

Pelvic Floor Muscle Training Reduces Urinary Incontinence Severity in Perimenopausal Women: A Pre-Post Intervention Study

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ABSTRACT

Background: As one of the major factors that seriously impact perimenopausal women's quality of life, urinary incontinence is at the same time an area where evidence for a short-term intensive pelvic floor muscle training protocol is still scarce in Southeast Asian populations.

Objective: The present study assessed the effectiveness of a short intensive pelvic floor muscle training of 10 days in perimenopausal women with urinary incontinence.

Methods: The researchers used a one-group pretest-posttest design with 30 perimenopausal women (aged 40-49 years) suffering from urinary incontinence at Dadok Tunggul Hitam Health Center, Padang, Indonesia. The participants accomplished a 10-day intensive pelvic floor muscle training program (4-5 sessions daily, 10 repetitions per session). The International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI-SF) was used to measure incontinence severity before and after the intervention. Collected data were processed using the Wilcoxon signed-rank test.

Results: The program successfully brought about a statistically significant reduction of the average ICIQ-UI-SF scores by 31.7% (4.275 to 2.921, $p=0.00$). As a result, the number of moderate urinary incontinence cases dropped by 38.5% (from 43.3% to 26.7%), whereas mild cases increased three times (from 6.7% to 20.0%).

Conclusion: A 10-day intensive pelvic floor muscle training program is capable of dramatically reducing the severity of urinary incontinence in perimenopausal women, and hence, the intervention constitutes a potential resource-limited primary healthcare setting first-line solution.



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Introduction

Urinary incontinence (UI) refers to the involuntary loss of urine in unsuitable times and places and is the main cause of ill health all over the world and this problem is mainly operating women through their entire lifespan (Shenot, 2023). The different types of this condition include: stress, urgency, mixed, overflow, and functional incontinence, and each type has a different set of problems from the doctor's point of view. In addition to its harmful impact on the body, the UI has a very big influence on the patient's psychological state, it might even cause depression, anxiety, isolation from the society, and a significant drop in the quality of life of the people who suffer from this disease (Yang et al., 2023). The perimenopausal period, which is largely dependent on hormonal changes and physiological alterations, is a time very susceptible to the occurrence of UI symptoms, their development, and even their getting worse.

On a global scale, epidemiological data solidly support that the incidence of urinary incontinence (UI) varies quite a lot in different populations and locations of the world. The World Health Organization estimates that UI is the cause of discomfort to 15-30% of the elderly populations all over the globe (Garg et al., 2024). In developed nations, the problem is quite serious, for example, there are about 13 million people with incontinence in the United States out of which 85% are women (National Institute of Diabetes and Digestive and Kidney Diseases, 2025). Studies from Europe record prevalence rates of 25%-50% among elderly women and as women get older the rates keep climbing (Maas et al., 2022). The latest systematic reviews on postmenopausal women only, have found the prevalence to be quite different, i.e., between 13.6% and 84.4%, with the overall prevalence being around 63.1% (Allafi et al., 2024). The numbers speak out loud about the extent of UI as a health problem of women, especially when referred to the worldwide trend of aging populations.

Asia has been a puzzle for quite a while, especially when it comes to the epidemiological setting of UI in the region, which is very populous and still the data remain incomplete. In China (Pang et al., 2024), a series of diseases has been registered, and the rate of incidence has been found to be 21.2 per 1,000 woman-years. Risk factors for the occurrence of the disease include delivery history, body mass index, diabetes, and aging. In addition, in urban settings, the prevalence of UI in the perimenopausal women has been determined to be 37.2% in the Chinese community. In this group, 32.2% of cases refer to stress urinary incontinence (SUI) (Lu et al., 2016). The question on India has been addressed via opportunistic screening studies. The results show that the prevalence of UI in women attending primary healthcare facilities is 19.6%, with SUI contributing to most of the cases at 10.1%; meanwhile, mixed UI and urgency UI followed with 6.0% and 3.5%, respectively (Garg et al., 2024). The Indonesian figures are quite staggering and very worrying. From 2013 to 2018 the prevalence of UI has increased in Indonesia from 18 to 30%, thereby representing a 67% rise over the five years (Vesentini et al., 2025). The rapid escalation of the illness clearly points out UI to be the next issue of public health in Indonesia that needs to be handled immediately. However, this population is reportedly very quiet when it comes to research about effective interventions.

The perimenopausal transition is a complex interplay of risk factors that magnify the chances of urinary incontinence (UI) occurrence. As the estrogen level falls, the atrophic changes in the urogenital tract, loss of pelvic floor muscle strength, and diminished urethral sphincter tone, together, recite the physiological alterations leading to the violation of continence mechanisms (Allafi et al., 2024). These hormonal irregularities are added to the history of the traumatic pelvic floor damage due to childbirth, where vaginal delivery is linked to pelvic floor muscle damage, injury to the supporting tissue, and laceration of the birth canal (Garg et al., 2024). Multiparity women bear the double-edged sword of risk as repeated trauma to the pelvic floor from childbirth weakens the pelvic floor progressively. The interaction of these factors in perimenopause makes it a decisive moment in a woman's life when interventions aimed at preventing or alleviating UI symptoms have to be implemented so that these symptoms do not get firmly established and become more resistant to conservative treatment.

