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Comparison of Different Dosages of Pelvic Floor Muscle Training Exercises Among Post-Partum Women with Urinary Incontinence: A Randomized Clinical Trial

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ABSTRACT

Introduction: Pelvic floor muscle training (PFMT) has been recognized as the primary intervention for addressing urinary incontinence (UI) in women. Nonetheless, variations in dosimetry of these exercises in terms of duration of contraction & rest cycles and training duration have reported conflicting findings. This research sought to compare the efficacy of most common dosimetry protocols for PFMT in terms of UI symptoms, quality of life (QOL) and pelvic floor muscle strength.

Methods: The present study included 140 females with UI, who were randomly allocated to four groups, of 35 participants each. Group A performed three sets of 8 maximal contractions with 6-seconds hold and 6-seconds rest. Group B performed 3 sets of 25 maximal contractions with 3-seconds hold and 3 seconds rest, group C performed 3 sets of 10 maximal repetitions with 10-seconds hold and 10 seconds rest while group D performed 3 sets of 15 maximal contractions with 5-seconds hold and 15 seconds rest. All the exercises were performed twice daily. All participants were assessed at baseline and after 12 weeks using the ICIQ-UI SF, ICIQ-LUTSqol, QUID, and Oxford muscle grading systems.

Results: 125 subjects completed the study. All the groups showed significant within-group improvements ($p<0.001$) with Group A demonstrating the greatest improvement across all outcome measures. A between-group analysis also showed Group A as the most effective protocol.

Conclusion: Though all the protocols were effective, the dosimetry used in group A showed maximum benefits among the women suffering from UI.

Keywords: *Pelvic floor muscle, Urinary incontinence, Quality of life, Pelvic floor muscle strength*

1. INTRODUCTION

Urinary incontinence (UI) is defined by the International Continence Society as any involuntary urine leak that interferes with day-to-day activities and is associated with low self-esteem, depression, and helplessness (1,2). Urinary continence occurs when the bladder pressure remains below the urethral closure pressure. Any bladder or urethral malfunction may disrupt this interaction and the closure pressure drops below the bladder pressure, causing urine leakage resulting in

incontinence (3). Due to a number of circumstances, including age, inadequate postpartum care, congenital urogenital abnormalities, and previous gynecological procedures, women are more likely to have UI as compared to males (4). Nearly 70% of women have reported this issue at some point in their life, making it a fairly common ailment worldwide (5).

UI has been broadly categorized into three types viz. Stress UI, Urgency UI, and Mixed UI. Stress UI is characterized by the involuntary leakage of urine during physical activity or as a result of sneezing or coughing (2). Urgency UI involves involuntary urine leakage that occurs simultaneously with a strong, urgent need to urinate that is hard to postpone. Mixed UI refers to the involuntary loss of urine that occurs with both urgency and also during physical exertion or while sneezing or coughing.(6)

Even though UI is not fatal, long-term symptoms may have a substantial negative influence on a person's physical and mental health and their overall quality of life.(7,8) Numerous patients consciously restrict their social interactions, cut down on their trips, and progressively distance themselves from their communities. UI is thus often referred to as "social cancer" (4). One of the most common conservative treatments for UI is physical therapy, that includes pelvic floor muscle training (PFMT) also referred to as Kegel exercises. These exercises are aimed to increase the strength and functionality of the pelvic floor muscles (9). PFMT is advantageous for all forms of urinary incontinence (10). Strong contractions of the pelvic floor muscles during Kegel exercises help compress the urethra, increasing intra-urethral pressure and reducing urine leakage when there is a rise in intra-abdominal pressure, which explains its effectiveness in patients with UI. Furthermore, Kegel exercises may prevent reflexive or involuntary contractions of the detrusor muscle (11).

