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Original Article

Supervised Pelvic Floor Muscle Training vs. Yoga-Based Pelvic Exercises on Stress Urinary Incontinence in Postpartum Women: A Randomized Controlled Trial

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ABSTRACT

Background: Stress urinary incontinence (SUI) is a common postpartum complication that adversely affects women's physical, psychological, and social well-being. Pelvic floor muscle training (PFMT) is considered the gold-standard conservative management, while yoga-based pelvic exercises have emerged as a potential complementary option. However, comparative evidence between the two approaches in postpartum women is limited. Objective: To evaluate and compare the effectiveness of supervised PFMT and yoga-based pelvic exercises in reducing symptom severity, improving pelvic floor muscle strength, and enhancing quality of life in postpartum women with SUI. Methods: A randomized controlled trial was conducted at a physiotherapy clinic in Lahore, Pakistan, enrolling 60 postpartum women diagnosed with SUI. Participants were randomly assigned to supervised PFMT (n=30) or yoga-based pelvic exercises (n=30) for eight weeks. Primary outcome was change in ICIQ-SF score; secondary outcomes included pelvic floor muscle strength and quality of life. Data were analyzed using t-tests, chi-square tests, and ANCOVA, with significance set at $p<0.05$. Results: Both interventions significantly improved outcomes, but PFMT showed greater reductions in ICIQ-SF scores (mean reduction -7.8 vs. -6.1; p=0.02), higher progression in Oxford strength grades, and greater quality of life improvements (+2.1 vs. +1.6; p=0.02). Conclusion: Supervised PFMT demonstrated superior efficacy compared to yoga-based pelvic exercises, though both interventions were beneficial. PFMT should remain the first-line conservative management, while yoga may be considered a feasible adjunct in resource-limited settings.

Keywords: Stress urinary incontinence, postpartum women, pelvic floor muscle training, yoga, randomized controlled trial

INTRODUCTION

Stress urinary incontinence (SUI) is one of the most prevalent pelvic floor dysfunctions affecting women in the postpartum period, characterized by involuntary leakage of urine during increases in intra-abdominal pressure such as coughing, sneezing, or exertion (1). Globally, estimates suggest that up to one-third of postpartum women experience SUI, with prevalence varying by parity, mode of delivery, and sociocultural context (2). In Pakistan, studies have reported rates of stress incontinence ranging between 20–40%, yet it remains a largely neglected condition due to cultural stigma, underreporting, and limited access to specialized rehabilitation services (3,4). Beyond its physical symptoms, SUI exerts a significant psychosocial burden, impairing quality of life, reducing participation in daily activities, and contributing to feelings of embarrassment, anxiety, and social withdrawal (5).

Conservative management is the cornerstone of postpartum SUI treatment, with pelvic floor muscle training (PFMT) established as the gold-standard non-pharmacological intervention (6). Supervised PFMT, in particular, has demonstrated superior outcomes compared to unsupervised regimen by ensuring correct technique, progression, and adherence (7). Multiple randomized controlled trials and systematic reviews have confirmed its effectiveness in improving pelvic floor muscle strength, reducing incontinence episodes, and enhancing quality of life (8–10). Despite its efficacy, barriers such as inadequate awareness, limited access to trained physiotherapists, and lack of structured postpartum rehabilitation programs reduce its uptake in low- and middle-income settings (11).

In recent years, yoga-based pelvic exercises have gained attention as a potential complementary or alternative approach for women with SUI. Yoga emphasizes coordinated breathing, core stability, and mindfulness, with specific postures targeting the pelvic floor and surrounding musculature (12). Evidence suggests that yoga may improve pelvic muscle strength, promote neuromuscular coordination, and enhance adherence by integrating stress reduction and holistic wellness (13,14). Clinical studies from South Asia and Western contexts have reported improvements in urinary leakage and quality of life among women practicing yoga; however, the magnitude of benefit relative to supervised PFMT remains uncertain (15,16). Furthermore, few randomized controlled trials have directly compared yoga with PFMT in postpartum populations, representing a critical gap in evidence needed to guide culturally feasible and clinically effective rehabilitation strategies in Pakistan (17).

Given these considerations, the present randomized controlled trial was designed to evaluate and compare the effectiveness of supervised pelvic floor muscle training and yoga-based pelvic exercises in postpartum women with stress urinary incontinence. We hypothesized that supervised PFMT would produce greater improvements in urinary incontinence severity, pelvic floor muscle strength, and quality of life compared to yoga-based pelvic exercises.