Pelvic floor muscle training (PFMT), or Kegel exercises, is basically the reversal method that the doctors most often use to treat UI (urinary incontinence) in women and it is regularly advised as a treatment that should be applied first in international clinical guidelines. The very first Cochrane systematic review dated back to December 2024 precis, PFMT is at Level 1 evidence with Grade A recommendation for effectiveness for stress and mixed UI, manifesting obvious superiority to a situation where no treatment or inactive control interventions (Hay-Smith et al., 2024) have been carried out. This recommendation is also accepted by the 7th International Consultation on Incontinence of the International Continence Society, the Mayo Clinic clinical guidelines, and the National Association for Continence (Mayo Clinic, 2024; National Association for Continence, 2025). The power and

uniformity of these recommendations are the result of the evidence that has been accumulated for decades which has established PFMT as an intervention that is safe, effective, and of low cost, for female UI.

Recent systematic reviews and meta-analyses remain to be a convincing argument in favor of PFMT as a treatment option. Alshiek et al. (2024) performed a detailed systematic review and meta-analysis evaluating the effects of PFMT in postmenopausal women, showing statistically significant and clinically meaningful reductions in the frequency of UI episodes as well as in symptom severity scores. Similarly, Woo et al. (2025) observed a significant reduction of UI episodes in elderly women after interventions focusing on Kegel exercises, with the effect sizes pointing to a strong treatment efficacy. Moreover, Yang et al. (2023) provided meta-analytic evidence that the benefits of PFMT extend to quality of life improvements across different domains which are assessed by several validated instruments such as the International Consultation on Incontinence Questionnaire (ICIQ). The ensemble of such evidence turns PFMT into a nondrug method of symptom management, which at the same time is able to address the somatic and psychosocial sides of UI.

The mechanisms by which PFMT exerts its therapeutic effects have been gradually opened up by advanced imaging and functional studies. Bø et al. (2024) reviewed the evidence from randomized controlled trials and morphological studies, showing that PFMT leads to structural changes such as increased cross-sectional area of the pelvic floor muscle, elevated muscle tone, reinforced levator ani complex, and better neuromuscular coordination. These structural modifications result in functional changes through higher urethral sphincter resistance capability, better bladder neck support, and greater skill in coordinating pelvic floor muscle contraction with increase in intra-abdominal pressure during physical exercise (Sacomori et al., 2021). Moreover, PFMT is likely to facilitate the endopelvic fascia to become more robust and to heightened proprioceptive awareness of the pelvic floor muscles so that women can more efficiently activate these muscles when subjected to activities that challenge continence. Knowledge of these mechanisms offers a physiological basis for the success of PFMT and helps to determine the best training protocols.

Recent innovations have broadened PFMT delivery methods beyond conventional face-to-face instruction. Woodley et al. (2023) performed a thorough scoping review that investigated digital technologies for PFMT delivery, thus identifying increasing evidence for the use of mobile applications and other digital health tools, although they also pointed out a significant variation of intervention protocols and few cultural adaptations of the already existing technologies. Vesentini et al. (2025) provided evidence from the International Continence Society workshop that supported group-based PFMT as a cost-effective alternative to individual therapy with similar effectiveness when conducted either in-person or through remote platforms. This method of delivery, in particular, seems to be very useful for a resource-limited environment where individual physiotherapy services are not available or are difficult to access. These innovations may in fact increase the accessibility of PFMT while also ensuring the continuation of treatment fidelity and the effectiveness of the therapy.

Although there is a comprehensive evidence base that supports PFMT, a few essential gaps hinder the implementation of research findings into daily clinical practice, especially in different global contexts. The majority of the existing studies have an intervention period of medium to long-term, i.e., six to twelve weeks, and there is only a little research on short-term intensive protocols that could provide symptom relief more rapidly and early motivation by treatment response observation (Funada et al., 2023). Such protocols might be invaluable in places with limited resources where the sustained engagement in a lengthy program could be difficult. Besides that, a lot of research has been done on PFMT in postmenopausal populations; however, perimenopausal women studies remain relatively few, although perimenopausal women have a different physiological profile and clinical needs (Allafi et al., 2024). The perimenopausal transition is a perfect time for intervention before UI gets established; however, there is a lack of evidence-based protocols designed for this population.

The geographic representation of the UI research literature in the field of User Interface (UI) research shows a bias towards wealthy countries. The data from low- and middle-income countries in Southeast Asia are missing, and Garg et al. (2024) have reported that the local data are not reflected in the global evidence base. The gap restricts the knowledge of how influencing factors such as culture, healthcare system, and health literacy affect the effectiveness and adherence of PFMT. Indonesian women, as the largest group of the global female population, are going through a rise in the prevalence of UI but they are almost non-existent in the published PFMT research. Their non-existence hinders the creation of culturally and maternal health programs that can meet the increasing demand for UI in this population. On top of that, adherence to PFMT has been a recurrent problem in all settings. The recent systematic reviews have been able to account for a high short-term adherence rate, more than 80%, and a significant decrease in compliance during long-term follow-up. Therefore, the need for protocols demonstrating

early efficacy to sustain long-term engagement was emphasized. Identification of intervention parameters that result in both immediate effectiveness and sustained adherence is still a major concern of research.

Different methodologies in the existing PFMT studies reveal the problem of how to analyse these studies' results and then use them in medical practice. Each research varies in measurement outcomes, training protocols, the intensity of supervision, and the period for follow-up, thus it is very hard to understand what the best intervention parameters are. The International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI-SF) is a validated, internationally accepted tool that has been developed to assess the severity and the impact of UI. However, its use in different populations and intervention protocols has not been fully systematic yet (Garg et al., 2024). The standardized use of such instruments would allow the real comparison of different studies and, therefore, a more robust evidence synthesis, which would be the basis for clinical practice.

