Duration of UI, n (%)		
<3 months	3 (17.6)	3 (17.6)
3–6 months	6 (35.3)	6 (35.3)
7–12 months	5 (29.4)	5 (29.4)
>12 months	3 (17.6)	3 (17.6)
Employment status, n (%)		
Homemaker/Unemployed	8 (47.1)	9 (52.9)
Employed	7 (41.2)	6 (35.3)
Self-employed	2 (11.8)	2 (11.8)

PFMT, pelvic floor muscle training; BMI, body mass index; UI, urinary incontinence; IQR, interquartile range.

As shown in Table 1, the two groups demonstrated broadly comparable baseline demographic and clinical characteristics. The mean age was 29.76±2.73 years in the supervised PFMT group and 29.53±2.87 years in the home-based PFMT group, while the mean gestational age was 33.12±1.83 and 33.35±1.54 weeks, respectively. Mean pre-pregnancy BMI was 27.74±3.35 kg/m² in the supervised group and 28.65±4.51 kg/m² in the home-based group. Median gravidity was 2.00 in both groups, whereas

median parity was 2.00 in the supervised group and 1.00 in the home-based group. The distribution of UI duration was identical between groups, with the highest proportion reporting symptoms for 3–6 months (35.3%). Homemakers/unemployed participants constituted the largest employment category in both groups, accounting for 47.1% of the supervised group and 52.9% of the home-based group. Overall, the baseline characteristics are presented in Table 1.

Table 2. Pre- and Post-Intervention KHQ and IIQ-7 Scores

Outcome Measure	Group	Before Intervention, Mean ± SD	After Intervention, Mean ± SD
KHQ Total Score	Supervised PFMT (n=17)	38.91 ± 14.79	10.64 ± 9.68
	Home-based PFMT (n=17)	38.13 ± 11.17	22.02 ± 11.34
IIQ-7 Total Score	Supervised PFMT (n=17)	56.58 ± 21.55	15.41 ± 14.54
	Home-based PFMT (n=17)	55.46 ± 16.49	33.33 ± 23.14

KHQ, King's Health Questionnaire; IIQ-7, Incontinence Impact Questionnaire-7; PFMT, pelvic floor muscle training; SD, standard deviation.

As presented in Table 2, both groups demonstrated reductions in KHQ and IIQ-7 scores following the six-week intervention. The KHQ total score decreased from 38.91±14.79 to 10.64±9.68 in the supervised PFMT group and from 38.13±11.17 to 22.02±11.34 in the home-

based PFMT group. Similarly, the IIQ-7 score decreased from 56.58±21.55 to 15.41±14.54 in the supervised group and from 55.46±16.49 to 33.33±23.14 in the home-based group. Because lower scores on both measures indicate less impact of urinary incontinence, the findings indicate

improvement in both groups, with a greater numerical reduction observed in the supervised PFMT group.

Table 3. Within-Group Comparison of KHQ and IIQ-7 Scores

Outcome Measure	Group	Pre-intervention Mean $\pm$ SD	Post-intervention Mean $\pm$ SD	tvalue	p-value
KHQ Total Score	Supervised PFMT (n=17)	42.17 $\pm$ 10.89	19.34 $\pm$ 11.91	8.093	<0.001*
	Home-based PFMT (n=17)	34.86 $\pm$ 14.03	13.33 $\pm$ 11.40	10.999	<0.001*
IIQ-7 Total Score	Supervised PFMT (n=17)	56.58 $\pm$ 21.55	15.41 $\pm$ 14.54	9.170	<0.001*
	Home-based PFMT (n=17)	55.46 $\pm$ 16.49	33.33 $\pm$ 23.14	6.303	<0.001*

Significant at $p \leq 0.05$. KHQ, King's Health Questionnaire; IIQ-7, Incontinence Impact Questionnaire-7; PFMT, pelvic floor muscle training; SD, standard deviation.

As shown in Table 3, both groups demonstrated statistically significant reductions in KHQ and IIQ-7 scores following the six-week intervention.

Significant improvements were observed for both the supervised and home-based PFMT groups, with $p < 0.001$ for all comparisons.

Table 4. Between-Group Comparison of Changes in KHQ and IIQ-7 Scores

Outcome Measure	Group	n	Mean Change $\pm$ SD	tvalue	p-value
KHQ Total Score	Supervised PFMT	17	22.84 $\pm$ 11.64	0.381	0.706
	Home-based PFMT	17	21.53 $\pm$ 8.07		
IIQ-7 Total Score	Supervised PFMT	17	41.18 $\pm$ 18.51	3.342	0.002*
	Home-based PFMT	17	22.13 $\pm$ 14.48		

Significant at $p \leq 0.05$. KHQ, King's Health Questionnaire; IIQ-7, Incontinence Impact Questionnaire-7; PFMT, pelvic floor muscle training; SD, standard deviation.