Although, Kegel exercises are recommended by the International Continence Society (ICS) for the treatment of UI, there are currently no established standards regarding its parameters in terms of duration of muscle contraction and relaxation, number of repetitions, frequency and duration. The precise dosage of Kegel exercises for women with UI is not well-defined, leading to variability in clinical practice and limiting the consistency of the treatment outcomes (12). This study seeks to address the current gap by systematically evaluating the impact of most commonly used PFMT dosimetry protocols on symptom reduction, pelvic floor muscle strength and QOL in women with UI. By exploring variations in training intensity, frequency and duration, this study aims to identify the most effective PFMT regimen for improving UI symptoms, enhancing muscular strength, and improve overall QOL. The findings may contribute to more standardized, evidence- based PFMT protocols for clinical practice.

2. METHODS

2.1. Study Design

A randomized clinical trial was conducted in the outpatient department of Gynecology and Urology in Maharishi Markandeshwar Medical College & Hospital (MMMC&H), Kumarhatti, Solan, Himachal Pradesh, India, from August 2024 to March 2025. A total of 160 females were evaluated, of whom 140 were selected based on the predetermined inclusion criteria of the research. The study has been conducted in accordance to the guidelines outlined in the Consolidated Standards of Reporting Trials (CONSORT) 2017. The CONSORT flow diagram, presented in Figure 1, offers a clear visual depiction of the trial's design.

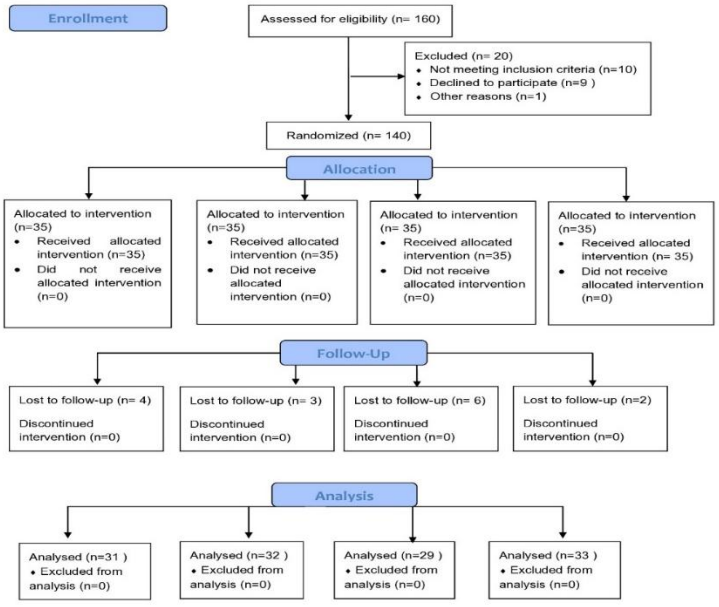

Figure 1: The CONSORT flow diagram of the trial

2.2. Ethical Consideration

Before participation, each participant was provided with information on the study's goal and objectives, followed by the acquisition of their written informed consent. This research received ethical clearance from the Institutional Ethical Committee of MMMC&H, Kumarhatti, Solan, vide reference number: MMMCH/IEC/24/926 dated: 20/07/2024. This research is registered in the Clinical Trial Registry of India (CTRI) with Registration No: CTRI/2024/09/073662 dated:09/09/2024. The study complies with the ethical criteria set out by the Helsinki Declaration (Revised 2013) and the National Medical Commission's research guidelines (13,14).

2.3. Sample Size

The sample size was calculated using G* software (version 3.1.9.7) for the statistical model of the F-test (ANOVA: repeated measurements, within-between interaction). The sample size was calculated by evaluating the score differences in the ICIQ-LUTSqol questionnaire among females with UI, yielding an effect size (d) of 0.17 according to a previous study (15); the final sample size for the research was N = 128. The anticipated dropout rate of 10% was included into the sample size, yielding a final sample of N = 140, equally allocated among four groups (35 females each group).