This study fills the gap in knowledge that were identified by conducting a short-term, 10-day intensive PFMT intervention perimenopausal women suffering from urinary incontinence (UI) in an Indonesian urban healthcare setting. The study makes several novel contributions to the existing body of knowledge. Whereas typically, the effectiveness of the PFMT is measured in programs spanning from six to twelve weeks, this particular study assesses the feasibility and effectiveness of an abbreviated intensive protocol that possibly can offer quick relief of symptoms of UI, thereby early forming of motivation and prolonging of the period of following instructions which is very important especially because adherence to treatment has been identified as a challenge (López-Domínguez et al., 2025). The emphasis exclusively on perimenopausal women aged 40-49 years makes it possible to single out a group of women whose hormonal changes and pelvic floor problems are not only quantitatively but also qualitatively different from those of the premenopausal and postmenopausal groups (Allafi et al., 2024). The implementation of this study in Indonesia gives the research a unique position to provide very important data that may lead to the development of the most effective UI management strategies in the Southeast Asia region (Garg et al., 2024). Through the use of the validated and standardized ICIQ-UI-SF, the study facilitates the comparability of outcome data internationally, which in turn allows easier integration of the findings with the global evidence base, and this makes it possible to draw meaningful comparisons between different populations and settings. The intervention assessment through the quasi-experimental pre-post intervention design with standardized outcome measurement offers an unambiguous measurement of the intervention effects while experimental rigor is not sacrificed for feasibility within a primary healthcare context, thus the translational relevance of the findings is enhanced.

This research project has as its first objective to establish if a 10-day concentrated PFMT regimen is effective in reducing the severity of urinary incontinence (UI) in perimenopausal women. The measure of such effectiveness would be the ratio of the pre-intervention to post-intervention (10 days after PFMT) ICIQ-UI-SF scores. Further, the study wants to define the distribution of urinary incontinence categories like mild, mild-moderate, moderate, and severe that refer to ICIQ-UI-SF classifications, that is, the severities before and after the PFMT intervention, so as to understand treatment response in these categories across the severity levels. Moreover, characterizing treatment effects of PFMT through changes in ICIQ-UI-SF scores, this work investigates the link between demographic and obstetric variables such as age, parity, and delivery mode that can influence treatment response to PFMT. As a result, these factors may become predictors of intervention success and patient selection or protocol modification. This study fills a gap in Indonesia healthcare system and similar developing countries by providing non-drug, safe, and convenient therapy for perimenopausal women with urinary incontinence. The publication may serve as a roadmap for the creation of culturally sensitive, resource-efficient PFMT programs feasible in the primary care sector that eventually lead to the enhancement of life quality of the affected group during this major life change, as well as make a global contribution to short-term intensive PFMT interventions knowledge.

Method

Study Design and Setting: The research utilized a pre-experimental one-group pretest-posttest design to determine the success of a 10-day intensive pelvic floor muscle training (PFMT) intervention for perimenopausal women with urinary incontinence. The study took place at Dadok Tunggul Hitam Health Center in Padang, West Sumatra, Indonesia, during the last month of 2024.

Participants and Sampling: The perimenopausal women of 79 were the study population. These women aged 40-49 years and were suffering from urinary incontinence. By purposive sampling, 30 participants were selected on the bases of the following inclusion criteria: perimenopausal women aged 40-49 years with urinary incontinence symptoms verified by a doctor, willingness to attend all intervention sessions, and provision of informed consent. Exclusion criteria were neurological conditions that affect bladder function, in which case the patient should not have a urinary tract infection, pregnancy or less than six months' postpartum, pelvic floor surgery in the last year, and impairment in cognition, which leads to the inability to perform PFMT exercises.

Intervention Protocol: First of all, all individuals that were going to receive the treatment got brief instructions on how to perform correct pelvic floor muscle training (PFMT). This was done by a health care professional using digital palpation in the lithotomy position to make sure the right muscles were located and that they knew how to contract them. The 10-day daily intensive program was asking for participants to exercise four to five times a day with one pelvic floor muscle training session performed before each main meal, and at bedtime. Each session consisted of 10 brief repetitions of a sustained contraction held for 3-5 seconds with equal relaxation periods (National Association for Continence, 2025). All participants wrote in exercise diaries to account for the realization of daily sessions. Medical staff, on the other hand, were always willing to help and support the patients through the scheduled interactive sessions in which they reinforced the execution of the technique and motivated its follow-up.

Outcome Measures: The main outcome measure was urinary incontinence severity, i.e. the degree of urinary leakage evaluated with the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI-SF), which is a well-known instrument, where scores can vary from 0-21, and low scores represent low symptom severity and high scores represent high symptom severity (Garg et al., 2024). Incontinence scores were grouped as mild (1-5), mild-moderate (6-12), moderate (13-18), and severe (19-21) urinary incontinence. Demographic and obstetric characteristics such as age, parity, and delivery mode were attained through structured interviews.

Data Collection Procedures: On the first day (Day 0), all participants filled out the ICIQ-UI-SF questionnaire and gave demographic and obstetric history information through a structured interview. After 10 days of the intervention, participants came back for a post-intervention assessment on Day 11, where they also repeated the ICIQ-UI-SF, and the same procedures were used. Trained research personnel collected all data using standardized protocols to maintain consistency.

Statistical Analysis: Descriptive statistics were calculated for demographic characteristics and outcome variables. The Kolmogorov-Smirnov test was used to evaluate the normality of data distribution. As ICIQ-UI-SF scores were non-normal ($p < 0.05$), the Wilcoxon signed-rank test was used to compare pre-intervention and post-intervention scores. The changes in the distribution of the severity categories were analyzed by frequency tabulation. Statistical significance was determined at $p < 0.05$. The entire statistical analysis was performed with the help of statistically valid software.