As presented in Table 4, the mean change in KHQ score was 22.84 $\pm$ 11.64 in the supervised group and 21.53 $\pm$ 8.07 in the home-based group, with no statistically significant difference between groups ($t=0.381$, $p=0.706$). In contrast, the supervised

PFMT group demonstrated a significantly greater reduction in IIQ-7 score than the home-based group (41.18 $\pm$ 18.51 vs. 22.13 $\pm$ 14.48; $t=3.342$, $p=0.002$).

Table 5. Test of Normality Using the Shapiro-Wilk Test

Variable	Supervised PFMT W	p-value	Interpretation	Home-based PFMT W	p-value	Interpretation
KHQ Total Score - Pre	0.946	0.299	Normal	0.943	0.208	Normal
KHQ Total Score - Post	0.919	0.059	Normal	0.979	0.751	Normal
Change in KHQ Total Score	0.941	0.222	Normal	0.970	0.467	Normal

IIQ-7 Total Score - Pre	0.944	0.372	Normal	0.930	0.218	Normal
IIQ-7 Total Score - Post	0.866	0.019	Non-normal	0.943	0.354	Normal
Change in IIQ-7 Total Score	0.985	0.988	Normal	0.931	0.225	Normal

PFMT, pelvic floor muscle training; KHQ, King's Health Questionnaire; IIQ-7, Incontinence Impact Questionnaire-7. $p < 0.05$ indicates statistically significant departure from normality.

Results Description

As shown in Table 5, the Shapiro-Wilk test indicated that the majority of outcome variables were normally distributed in both groups ($p > 0.05$). The only exception was the post-intervention IIQ-7 score in the supervised PFMT group, which demonstrated a significant departure from normality ($W = 0.866$, $p = 0.019$). The change scores for both KHQ and IIQ-7 were normally distributed in both groups. Based on the normality assessment, parametric tests were used for the primary within- and between-group comparisons where their assumptions were satisfied.

4. DISCUSSION

The present randomized controlled trial compared supervised and home-based pelvic floor muscle training (PFMT) among 34 women with urinary incontinence (UI) in the third trimester of pregnancy. Both interventions produced significant within-group improvements in several domains of the King's Health Questionnaire (KHQ) and in the Incontinence Impact Questionnaire-7 (IIQ-7), indicating reduced urinary-incontinence-related burden and improved quality of life following six weeks of training. However, significant between-group differences were observed for KHQ Incontinence Impact, Social Limitations, Personal Relationships, Sleep/Energy and Severity Measures, as well as the IIQ-7 total score, with greater improvement in the supervised group. These findings suggest that although PFMT can be beneficial when performed independently at home, professional supervision may provide additional benefits for selected quality-of-life and functional outcomes. This interpretation is consistent with Mishra et al. (2022), who reported

significant improvements following PFMT and greater post-intervention benefits in the supervised group, supporting the potential importance of exercise monitoring and adherence (32). Similarly, previous evidence has demonstrated that PFMT can improve urinary symptoms and quality of life during pregnancy, although variations in intervention protocols, adherence and methodological quality make direct comparisons between studies difficult (20,22).

The improvement observed in KHQ domains provides further evidence that PFMT may influence multiple aspects of daily life affected by UI rather than urinary symptoms alone. Significant within-group improvements were identified in General Health, Physical Limitations and Emotional domains in both groups, whereas greater between-group differences were observed for Incontinence Impact, Social Limitations and Personal Relationships in favour of supervised training. These findings are broadly consistent with Kharaji et al. (2023), who reported beneficial effects of both supervised and unsupervised PFMT on quality-of-life outcomes, while supervised approaches demonstrated greater improvements in some domains (33,34). The present findings also correspond with Kamali et al. (2023), who reported improvements across several KHQ domains following supervised PFMT delivered through videoconferencing, suggesting that professional guidance may facilitate more effective exercise performance even when direct face-to-face treatment is not provided (35). However, the absence of significant between-group differences in General Health, Physical Limitations and Emotional scores indicates that supervision did not confer an additional statistically demonstrable benefit across every quality-of-life domain. This

distinction is important because significant improvement within each group does not necessarily indicate superiority of one intervention over another.

The significant improvement in KHQ Severity Measures in both groups, together with the greater reduction observed in the supervised group, is consistent with evidence supporting PFMT during pregnancy. Jinapun and Sangnucktham (2024) reported that PFMT during the third trimester reduced urinary symptoms and improved quality of life compared with standard care, supporting the clinical relevance of pelvic floor strengthening during late pregnancy (37). The improvement in Sleep/Energy and Social Limitations observed in the current study may also reflect the broader consequences of reducing urinary leakage and its associated restrictions. Molina-Torres et al. (2023) similarly reported improvements following a pelvic-floor exercise programme, although differences in intervention duration and participant characteristics limit direct comparison with the present six-week protocol (36). Earlier evidence has also suggested that the benefits of PFMT are influenced by adherence and regular exercise practice, which may partly explain differences between supervised and home-based approaches (22-24). Habib et al. (2018), for example, identified poor adherence as a major limitation of home-based PFMT during pregnancy, despite favourable outcomes among participants who completed the intervention (23). Therefore, the additional improvement observed in selected domains in the supervised group may plausibly be related to closer monitoring, reinforcement of correct contraction technique and improved adherence, although these mechanisms were not directly measured in the present study.