2.4. Subject Selection Criteria

Participants were selected based on inclusion criteria: married females aged 18 to 45 years in their post-partum phase, clinically diagnosed with UI by a qualified physician, all types of UI, experiencing UI symptoms for at least one month, able to voluntarily contract pelvic floor muscles as confirmed by using Oxford Grading Scale and willing to participate in the research. Women were excluded if they were pregnant, had a history of incontinence surgery, pelvic malignancy, neurological disorders, prior pelvic surgery and history of any psychological impairments.

2.5. Randomization and Sampling

A total of 140 women diagnosed with UI were recruited for this study, based on predefined inclusion and exclusion criteria. Participants were blinded to their group allocation and were randomly assigned to one of four intervention groups viz. Group A, B, C and D using the lottery method to ensure equal distribution and minimize selection bias. To reduce assessment bias, outcome measurements at baseline and post intervention were conducted by a trained staff nurse having seven years of clinical experience and was not involved in the intervention program and also kept blinded to group allocation.

2.6. Intervention Protocol

2.6.1. Procedure

A written informed consent was taken and demographics and baseline readings of the outcome measures were recorded and documented for all participants prior to the commencement of the intervention. Each group adhered to a systematic PFMT procedure, conducted biweekly under supervision in the hospital and at home on the intervening days. Each session had a duration of approximately 20 minutes, and the whole intervention was given twice daily for 12 weeks. Participants were contacted by telephone on home exercise days to assess compliance and resolve any issues.

2.6.2. Participants Education and Instructions

Prior to beginning of the PFMT program, all participants engaged in an interactive session during which the examiner elucidated pelvic floor anatomy, the etiology of urinary incontinence, and the advantages of PFMT in the local language. In this session, participants were also taught method of efficient contraction of their pelvic floor muscles while maintaining relaxation in adjacent muscles, including the gluteal and abdominal muscles. All groups executed pelvic floor muscle training (PFMT) in the supine position, with the hips and knees extended to optimize pelvic floor muscle contraction.

Steps for PFMT

1. Participants are instructed to accurately identify their pelvic floor muscles; they can do this by squeezing the pelvic muscles while urinating. Inserting a finger into the vagina allows for sensation of the pressure in the finger.
2. Participants were guided to begin the PFMT by tightening their pelvic floor muscles with the intensity and duration assigned to their respective groups.

2.7. Group- Wise Interventions

Interventional Group A: Participants in this group were directed to execute three sets of eight maximal pelvic floor muscular contractions, each held for 6 seconds, with a 6-second rest period between contractions. The workouts were conducted bidaily for a total period of 12 weeks (16–18).

Interventional Group B: Participants in this group executed 25 maximal contractions throughout three sets of pelvic floor muscle training, with each contraction lasting 3 seconds, followed by a 3-second rest period. The treatment was adhered to bidaily for a duration of 12 weeks (19).

Interventional Group C: Participants in this group were directed to execute pelvic floor muscle training (PFMT) with a

contraction duration of 10 seconds followed by a 10-second break, comprising 3 sets of 10 maximum contractions. The workouts were conducted bidaily for a duration of 12 weeks (20).

Interventional Group D: Participants in this group adhered to a PFMT regimen consisting of a 5-second contraction period, followed by a 15-second rest interval. They executed three sets of fifteen voluntary contractions, twice daily for a duration of twelve weeks (21).

2.8. Monitoring and Adherence

To ensure adherence, participants were monitored by the research team via telephone on home exercise days. Random visits were also conducted by the research team to ensure that the patient is adhering to the protocol and to address any difficulty being faced by them. Additionally, participants attended supervised sessions twice a week at the hospital, where the correct performance of PFMT was supervised and any concerns regarding the exercise protocol was addressed.

2.9. Outcomes Measures

The outcome measures used in the study included ICIQ-UI SF to evaluate the severity of the symptoms of UI (22,23,24), ICIQ-LUTSqol to evaluate the quality of life (23,24,25,26), QUID was used to differentiate between the stress UI and urge UI (27,28,29) and Oxford Grading Scale of manual muscle testing to evaluate the strength of pelvic floor muscles (11,30). Prior permission was obtained from the ICIQ module team to use the ICIQ-UI SF and ICIQ-LUTSqol questionnaires in the study. The QUID questionnaire was freely available for use. The readings of the outcome measures were taken on 1st day of the study and at the end of 12 weeks.