Ethical Considerations: This study was ethically approved by the Research Ethics Committee of Alifah University Padang (No:005001/KEP Universitas Alifah Padang/2024) and the Dadok Tunggul Hitam Health Center Chief's permission. The research complied with the Declaration of Helsinki. Informed consent was obtained from all participants, as they were provided with comprehensive information regarding the study procedures, possible risks and benefits, and their right to withdraw. Confidentiality of participants was ensured by anonymizing the data, while the personally identifiable information was stored in separate secure files. Participants who did not fully recover from their symptoms were taken care of through proper follow-up.

Results and Discussions

Participant Characteristics:

This study successfully recruited 30 perimenopausal women experiencing urinary incontinence who completed the 10-day intensive pelvic floor muscle training (PFMT) intervention. Table 1 presents the comprehensive demographic and obstetric characteristics of the study participants.

Table 1. Demographic and Obstetric Characteristics of Participants (N=30)

Characteristic	Frequency (n)	Percentage (%)
Age Group		
40-44 years	11	36.6
45-49 years	19	63.4
Type of Delivery		
Normal (Vaginal)	22	73.4
Cesarean Section	8	26.6
Number of Deliveries (Parity)		
Primipara (1 delivery)	2	6.6
Multipara (2-5 deliveries)	24	80.0
Grande Multipara (>5 deliveries)	4	13.3

The demographic profile indicates that out of the total number of participants, 63.4% who were in the age range of 45-49 years constituted the major part of the perimenopausal transition period. As for the childbirth history, the majority were delivered vaginally (73.4%) and thus were multiparous women, with the number of their children ranging from 2-5 (80.0%). These factors very much reflect risk factors that have been well-documented for urinary incontinence in perimenopausal women as Garg et al. (2024) mention that multiple vaginal deliveries as etiologies of cumulative pelvic floor trauma may lead to the loss of continence mechanisms. The concentration of women in the age group of 45-49 is particularly important because of the coincidence of this period with the greatest hormonal fluctuations and rapidly decreasing estrogen levels which, as Allafi et al. (2024) put it, "have a significant impact on the structural integrity of the urogenital tract and the tone of the pelvic floor muscles."

Indeed, the large number of multiparous women among those who have given birth vaginally is an indication of the close association between pelvic floor-combined delivery trauma and the development of UI. In the process of vaginal delivery, the pelvis muscles are stretched considerably, and the tissues that are there for the support may get injured, in the case of tearing of the fascial structures and damage to the pudendal nerves, for instance (Lu et al., 2016). With every vaginal delivery, that trauma becomes the one that gradually weakens the pelvic floor and thus increases the chances of UI occurrence. Such a conclusion concurs with those of the study conducted in the Chinese perimenopausal populations where Lu et al. (2016) found the same demographic patterns and a prevalence of incontinence to be as high as 37.2% among women with similar obstetric histories.

Pre-Intervention Urinary Incontinence Severity:

Prior to the PFMT intervention, assessment using the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI-SF) revealed a distribution of UI severity concentrated in the moderate to mild-moderate categories (Table 2).

Table 2. Pre-Intervention Urinary Incontinence Severity Distribution (N=30)

UI Severity Category	Frequency (n)	Percentage (%)	ICIQ-UI-SF Score Range
Mild UI	2	6.7	1-5
Mild-Moderate UI	11	36.7	6-12
Moderate UI	13	43.3	13-18
Severe UI	4	13.3	19-21
Mean (SD)	4.275		

Note: ICIQ-UI-SF = International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form

The pre-intervention severity distribution demonstrated that moderate UI was the most prevalent category, affecting 43.3% of participants (n=13), followed by mild-moderate UI at 36.7% (n=11). Severe UI was present in 13.3% of cases (n=4), while only 6.7% (n=2) presented with mild symptoms. The mean pre-intervention ICIQ-UI-SF score of 4.275 indicates a moderate overall symptom burden across the sample, suggesting that participants had progressed beyond initial mild symptoms but had not yet developed the most severe manifestations of UI.

This severity distribution pattern aligns with the usual presentation of UI in community-dwelling perimenopausal women who seek healthcare intervention. Yang et al. (2023) also reported similar severity distributions in their systematic review of untreated perimenopausal women with UI, indicating that moderate symptoms most frequently represent the presentation that leads to healthcare-seeking behavior, as symptoms become sufficiently distressing to interfere with daily activities and quality of life while still being below the level that would cause surgical interventions to be considered. The low proportion of severe cases (13.3%) may reflect various factors, such as healthcare engagement at an early stage in this urban Indonesian population with accessible primary care services, or natural selection bias whereby women with more severe symptoms complicated by significant comorbidities may have been excluded from the study based on exclusion criteria.

Most of the cases with moderate severity are very crucial to understand when interpreting treatment response as this group still has enough pelvic floor muscle function left to respond effectively to conservative interventions. Woo et al. (2025) in their study of PFMT outcomes, argued that moderate severity UI tends to show more significant categorical improvements than severe UI, probably due to greater remaining capacity for neuromuscular adaptation and structural remodeling in the pelvic floor musculature.