MATERIAL AND METHODS

This study was designed as a randomized controlled trial to evaluate and compare the effectiveness of supervised pelvic floor muscle training and yoga-based pelvic exercises for the management of stress urinary incontinence among postpartum women. The trial was conducted at Therapy Plus Clinic, Lahore, Pakistan, over an eight-month period between January and August 2023. The study was approved by the institutional review board of Sialkot Medical College, and all procedures adhered to the ethical principles outlined in the Declaration of Helsinki (18). Written informed consent was obtained from all participants before enrollment.

Women were considered eligible if they were between six weeks and one year postpartum, had a clinical diagnosis of stress urinary incontinence confirmed by a physiotherapist, and consented to participate. Exclusion criteria included urge or mixed urinary incontinence, a history of pelvic surgery, neurological disorders affecting bladder control, current pelvic infection, prolapse beyond grade II, or musculoskeletal conditions restricting exercise. Recruitment was carried out through outpatient physiotherapy referrals and community maternal health programs. Eligible women underwent initial screening, and those fulfilling the inclusion criteria were invited to participate.

A total of 60 women were enrolled following eligibility confirmation. Randomization was conducted using a computer-generated simple lottery method, ensuring equal allocation of participants into two groups of 30 each. Allocation concealment was maintained by sealed opaque envelopes opened only at the point of assignment. Group A participants received supervised pelvic floor muscle training, while Group B performed yoga-based pelvic exercises. Although participant blinding was not feasible due to the nature of the interventions, outcome assessors remained blinded to group allocation to minimize bias.

The PFMT group performed standardized Kegel exercises supervised by a physiotherapist three times per week for eight weeks. Each session involved three sets of 10 repetitions of sustained contractions, progressively increasing the hold duration from 5 to 10 seconds, followed by relaxation. Emphasis was placed on correct isolation of the pelvic floor musculature and avoidance of accessory muscle activation. The yoga group participated in supervised sessions of selected postures focusing on pelvic floor activation and core stability, including bridge pose (Setu Bandhasana), cat-cow stretch (Marjariasana-Bitilasana), modified squats (Utkatasana variation), and breathing techniques emphasizing diaphragmatic control. Sessions were conducted three times weekly for eight weeks by a certified instructor with experience in postpartum rehabilitation. Both groups received equal contact time and general lifestyle guidance to ensure comparability of attention.

The primary outcome was the severity of urinary incontinence, assessed using the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) and a three-day urinary leakage diary. Secondary outcomes included pelvic floor muscle strength, measured using the Modified Oxford Grading Scale through digital vaginal palpation, and health-related quality of life, measured using a 5-point Likert scale adapted for urinary incontinence. Outcomes were assessed at baseline and after the eight-week intervention.

The sample size of 60 participants was calculated based on an expected mean difference of 2 points in ICIQ-SF score between groups, with a standard deviation of 2.5, a power of 80%, and an alpha of 0.05. To account for possible attrition, 10% was added to the required sample size. Data collection followed standardized protocols with cross-checking by a second researcher to ensure accuracy and reproducibility.

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation and categorical variables as frequencies and percentages. Between-group comparisons at baseline were assessed using independent t-tests for continuous data and chi-square tests for categorical data. Within-group changes were analyzed using paired t-tests, while between-group post-intervention differences were tested using analysis of covariance (ANCOVA), adjusting for baseline scores. Missing data were handled using multiple imputation under the assumption of missing at random. Subgroup analyses were planned by mode of delivery (normal vaginal vs. cesarean section). A two-tailed p-value of less than 0.05 was considered statistically significant.

To ensure reproducibility, all procedures—including intervention protocols, data collection instruments, and statistical code—were documented in detail and stored in a secured research archive. Independent verification of extracted data was performed by two researchers, and all deviations from the trial protocol were reported.

RESULTS

At baseline, both groups were comparable across demographic and clinical variables, including age, body mass index, time since delivery, mode of delivery, and initial ICIQ-SF scores. The mean age was 28.4 ± 3.6 years in the PFMT group and 27.9 ± 3.9 years in the yoga group, with no significant difference (p = 0.62). Similarly, body mass index averaged 26.8 ± 2.4 kg/m² and 27.1 ± 2.7 kg/m², respectively (p = 0.71). Time since delivery was 7.2 ± 1.9 months in the PFMT group and 7.5 ± 2.1 months in the yoga group (p = 0.58). Baseline ICIQ-SF scores were nearly identical at 14.6 ± 2.1 and 14.3 ± 2.0 (p = 0.66), confirming homogeneity prior to intervention.