2.10. Data Analysis

The data was analyzed using SPSS version 26 (IBM SPSS 26). The Kolmogorov-Smirnov test was used to assess the normality of the data ($p > 0.05$). The data was presented as median and range due to its non-normal distribution. The Wilcoxon signed-rank test was used to evaluate baseline and post-intervention differences among the independent variables across the different groups. The disparity in scores between interventional groups A, B, C, and D from baseline to post-intervention was assessed using the Kruskal-Wallis test. Pearson's chi-squared test was used to ascertain the variations in UI types among various groups. The effect size was determined using Cohen's d formula: (M1-M2)/SD pooled, where M1 denotes the mean of pre-treatment, M2 signifies the mean of post-treatment, and SD represents the pooled standard deviation of the baseline data (31). The significance threshold was established at 0.05.

3. RESULTS

3.1. Baseline demographics

This research included 140 females with urinary incontinence (UI). The final analysis included 125 females (31 in group A, 32 in group B, 29 in group C, and 33 in group D) who completed their 3-month PFMT program, with 15 females (4 in group A, 3 in group B, 6 in group C, and 2 in group D) were the drop-outs during the course of the study. The study indicated no statistically significant variations in baseline characteristics across the four groups. The demographic details and the baseline findings of the participants has been summarized in table 1.

Table 1: Baseline Characteristics of the Participants

Variables	Group A (n=31)	Group B (n=32)	Group C (n=29)	Group D (n=33)	P value
	Median (Range)	Median (Range)	Median (Range)	Median (Range)	
Age (years)	33(21-44)	32.5(23-44)	31 (24-45)	35(24-45)	0.000
Height (cm)	165 (150-188)	160 (152-172)	164 (156-170)	161 (150-179)	0.002
Weight (Kg)	60 (48-80)	59 (42-80)	62 (49-80)	61 (49-81)	0.005
BMI kg/m^2	22.4 (16.81-28.69)	22.9 (16.61-31.64)	23.8 (18.22-27.68)	22.8 (18.14-28.03)	0.200*
Types of UI	SUI= 11 UUI= 14 MUI=6	SUI=20 UUI=7 MUI=5	SUI=19 UUI=2 MUI=8	SUI=17 UUI=7 MUI=9	0.280**#

Abbreviations: cm: Centimetres, kg: Kilogram, BMI: Body Mass Index, kg/m^2: Kilogram per meter square,

*Significant at $P < 0.05$ level of significance

**#represent Chi square analysis

Table 2: Baseline and Post-Intervention Comparison of Within Groups Among the females

Variables	Group A (n=31)		Group B (n=32)		Group C (n=29)		Group D (n=33)	
	Median (Range)	p	Median (Range)	p	Median (Range)	p	Median (Range)	p
ICIQUISF								
Baseline	19 (15-19)	<0.001*	18.5 (10-19)	<0.001*	16 (9-19)	<0.001*	16 (9-19)	<0.001*
Post	7 (0-14)		11 (1-16)		13 (0-15)		12 (0-16)	
ICIQLUTSqol								
Baseline	59 (51-64)	<0.001*	58.5 (51-64)	<0.001*	59 (50-67)	<0.001*	59 (47-64)	<0.001*
Post	40 (28-50)		41.5 (12-25)		48 (25-56)		45 (25-55)	
QUID								
Baseline	15 (12-21)	<0.001*	15 (12-25)	<0.001*	15 (11-26)	<0.001*	15 (10-26)	<0.001*
Post	5 (0- 9)		6 (0-12)		9 (0-17)		10 (0-16)	
Oxford Grading								
Baseline	1 (0-2)	<0.001*	2 (0-2)	<0.001*	1 (1-2)	<0.001*	1 (1-3)	<0.001*
Post	3 (2-5)		3 (2-5)		3 (2-4)		3 (2-5)	
*-Significant at <0.05								

Table 2 shows intra-group analysis of all the 4 parameters. The results showed that all groups demonstrated statistically significant improvement in all the 4 parameters at $P < 0.05$.