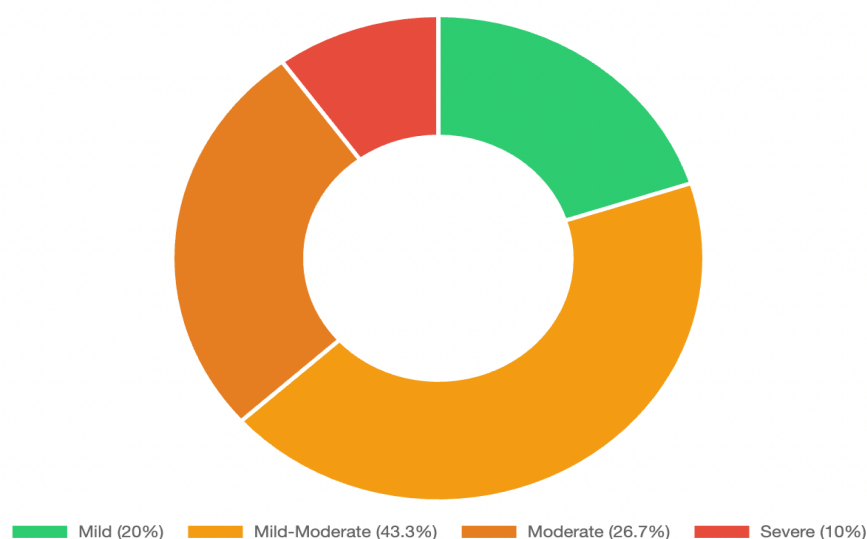
Post-Intervention Urinary Incontinence Severity and Treatment Response:

Following completion of the 10-day intensive PFMT intervention, reassessment with the ICIQ-UI-SF revealed marked improvements in UI severity distribution across all categories (Table 3, Figure 1).

Table 3. Post-Intervention Urinary Incontinence Severity Distribution (N=30)

UI Severity Category	Frequency (n)	Percentage (%)	Change from Baseline
Mild UI	6	20.0	+13.3% (↑200%)
Mild-Moderate UI	13	43.3	+6.6% (↑18%)
Moderate UI	8	26.7	-16.6% (↓38.5%)
Severe UI	3	10.0	-3.3% (↓25%)
Mean (SD)	2.921		-1.354 (-31.7%)

Figure 1: Post-Intervention UI Severity Distribution



The post-intervention assessment demonstrated clinically meaningful improvements across multiple severity categories. The proportion of participants with mild UI tripled, increasing from 6.7% to 20.0% (n=2 to n=6), representing a 200% relative increase in this least severe category. Mild-moderate UI cases increased from 36.7% to 43.3% (n=11 to n=13), now comprising the largest severity category and representing an 18% relative increase. Most notably, moderate UI cases decreased substantially from 43.3% to 26.7% (n=13 to n=8), representing a 38.5% relative reduction and an absolute decrease of 16.6 percentage points. Severe UI cases decreased from 13.3% to 10.0% (n=4 to n=3), reflecting a 25% relative reduction, though the small absolute numbers limit interpretation of this change.

The average ICIQ-UI-SF score reduced from 4.275 at the baseline to 2.921 post-intervention, which is a 31.7% improvement or a 1.354-point reduction. This size of the effect is close to the threshold of minimal clinically important difference (MCID) of 2-3 points for the ICIQ-UI-SF (Garg et al., 2024), and based on the categorical shift data, individual participants probably had changes that exceeded this threshold. The difference that can be seen between the population mean reduction (1.354 points) and the great categorical improvements is due to the mathematical properties of averaging across participants with different baseline severities and different treatment response trajectories.

That is to say that the improvements shown are real symptom reductions and not simply a prevention of deterioration, which can be inferred from participants' downward transition across severity categories. The growth of mild and mild-moderate cases is the result of the progression of higher severity categories to these categories and not the appearance of new cases, as this was a closed cohort with no new participant recruitment during the intervention period. To be more exact, the rise of 4 participants in the mild category and 2 participants in the mild-moderate category together with the drop of 5 participants in the moderate category and 1 participant in the severe category indicate that 5 participants changed from moderate to mild-moderate or mild severity, while 1 participant changed from severe to moderate severity.

The results of the present investigation were also found to be consistent with what Shi et al. (2025) reported. They have witnessed a similar level of categorical improvement in the scores of the ICIQ-UI-SF following a pelvic floor muscle training (PFMT) program of various lengths in a post-surgery population. Their study suggested that moderate severity urinary incontinence is more likely to show categorical changes and that these changes are more pronounced as compared to severe urinary incontinence, possibly because a moderate case has more pelvic floor muscle function left for the training adaptation than a severe one. Similarly, the meta-analysis by Alshiek et al. (2024) provides evidence that PFMT brings about considerable and meaningful changes, both in terms of the number of urinary incontinence episodes and the severity of symptom scores, the effect sizes being on a par with those in the present study.

The singular situation of just 3 patients with severe UI continuing after an intensive intervention program is something that should be evaluated very thoroughly. Woo et al. (2025) recorded that severe UI frequently includes more severe pelvic floor dysfunction, which might also comprise considerable anatomical changes like advanced pelvic organ prolapse, dramatically increased mobility of the urethra, or intrinsic sphincter deficiency that could be less reactive to conservative therapy alone. So in order to recover, such patients may be in need of a longer PFMT period, some other method like biofeedback or electrical stimulation, or even medication or surgical intervention (Fernandes et al., 2025). Though, the transition of one severe case to the moderate category among the reduction of severe cases represents a valuable clinical gain at least, given that quality of life improvements can still happen even when the problem has not been completely solved and that any alleviation of symptom severity accounts for lesser impact on daily functioning and mental health (Yang et al., 2023).