The IIQ-7 findings provide additional support for the functional benefits of PFMT. Both groups demonstrated significant reductions in IIQ-7 scores after the intervention, indicating a lower impact of urinary incontinence on daily activities and quality of life. Importantly, the between-group difference was statistically significant, with a substantially greater reduction in the supervised

group. This finding is consistent with Matuszewski et al. (2023) and Hwang et al. (2023), who reported improvements in IIQ-7 outcomes following pelvic floor muscle interventions, demonstrating that PFMT can reduce the functional and psychosocial burden associated with urinary incontinence (38,39). The current results also complement evidence linking pelvic floor exercise adherence and self-efficacy with fewer urinary symptoms and lower quality-of-life impairment (16). Nevertheless, the benefit of home-based PFMT should not be overlooked. Khorasani et al. (2020) found that a home-based pelvic-floor-focused exercise programme improved functional disability and related outcomes in postpartum women, while Yu et al. (2023) reported beneficial effects of exercise-based interventions on urinary symptoms, pelvic floor muscle function and quality of life among pregnant and postpartum women (18,19). Thus, home-based PFMT may represent a practical alternative where regular physiotherapy access is limited, although supervision may be particularly useful for improving adherence and ensuring correct performance.

The findings should also be interpreted in the context of the broader literature. Khorasani et al. (2018) reported overall beneficial effects of physiotherapy and PFMT for pregnancy-related urinary incontinence but highlighted considerable heterogeneity, particularly in pelvic floor muscle strength outcomes (20). Ren et al. (2020) similarly emphasised the importance of regular and personalised exercise, while Abdelmahmoud et al. (2025) identified adherence as an important factor influencing PFMT effectiveness and suggested that supervised or technology-supported approaches may enhance outcomes (21,24). Conversely, Borello-France et al. (2006) demonstrated that different exercise positions did not significantly alter treatment outcomes, indicating that factors other than exercise position may be more important determinants of response (15). Borello-France et al. (2008) further reported that improvements following intensive PFMT could be maintained for six months, although the optimal frequency of maintenance exercise remained

uncertain (17). Collectively, these studies support PFMT as an effective conservative intervention while also demonstrating that treatment delivery, adherence, exercise intensity and follow-up may influence outcomes. The present study extends this evidence by directly comparing supervised and home-based PFMT specifically among women with UI in the third trimester, a population that remains comparatively underrepresented in direct comparative trials [40].

The study has several limitations that should be considered when interpreting the findings. First, the sample was small, with only 34 participants, which limits statistical power and generalisability. Second, purposive sampling from a single hospital may have introduced selection bias and limits applicability to the wider pregnant population [41]. Third, the intervention lasted only six weeks, preventing assessment of whether improvements were maintained during the remainder of pregnancy or after childbirth. Fourth, only women in the third trimester were included; therefore, the findings cannot be directly generalised to women in earlier pregnancy or the postpartum period. Finally, the primary outcomes were questionnaire-based and therefore may have been influenced by self-report and response bias. In addition, although participants in the home-based group were provided with exercise diaries, adherence was not objectively quantified, limiting the ability to determine whether differences between groups were attributable specifically to supervision or to differences in exercise compliance.

5.1 CONCLUSION

Both supervised and home-based PFMT produced significant improvements in urinary-incontinence-related quality of life and functional impact among women with UI in the third trimester of pregnancy. Supervised PFMT demonstrated significantly greater improvements in selected KHQ domains and in the overall IIQ-7 score, whereas several other KHQ domains improved significantly in both groups without significant between-group differences. These findings indicate that home-based PFMT can provide meaningful benefits when regular physiotherapy

supervision is not feasible, while supervised training may offer additional benefits for selected functional and quality-of-life outcomes. The findings support the incorporation of appropriately instructed PFMT into physiotherapy and antenatal care for women experiencing UI during late pregnancy.

5.2 LIMITATIONS

- The sample size was small ($n=34$), limiting statistical power and generalisability.
- Purposive sampling from a single hospital may have introduced selection bias and reduced external validity.
- The six-week intervention did not allow assessment of long-term maintenance of treatment effects.
- Only women in the third trimester were included; therefore, findings cannot be generalised to earlier pregnancy or the postpartum period.
- Outcomes were assessed primarily using self-reported questionnaires, which may be subject to response and recall bias.
- Adherence to home-based PFMT was not objectively monitored, limiting interpretation of whether differences were related to supervision, adherence or both.

5.3 RECOMMENDATIONS

- Future studies should recruit larger samples to improve statistical power and generalisability.
- Multicentre trials involving different hospitals and healthcare settings should be conducted to improve representativeness.
- Longer follow-up should be incorporated to determine whether treatment benefits are sustained throughout pregnancy and after delivery.
- Future research should objectively monitor adherence to home-based PFMT using exercise logs, digital monitoring or other validated methods.
- Comparative PFMT studies should include women across different pregnancy trimesters and during the postpartum period.

- Future trials should consider combining subjective questionnaires with objective measures of pelvic floor muscle function and urinary symptoms.

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