The research indicates that in Group A, the ICIQUISF, ICIQ-LUTSqol, QUID, and Oxford grading had substantial effect sizes of 3.8, 3.7, 5.0, and 3.7, respectively. Group B had a substantial effect size for ICIQUISF, ICIQ-LUTSqol, QUID, and Oxford grading, with values of d=2.60, d=3.3, d=3.3, and d=2.7, respectively. Group C had a substantial effect size for ICIQUISF (d = 1.5), ICIQ-LUTSqol (d = 2.4), QUID (d = 1.8), and Oxford grading (d = 1.7). Group D had a substantial effect size for ICIQUISF (d= 1.8), ICIQ-LUTSqol (d= 2.8), QUID (d= 1.9), and Oxford grading (d= 2.4).

Table 3: Multiple comparison between groups by Kruskal Wallis Test

Variables	Groups		Std. error	95% CI	p
ICIQUISF	Group A	B	9.06	0.08-4.59	0.050*
		C	9.29	2.63-7.25	0.000*
		D	9.00	2.35-6.83	0.000*
	Group B	A	9.06	-4.59-0.08	0.050*
		C	9.22	0.31- 4.90	0.001*
		D	8.92	0.03-4.47	0.006*
	Group C	A	9.29	-7.25-2.63	0.000*
		B	9.22	-4.90-0.31	0.001*

		D	9.16	-2.63-1.92	0.515
	Group D	A	9.00	-6.83-2.23	0.000*
		B	8.92	-4.47-0.03	0.006*
		C	9.16	-1.92-2.63	0.515
ICIQLUTSqol	Group A	B	9.10	-4.01-4.20	0.805
		C	9.33	0.02-8.45	0.000*
		D	9.04	-0.13- 8.02	0.012*
	Group B	A	9.10	-4.20-4.01	0.805
		C	9.26	-0.03-8.32	0.001*
		D	8.96	-0.19-7.89	0.023*
	Group C	A	9.33	-8.45-0.02	0.000*
		B	9.26	-8.32-0.03	0.001*
		D	9.20	-4.44 -3.85	0.277
	Group D	A	9.04	-8.02- 0.13	0.012*
		B	8.96	-7.89 -0.19	0.023*
		C	9.20	-3.85-4.44	0.277
QUID	Group A	B	9.09	-1.51-3.06	0.415
		C	9.32	0.34- 5.04	0.002*
		D	9.02	-0.007-4.54	0.004*
	Group B	A	9.09	-3.06-1.51	0.415
		C	9.25	-0.41-4.24	0.022*
		D	8.95	-0.76-3.74	0.040*
	Group C	A	9.32	-5.04-0.34	0.002*
		B	9.25	0.41-4.24	0.022*
		D	9.18	-2.74-1.88	0.767
	Group D	A	9.02	-4.54 -0.007	0.004*
		B	8.95	-3.74-0.76	0.040*
		C	9.18	-1.88-2.74	0.767
Oxford Grading	Group A	B	8.32	-0.03-0.92	0.025*
		C	8.53	0.21-1.20	0.000*
		D	8.26	-0.06-0.88	0.032*
	Group B	A	8.32	-0.92-0.03	0.025*
		C	8.47	-0.22-0.75	0.124
		D	8.19	-0.50-0.43	0.914
	Group C	A	8.53	-1.20-0.21	0.000*

		B	8.47	-0.75-0.22	0.124
		D	8.40	-0.78-0.18	0.098
	Group D	A	8.26	-0.88-0.68	0.032*
		B	8.19	-0.43-0.50	0.914
		C	8.40	-0.18-0.78	0.098
***-Significant at <0.05**					

Table 3 showed the between group analysis for all the parameters. The results showed significant difference of ICIQ-UI SF between all the groups except group C & D which showed non-significant difference. Regarding ICIQ-LUTSqol and QUID, groups A & B and C & D showed non-significant difference between them and rest all other groups showed significant differences between them. The Oxford grading showed significant differences between all the groups except between groups B & C, B & D and C & D which showed non-significant differences at $P < 0.05$.