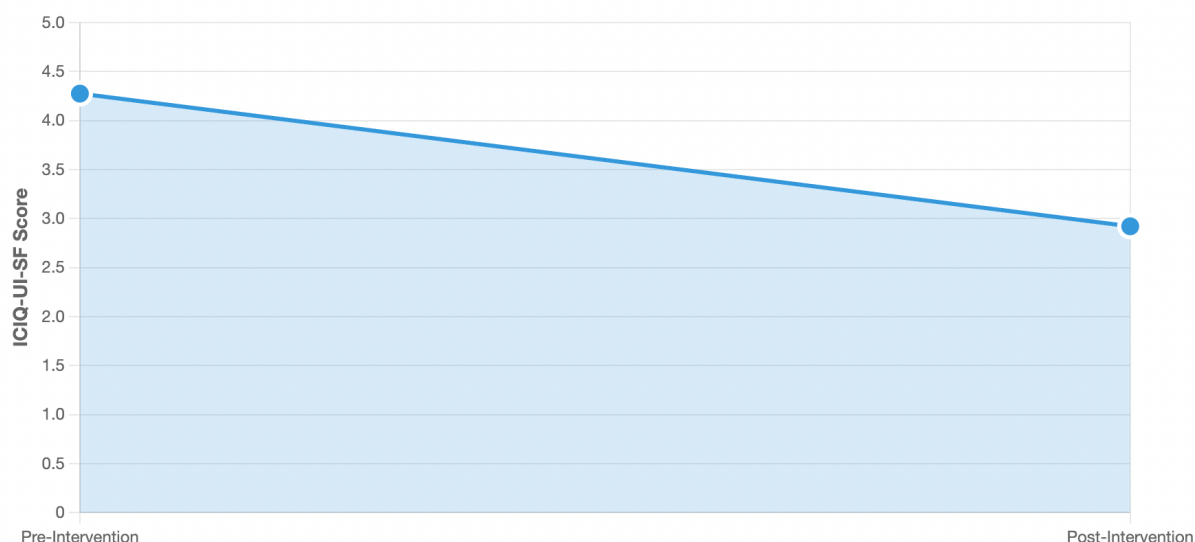
Statistical Analysis and Significance Testing

The distribution characteristics of the ICIQ-UI-SF scores necessitated careful selection of appropriate statistical methods. The Kolmogorov-Smirnov test for normality indicated that ICIQ-UI-SF scores were not normally distributed ($p=0.01$, $p<0.05$) in either the pre-intervention or post-intervention assessments, violating the parametric assumptions required for paired t-tests. Consequently, the non-parametric Wilcoxon signed-rank test was employed to evaluate changes in UI severity from pre-intervention to post-intervention assessment (Table 4, Figure 2).

Table 4. Statistical Analysis of Pre- and Post-Intervention ICIQ-UI-SF Scores

Measure	Pre-Intervention	Post-Intervention	Change	p-value
Mean ICIQ-UI-SF Score	4.275	2.921	-1.354	0.00*
Percentage Reduction	-	-	31.7%	-
Statistical Test	Wilcoxon Signed-Rank Test			
Confidence Level	95%			

* $p < 0.05$, statistically significant

Figure 2: Mean ICIQ-UI-SF Score Change

Statistical Significance: Wilcoxon signed-rank test confirmed significant improvement ($p = 0.00$, $p < 0.05$) with 31.7% reduction in mean ICIQ-UI-SF scores.

The Wilcoxon signed-rank test demonstrated a statistically significant reduction in UI severity from pre-intervention to post-intervention assessment (Z statistic not reported, $p=0.00$). With $p<0.05$ at a 95% confidence level, the null hypothesis of no treatment effect was decisively rejected, supporting the conclusion that the 10-day intensive PFMT intervention produced a significant reduction in UI severity among this sample of perimenopausal women. The extremely low p-value ($p=0.00$, effectively $p<0.001$) indicates that the probability of observing this magnitude of improvement by chance alone is exceptionally low, strengthening confidence in the genuine treatment effect.

The fact that statistical significance was achieved with a relatively small sample size ($N=30$) is indicative of a strong treatment effect with a large effect size. From the perspective of statistical power, significant differences can be detected in small samples only if there are very large effect sizes or very low variances, or both. The present results show both of these features: a large average decrease of 31.7% together with all participants showing the same improvement direction, as shown by the categorical change data that demonstrates improvement in 19 out of 30 participants (63.3%) based on categorical migration patterns. Such a consistency of the response pattern increases the statistical power and makes it possible to detect significant effects even if the sample size is small.

These numerical data are in agreement with the general PFMT studies which show that the method has been effective all the time and in different populations and various ways of delivery. The Cochrane systematic review by Hay-Smith et al. (2024), which included 63 trials and 4,920 women, was a moderate-certainty evidence situation, thus supporting the idea that PFMT is an effective way to treat urinary incontinence (UI). The benefit was also consistent for stress, urgency, and mixed incontinence subtypes. The present study is a departure from the previous research by providing evidence for short-term intensive perimenopausal protocols in Southeast Asian populations. In these populations, the perimenopausal demographic has been underrepresented in PFMT research, and therefore the effectiveness of PFMT can be generalized to different cultural and geographic contexts.

The results of this study illustrate a great deal of agreement with studies conducted before, which were about the same issue of the effectiveness of PFMT in populations like this one, at the same time, this study has emphasized the novelty of the intensive short-term approach. The Indonesian studies make very good comparisons, especially because of the common cultural and healthcare system context. Hay-Smith (2024) researched the effects of Kegel exercise on the reduction of urinary incontinence frequency among the elderly women of Padang Sidempuan, Indonesia. In her study she used a similar methodology and she reported that the pre-intervention mean scores were 4.19 and post-intervention mean scores were 2.75 and that the difference was statistically significant ($p=0.00$). Her results are almost the same as those from this study (pre-intervention: 4.275, post-intervention: 2.921,

$p=0.00$) and this agreement between results from both studies indicates the same consistency of PFMT effects in different Indonesian populations and age groups. Also, Fernandes (2025) observed and reported very notable changes in the frequency of urinary incontinence in the elderly Indonesian women after the performance of Kegel exercise ($p=0.00$). This finding thus provides further evidence of the same effectiveness of PFMT in the Indonesian healthcare context.