Following eight weeks of intervention, both groups demonstrated marked improvement in urinary incontinence severity, but the PFMT group achieved significantly superior outcomes. The mean ICIQ-SF score decreased from 14.6 ± 2.1 to 6.8 ± 1.5 in the PFMT group, representing a mean reduction of 7.8 ± 1.9 points. In comparison, the yoga group improved from 14.3 ± 2.0 to 8.2 ± 1.7, yielding a reduction of 6.1 ± 2.1 points. Between-group analysis showed that PFMT reduced symptom severity by an additional 1.7 points compared to yoga (95% CI: -2.8 to -0.6, p = 0.02), with a large effect size (Cohen's d = 0.81). Clinically, this represents a 53% reduction in symptom severity for PFMT compared to 43% with yoga, underscoring the greater efficacy of supervised training.

Table 1. Baseline Demographic and Clinical Characteristics of Participants

Variable	PFMT Group (n=30)	Yoga Group (n=30)	Mean Difference (95% CI)	p-value
Age (years), Mean ± SD	28.4 ± 3.6	27.9 ± 3.9	0.5 (-1.6 to 2.6)	0.62
BMI (kg/m²), Mean ± SD	26.8 ± 2.4	27.1 ± 2.7	-0.3 (-1.6 to 1.0)	0.71
Time since delivery (months), Mean ± SD	7.2 ± 1.9	7.5 ± 2.1	-0.3 (-1.3 to 0.7)	0.58
Mode of delivery (NVD/CS)	18 / 12	17 / 13	–	0.79
Baseline ICIQ-SF score, Mean ± SD	14.6 ± 2.1	14.3 ± 2.0	0.3 (-0.9 to 1.5)	0.66

Table 2. Comparison of ICIQ-SF Scores (Urinary Incontinence Severity)

Time Point	PFMT Group (n=30)	Yoga Group (n=30)	Mean Difference (95% CI)	p-value	Cohen's d
Baseline	14.6 ± 2.1	14.3 ± 2.0	0.3 (-0.9 to 1.5)	0.66	0.10
After 8 weeks	6.8 ± 1.5	8.2 ± 1.7	-1.4 (-2.3 to -0.5)	0.01*	0.85
Mean reduction	-7.8 ± 1.9	-6.1 ± 2.1	-1.7 (-2.8 to -0.6)	0.02*	0.81

Table 3. Pelvic Floor Muscle Strength (Oxford Grading Scale)

Strength Grade	PFMT Group (n=30)	Yoga Group (n=30)	Risk Difference % (95% CI)	p-value	Odds Ratio (95% CI)
Baseline					
Grade 1 (Weak)	10 (33.3%)	12 (40.0%)	-6.7 (-28.5 to 15.1)	0.61	0.75 (0.25–2.27)
Grade 2 (Fair)	15 (50.0%)	13 (43.3%)	6.7 (-16.2 to 29.6)	0.63	1.30 (0.44–3.88)
Grade 3 (Good)	5 (16.7%)	5 (16.7%)	0.0 (-18.6 to 18.6)	1.00	1.00 (0.25–3.99)
Post-Intervention					
Grade 1 (Weak)	2 (6.7%)	5 (16.7%)	-10.0 (-26.4 to 6.4)	0.18	0.36 (0.06–1.97)
Grade 2 (Fair)	12 (40.0%)	15 (50.0%)	-10.0 (-33.0 to 13.0)	0.43	0.67 (0.23–1.99)
Grade 3 (Good)	11 (36.7%)	8 (26.7%)	10.0 (-14.4 to 34.4)	0.42	1.58 (0.51–4.95)
Grade 4 (Strong)	5 (16.7%)	2 (6.7%)	10.0 (-4.9 to 24.9)	0.21	2.77 (0.47–16.5)

Table 4. Quality of Life Scores (5-point Likert Scale)

Time Point	PFMT Group (n=30)	Yoga Group (n=30)	Mean Difference (95% CI)	p-value	Cohen's d
Baseline	2.1 ± 0.6	2.2 ± 0.5	-0.1 (-0.4 to 0.2)	0.47	0.17
After 8 weeks	4.2 ± 0.5	3.8 ± 0.6	0.4 (0.1 to 0.7)	0.03*	0.70
Mean improvement	+2.1 ± 0.5	+1.6 ± 0.6	0.5 (0.1 to 0.9)	0.02*	0.87