4. DISCUSSION

The present study evaluated the effectiveness of commonly used dosimetry protocols for PFMT on UI severity, pelvic floor muscle strength and QOL in women with UI. When the groups were tested for intra-group changes in the outcomes, the results showed significant improvements in the baseline and post-treatment readings of all the outcomes measures, including ICIQ-UI SF, ICIQ-LUTSqol, QUID scores and oxford grading of pelvic floor strength across all the groups.

The present study was conducted on post-partum females. The reason for conducting the study on these females is due to the fact that during pregnancy and child birth, pelvic floor muscles undergo huge stretch and also there is tearing of these muscles due to child bearing. The associated hormonal changes cause the PFM musculature to soften while preparing for the delivery (17). Consequently, the incidence of UI is highest among them.

The improvement in pelvic floor muscle strength using oxford grading could be directly linked to the fact that the exercise protocols used in the study include the repetitive timed contraction and relaxation of pelvic muscles. This cycle of repeated contraction and relaxation has already been proved to enhance endurance, strength, and relaxation of the musculature. The relief in UI symptoms brought by these exercises could also be due to the fact that these exercises cause the elevation of structures of the pelvic floor, which in turn enhances the support of urethra. This increases the shorten the fibres of PFM and increases its thickness, thereby closing the levator hiatus and bladder neck gets lifted up (32,33).

The improvement in the function of the pelvic floor muscles caused improvement in the UI severity, evaluated using ICIQ-UI SF, which subsequently has led to the enhanced QOL, evaluated using ICIQ-LUTSqol, among these patients. This findings of the present study are in compliance to the findings of the study done by Fitz et al in 2020 and Wang et al in 2022, who have also concluded that PFMT, in the form of Kegel exercises, have benefitted the patients with UI in terms of severity of symptoms as well as quality of life (34,35).

The QUID analysis also demonstrated significant reduction in symptoms for both stress and urge incontinence across all groups, supporting the findings of Dumoulin et al. that PFMT was beneficial for both UI subtypes. (36)

The present study ensured that all the participants are being taught the correct technique of the PFMT exercises, thereby ensuring best results for the participants. Kashanian et al. previously determined that PFMT is very successful and should be regarded as the primary conservative intervention for all forms of UI. Their findings indicate that Kegel exercises are helpful alone when executed properly, aligning with the results of our research (16). Although Kegel exercises are the primary intervention for UI, adherence remains a significant challenge. This issue is largely attributed to the incorrect technique often used during the exercises, which is difficult to monitor without proper guidance or feedback. As a result, patients experience varying degrees of improvement, leading to frustration and eventual non-compliance with the exercise regimen (37).

In the current study, females performed PFMT in the crook lying position, following a structured regimen of three sets of ten maximal contractions, two times a day for a total duration of 12 weeks. This methodology is consistent with the American College of Sports Medicine's recommendation, that advocated performing of 8 to 12 contractions per set to achieve muscular hypertrophy (38). The intervention of PFM was administered for 12 weeks, which are as per NICE recommendations, which have been strongly recommended among the females suffering from UI (39).

The length and intensity of PFMT influence the efficacy of therapy. Programs lasting at least 12 weeks have shown significant improvements in UI symptoms, whereas shorter programs often provide only marginal benefits. The duration of the PFMT used in the present study is in agreement of the study done by Wang et al who concluded that participating in daily pelvic floor muscle exercises for a duration of 3 months is both safe and effective, with a projected enhancement in symptoms for

40-60% of women experiencing UI (35). Additionally, a study by Cross et al. reported that Kegel exercises, when used as an isolated therapy, is effective in treating stress UI. However, they emphasized that implementing Kegel exercises as a dedicated program prior to physical activity should also be seriously considered (40).