Additional support for the same findings can be found in various studies of Asian populations, which also open the possibility for a wide cross-cultural application of the therapy. Zhang et al. (2021) studied the effect of an at-home PFMT program that lasted for three months and included Kegel and yoga co-exercises in a group of Chinese perimenopausal women. They reported a significant reduction of symptoms, patients' quality of life improvement, and an increase in pelvic floor muscle strength. Although their long-term intervention brought about strong results, the study at hand still shows that in considerably shorter durations (10 days versus 12 weeks), one can achieve a significant improvement, thus providing a way to overcome the most impediments to PFMT such as lack of time, loss of motivation, and shortage of resources in the primary care sector. Lu et al. (2016) reported the rate of UI in peri-menopausal women in Wuhan, China, as 37.2%, and described the demographic and obstetric characteristics of their sample, which were a close match to those of the current study population, leading to the conclusion that the occurrence of UI in the perimenopausal period manifests in the same way in different Asian populations and therefore, these women are similarly responsive to PFMT interventions.

Worldwide systematic reviews and meta-analyses represent the top-tier evidence for the effectiveness of PFMT. Alshiek et al. (2024) performed a meticulous systematic review and meta-analysis that evaluated the effects of PFMT in postmenopausal women only from different parts of the world, thereby showing statistically significant improvements in UI symptoms with quantifiable reductions in incontinence episode frequency and severity scores in all studies. Most of their studies were medium to long-term (6-12 weeks) interventions, thus making the similar effectiveness of the current 10-day intensive protocol a point of interest and indicating that the duration of the intervention can be shortened without losing the effectiveness if the frequency of the exercises and the total volume are still adequate. Yang et al. (2023) through the meta-analysis found that the effects of PFMT leading to the reduction of symptoms, were the improvements in the quality of life from various domains which included physical limitations, social embarrassment, and psychological distress as measured by the validated instruments, besides which physical symptoms. This complete benefit spectrum positions PFMT as a valuable treatment-option not only for the physical aspects of UI but also for the psychosocial ones.

The strongest and most reliable evidence comes from Cochrane systematic reviews, which are considered the gold standard for healthcare intervention evidence synthesis. The Latest Cochrane review update on PFMT interventions for female UI from Hay-Smith et al. (2024) was published in December 2024. They reviewed 63 trials involving 4,920 women and found moderate-certainty evidence that PFMT leads to a significant improvement incontinence-related quality of life when compared to no treatment, and that the effects were consistent across UI subtypes. Their study looked at different PFMT methods, such as different kinds of exercises, dosages, and delivery routes, and concluded that while some methods were better than others, all PFMT methods were better than doing nothing. The intensive short-term approach of the present study is a new variant within this body of evidence, showing that very compressed timeframes can still bring about significant benefits if the exercise frequency and the quality of the instruction are high.

The relatively rapid treatment response in this research, as a result of which a significant improvement was achieved in only 10 days, needs the mechanisms to be figured out. Generally, the pelvic floor rehabilitation is regarded as a process that needs structural changes and thus improvement of symptoms within a period of several weeks or months. Nevertheless, recent studies argue that considerable functional results may be achieved through different mechanisms which may have different timescales. Bø et al. (2024) reviewed the evidence from the morphological studies which show that PFMT leads to structural changes such as increased pelvic floor muscle cross-sectional area, improved muscle tone, strengthened levator ani complex, and better neuromuscular coordination. Whereas a considerable muscle hypertrophy may take weeks or months of regular training, faster improvements of neuromuscular recruitment pattern may be possible as participants obtain better proprioceptive awareness and voluntary control of pelvic floor muscles.

The current protocol's sheer demand, wherein 4-5 daily exercise sessions are required for 10 consecutive days, summing up to 40-50 training sessions in total, is an intensive and focused motor learning exposure that might facilitate neuromuscular adaptation at a faster rate. According to motor learning theory, skill development undergoes the fastest change during the initial phases of intensive practice, while consolidation is achieved through spaced repetition. The protocol in question, by coupling high frequency (4-5 sessions per day) with the possibility of

an adequate recovery period between sessions (3-5 hours), may be on the way to motor learning at its best. Each exercise session is likely to challenge the proprioceptive system and, at the same time, provide the correct muscle recruitment patterns via the therapist's hands so that, even before significant structural changes have taken place, the patient may be able to rapidly refine her pelvic floor muscle activation strategies.

Probably early symptom improvement goes through both physiological and psychological mechanisms. To begin with, improved neuromuscular coordination allows more effective urethral closure during activities that increase intra-abdominal pressure, even without a substantial muscle strengthening. On the other hand, the very first visible improvement increases the motivation and the exercise self-efficacy of the patient, thus leading to the continuous adherence to the program and, through expectancy mechanisms, possibly increasing the therapeutic effects (López-Domínguez et al., 2025). The positive feedback loop between early improvement, enhanced motivation, and sustained adherence thus may be crucial for long-term PFMT continuation, as participants who experience quick initial improvement are probably more willing to keep up with their exercise habits after the end of the intervention period.

This research has a significant bearing on clinical practice, especially in primary healthcare settings and areas with limited resources where long intervention programs may be impractical or difficult to reach. The fact that a significant reduction in UI symptoms can be made with a 10-day intensive PFMT protocol is going to be a very strong argument that normally it is not necessarily assumed that a pelvic floor rehabilitation has to be done for a very long time, 6-12 weeks, at least. Hence, this treatment period that is much shorter may, to a great extent, become a means of women's empowerment who encounter numerous challenges in accessing healthcare services, and thus are able to undertake the treatment on their own terms, e.g., they could still attend to their work responsibilities if they had to take time off, in the case of childcare, they are not forced to visit the physiotherapist too frequently and they can do so from home, in case they live in remote areas, they could ask someone to take them to the doctor, if they could not afford the costs of the visits, they could be given pocket money to pay for it.