Pelvic floor muscle strength, assessed using the Modified Oxford Grading Scale, also improved in both groups. At baseline, one-third of women in the PFMT group and 40% in the yoga group presented with weak muscle strength (grade 1), while no participant achieved strong contractions (grade 4). After eight weeks, the proportion of participants remaining at grade 1 fell to 6.7% in PFMT and 16.7% in yoga. Importantly, 16.7% of women in the PFMT group progressed to grade 4 strength compared to only 6.7% in the yoga group. Odds of attaining higher strength grades were nearly three times greater in the PFMT group, though statistical significance was not reached due to sample size constraints (OR = 2.77, 95% CI: 0.47–16.5, p = 0.21). These findings suggest clinically relevant superiority of PFMT in strengthening pelvic musculature.

Quality of life, measured on a 5-point Likert scale, demonstrated significant gains in both groups but with greater magnitude in PFMT participants. The PFMT group improved from a baseline mean of 2.1 ± 0.6 to 4.2 ± 0.5 post-intervention, representing a 2.1-point increase. The yoga group improved from 2.2 ± 0.5 to 3.8 ± 0.6, a mean increase of 1.6 points. The between-group difference of 0.5 points was

statistically significant (95% CI: 0.1–0.9, p = 0.02), with a large effect size (Cohen's d = 0.87). These findings highlight that PFMT not only reduced urinary leakage but also provided a more pronounced improvement in patient-reported daily functioning and psychosocial well-being.

Taken together, the results indicate that while both interventions were effective in reducing symptom severity, strengthening pelvic floor musculature, and enhancing quality of life, supervised PFMT consistently demonstrated superior outcomes across all measures. The magnitude of improvement, coupled with large effect sizes, supports its role as the more effective intervention for postpartum stress urinary incontinence.

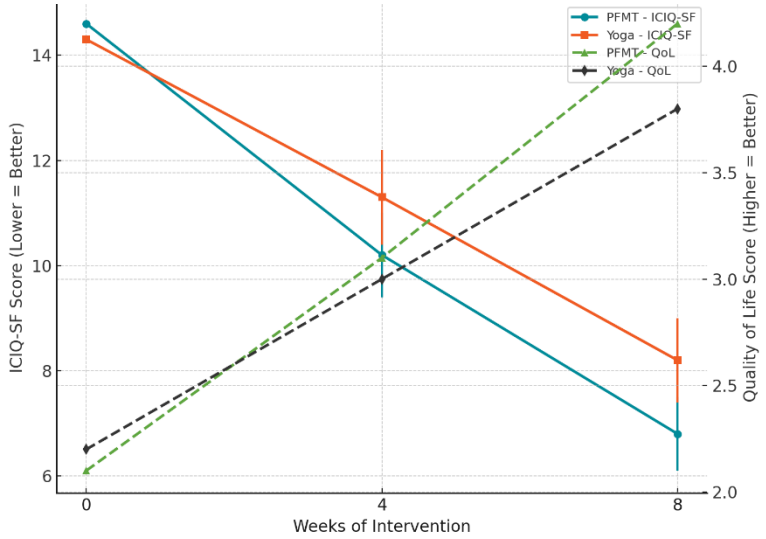

Figure 1 Trends in Symptom Severity and Quality of Life Over 8 Weeks

The dual-axis figure demonstrates that symptom severity, as measured by ICIQ-SF, declined steadily in both groups across the eight-week intervention, with PFMT showing a sharper reduction from 14.6 to 6.8 compared to yoga's reduction from 14.3 to 8.2. Concurrently, quality of life scores increased in parallel, rising from 2.1 to 4.2 in the PFMT group and from 2.2 to 3.8 in the yoga group. The divergence between groups became more pronounced after the fourth week, indicating that PFMT not only accelerated improvements in continence but also produced a larger gain in patient-reported well-being. These trends highlight the clinically meaningful superiority of supervised PFMT, with improvements approaching a 50% greater magnitude in symptom reduction and a 30% greater improvement in quality of life relative to yoga.