The present study PFMT protocol duration also align with a study done by Oliveira et al., who demonstrated that a 8 to 12 weeks training regimen helped decrease urine leakage and improve pelvic floor muscle strength, suggesting that the duration of PFMT plays a vital role in eliciting muscle hypertrophy and functional improvements (38). Another study done by Chaiyawat et al. demonstrated similar findings, indicating that PFMT over a 12-week period led to a decrease in urine leakage volume among women with stress urinary incontinence (19). The duration of 12 weeks is further supported by the study done by Mikus et al. (41), who reported that an 8-week Kegel exercise regimen was found out to be ineffective in ameliorating UI symptoms, suggesting that longer interventions are necessary.

Regarding the position of the patient while performing the Kegel exercise, different studies offer differing perspectives. The crook lying position used in the current study for performing PFMT was in contradiction with Chaiyawat et al. who advocated 5 different positions for performing Kegel exercises (19).

The present study included the blend of supervised PFMT sessions for 2 days per week and home exercise sessions on the intervening days. Further, the home exercise sessions compliance was ensured by regular telephonic contact as well as random visits to the house of the participants. The significant improvement in all the groups has the compliance to the study done by Cross et al. who have reported better results with supervised Kegel exercises as compared to unsupervised exercises (42). This finding is further supported by Ahlund et al. who also concluded the effectiveness of supervised PFMT, since it enhances adherence and fosters self-efficacy among participants (9).

4.1. Limitations and strength of the study

A major drawback of this research was the relatively small sample size, which may constrain the generalizability of the results, and self-reported compliance with home workouts might introduce reporting bias. Apart from this, the study protocol didn't have any provision of long-term follow-up.

Regarding the strength of the present study, the primary strength is its comparative methodology, which evaluates different dosimetry protocols for pelvic floor muscle training (PFMT) and provides significant insights for optimizing training parameters in the therapy of UI. Utilizing reliable outcome measures such as ICIQUI-SF, ICIQLUTSqol, and QUID ensures the findings are credible, while the presence of a supervisor throughout training aids participants in adhering to the program and executing PFMT accurately. Furthermore, the 12-week period enables a comprehensive assessment of the treatment's efficacy.

5. CONCLUSION

The results revealed that all four treatment protocols used in the present study yielded improvement in the patients in terms of severity of symptoms, quality of life as well as strength of pelvic floor musculature. Although, all the groups showed statistically significant improvement, but clinically it was found that the participants in group A showed the maximum benefit. More studies are required on this for generalizing the findings. Apart from the dosimetry, special focus was being put on the adherence and proper teaching of the protocol to the patients. This might be the fact that all the groups showed significant improvement. More studies are being required to establish this fact.

Data Availability Statement

The data that support the findings of the study are available on request from corresponding author [AS]. The data are not publicly available due to ethical and privacy restrictions [containing information that could compromise the privacy of research participants].

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Declaration of interest statement

The authors declare no conflict of interest.

Funding information

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List of abbreviation

PFMT- Pelvic floor muscle training, UI- Urinary Incontinence, QOL- Quality of life, ICIQ-UI SF- International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form, ICIQ-LUTSqol- The International Consultation on

Incontinence Questionnaire-Lower Urinary Tract Symptoms Quality of Life, QUID- the Questionnaire for Urinary Incontinence Diagnosis, BMI- Body mass index, ICCs- intraclass correlation coefficients

Ethical approval

This research received ethical clearance from the Institutional Ethical Committee of MMMC&H, Kumarhatti, Solan, vide reference number: MMMCH/IEC/24/926 dated: 20/07/2024. This research is registered in the Clinical Trial Registry of India (CTRI) with Registration No: CTRI/2024/09/073662 dated:09/09/2024.

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