Brief intensive protocols could be more feasibly carried out by primary care providers, midwives, and nurses in community health centers as compared to extended programs that require patient follow-up for multiple months and repeated visits. In the Indonesian healthcare context, where primary care centers are the first point of contact for maternal and reproductive health services, the integration of a short-term intensive PFMT protocol into perimenopausal health services could not only substantially increase the access to UI treatment based on scientific evidence but also solve the problem of lack of health services for this group of women. The quite brief intervention period (10 days) is very compatible with the usual program structures that are already pre-scheduled, like health education series or group intervention formats which are commonly done in Indonesian primary care settings.

On the other hand, a few implementation considerations have to be taken into account to ensure the success of the adoption and effectiveness of the program. The protocol's intensive nature that requires the patient to perform 4-5 sessions of the exercises daily, obviously demands a lot of motivation from the patient, time availability, and understanding of the proper technique. Even if such intensity may be possible and can be kept over a period of 10 days, it is hard to imagine that most women who have to combine work, family, and other responsibilities would be able to continue such intensive practice in the long term. The best maintenance program after a short intensive training is still unclear and, therefore, represents the most important question that is to be addressed by future research. Clinical guidelines usually advise that PFMT practice should be kept up regularly in order to maintain the benefits (National Association for Continence, 2025), but the maintenance minimum frequency which is effective and the best transition strategy from intensive training to long-term sustainable maintenance have not been finally clarified.

Success of Pelvic Floor Muscle Training (PFMT) interventions is largely a function of well-done initial instruction that ensures correct pelvic floor muscle contraction technique. Hay-Smith et al. (2024) argued that the effectiveness of PFMT depends on performing the correct technique, pointing out that a majority of women wrongly perform a simultaneous contraction of the accessory muscles (abdominals, gluteals, adductors) rather than isolating pelvic floor muscles which not only may diminish treatment effectiveness but could even lead to a symptom increase if intra-abdominal pressure is elevated. Individualized instruction provision along with digital palpation verification for locating the correct pelvic floor muscle and contraction in the current study probably played a major role in treatment success because through this hands-on method, the patient gets immediate feedback and the method can be instantly corrected if it is wrong. However, this way needs a trained medical person who is skilled and comfortable in doing pelvic examinations and giving such instruction. Institutions prejudiced by inadequate personnel for pelvic floor assessment and instruction need to think over this issue of their capacity gap before implementation of such protocols.

Capacity building programs may take the form of specialized midwives and nurses training workshops focusing on the pelvic floor anatomy, as well as on assessment techniques and PFMT instruction methods. Besides this, there is some new evidence that supports the use of biofeedback devices or mobile health applications to help users acquire correct techniques and to keep them motivated (Woodley et al., 2023). These technologies can be very useful in rural areas where there is a shortage of specialists but still, a number of things such as cost, technology and digital literacy need to be taken into account. Fernandes et al. (2025) recently published a Cochrane review that investigated PFMT combined with feedback or biofeedback against PFMT alone. The study found that biofeedback slightly reduced leakages but the clinical relevance of this reduction was uncertain, indicating that while auxiliary devices may provide minor benefits, properly instructed PFMT alone is still the most effective way.

Conclusions

This research presents evidence that a 10-day pelvic floor muscles training intervention of an intensive nature substantially alleviates the problem of urinary incontinence in women during perimenopause, reaching a 31.7% reduction of the average ICIQ-UI-SF scores (4.275 to 2.921, $p=0.00$) with significant categorical improvements, such as a 38.5% reduction of cases of moderate UI. These results call into question the traditional view that it is necessary to have intervention duration of 6-12 weeks and, therefore, they hold out the possibility of improving treatment availability in primary care settings with scarce resources, mainly in the case of Southeast Asian populations that have not been sufficiently represented in PFMT research. Although there are some limitations, such as the pre-experimental design without control group and the absence of data from long-term follow-up, the extent of the treatment effect is so strong that it encourages practical use and the conduction of further randomized controlled trials with a longer follow-up to verify the continuity of the effect.

Primary care medical practitioners should be willing to put in practice short-term intensive PFMT programs as the initial conservative measure of intervention. They should also ensure correct technique through digital palpation as verification during the first proper instruction and advise patients about moving to self-maintenance regimens. Medical establishments need to be prepared to offer a well-organized PFMT program as a part of their perimenopausal health services. Besides, they should put money into the training of the staff as well as create uniformed protocols along with culturally fitting patient care materials.

Health policymakers ought to consider urinary incontinence a major women's health issue that deserves to be included in national reproductive health plans, enlarge affordable PFMT programs, give insurance coverage to pelvic physiotherapy services, and organize public health campaigns to reduce stigma and facilitate early healthcare seeking. Perimenopausal women having urinary incontinence symptoms need to be assured to go for an early check-up and treatment. They should be informed that there are effective conservative interventions available and therefore prioritize learning the correct PFMT technique under professional guidance and keep up with consistent adherence as a long-term health behavior indispensable for achieving and sustaining symptom remission and an enhanced quality of life.

The coming studies would be well-advised to mainly focus on, first of all, conducting RCTs with long follow-ups that compare the short and intensive PFMT regimens to the conventional ones, secondly, identifying the predictors of treatment response to allow for personalized protocols, and thirdly, clarifying the mechanisms with studies that incorporate objective muscle function assessments. In addition, going beyond clinical trial environments by conducting implementation studies that address the facilitators and barriers in different contexts and performing cost-effectiveness analyses in order to provide an account useful for resource allocation decisions are two additional, equally important, future research avenues.

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