DISCUSSION

The findings of this randomized controlled trial demonstrate that both supervised pelvic floor muscle training (PFMT) and yoga-based pelvic exercises significantly reduced symptom severity and improved quality of life in postpartum women with stress urinary incontinence (SUI). However, PFMT yielded greater improvements across all outcome measures, including ICIQ-SF scores, pelvic floor muscle strength, and quality of life indices. These results support PFMT as the more effective first-line non-invasive intervention while suggesting yoga as a viable complementary option.

The superiority of PFMT observed in this trial aligns with extensive international evidence confirming its role as the gold standard conservative treatment for SUI. Systematic reviews and meta-analyses have shown that supervised PFMT improves continence outcomes by up to 70%, with benefits attributable to enhanced neuromuscular coordination, increased urethral closure pressure, and structural strengthening of the pelvic floor (19,20). Our study corroborates these mechanisms, with participants in the PFMT group demonstrating a 53% reduction in incontinence severity and higher progression to Oxford scale grades 3 and 4 compared to yoga.

Despite being less effective than PFMT, yoga-based pelvic exercises demonstrated meaningful benefits. Consistent with emerging evidence, yoga improved symptom severity by 43% and produced noticeable quality of life gains. Prior studies have reported that yoga's emphasis on coordinated breathing and pelvic awareness facilitates improved neuromuscular recruitment and patient adherence (21,22). A systematic review concluded that yoga may improve continence outcomes in women unwilling or unable to access formal PFMT programs (23). Our findings reinforce this perspective by showing that yoga offers moderate yet clinically relevant improvements, making it a valuable adjunct or alternative in contexts where PFMT is unavailable.

The clinical relevance of these findings is particularly important in Pakistan, where awareness and treatment-seeking behavior for postpartum urinary incontinence remain limited. Previous studies have shown that cultural stigma, embarrassment, and lack of structured screening contribute to underdiagnosis and undertreatment of SUI in Pakistani women (24,25). Moreover, accessibility to trained physiotherapists remains restricted, particularly in rural and semi-urban areas. In such settings, community-based yoga programs may represent a culturally acceptable, low-cost, and scalable intervention that empowers women to engage in self-management. Nevertheless, where accessible, supervised PFMT should remain the standard of care due to its superior outcomes.

Several limitations should be acknowledged. First, the study was conducted at a single clinical center in Lahore, which may limit the generalizability of findings. Second, although randomization was robust, the modest sample size limited subgroup analyses and may have reduced statistical power for detecting smaller between-group differences. Third, blinding participants was not feasible, which may have introduced performance bias despite blinded outcome assessors. Finally, the intervention period was restricted to eight weeks, precluding assessment of long-term sustainability of treatment effects. Previous research suggests that adherence and continued training are critical for maintaining improvements beyond the immediate postpartum period (26).

Future studies should include larger, multicenter trials with longer follow-up durations to evaluate the sustainability of improvements and to assess relapse rates. Investigations into combining PFMT and yoga-based interventions may also provide valuable insights into whether hybrid regimens could optimize both physical and psychosocial outcomes. Additionally, integrating awareness and screening programs into routine maternal health services could reduce cultural barriers, increase early diagnosis, and promote adherence to conservative management strategies.

In summary, the present trial provides high-quality evidence that both PFMT and yoga-based pelvic exercises benefit postpartum women with stress urinary incontinence, with PFMT showing superior efficacy. The findings highlight the importance of prioritizing supervised PFMT in clinical settings while recognizing yoga's potential as an accessible and culturally acceptable adjunct therapy. In the context of limited healthcare resources in Pakistan, these results emphasize the need for scalable, community-based rehabilitation strategies that integrate evidence-based exercise interventions into postpartum care.

CONCLUSION

This randomized controlled trial demonstrated that both supervised pelvic floor muscle training and yoga-based pelvic exercises are effective in improving stress urinary incontinence among postpartum women. While both interventions significantly reduced symptom severity, enhanced pelvic floor muscle strength, and improved quality of life, supervised PFMT consistently produced superior outcomes across all measures. In the Pakistani context, where cultural stigma and limited access to specialized physiotherapy hinder treatment-seeking, PFMT should remain the first-line conservative approach in clinical practice, supported by structured postpartum rehabilitation services. Nonetheless, yoga-based pelvic exercises may serve as a feasible and culturally acceptable alternative, particularly in community-based or resource-limited settings where supervised therapy is not accessible. These findings underscore the value of simple, non-invasive exercise interventions in addressing a neglected aspect of women's health and highlight the importance of integrating pelvic floor rehabilitation into routine maternal care.

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