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ASSESSMENT OF THE EFFECT OF PELVIC FLOOR MUSCLE EXERCISES APPLIED DURING PREGNANCY IN POSTPARTUM STRESS INCONTINENCE AND QUALITY OF LIFE

GEBELİKTE UYGULANAN PELVİK TABAN EGZERSİZLERİNİN POSTPARTUM STRES İNKONTİNANSA VE YAŞAM KALİTESİNE ETKİSİ

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ABSTRACT

Aim: It is aimed to evaluate the effect of pelvic floor muscle exercises during pregnancy on pelvic floor muscle strength, stress incontinence and quality of life in postpartum period.

Methods: The study was conducted October 2014 - May 2016 in Ege University Hospital (n=32; 14 control and 18 intervention groups). Data were collected using electromyography biofeedback, perineometer, and Modified Oxford Scale, Urogenital Distress Inventory-6 and Incontinence Impact Questionnaire-7. In the data analyzed using the SPSS 16.0 package program; number, percentage, Independent T Test, Mann Whitney U Test, Wilcoxon Ordered Signs Test, and Chi-Square Test were performed.

Results: During the period from pregnancy to postpartum eighth week, changes in pelvic floor muscle strength; according to the Modified Oxford Scale, women in the intervention group increased by 0.11 degrees, women in the control group decreased by 0.21, but difference wasn't significant (U=85.5, U=64.0) (p> 0.05). In groups; when the, Urogenital Distress Inventory-6 scale mean scores were compared; in pregnancy (U=77.0) (p> 0.05) and in the postpartum (U=87.0) (p> 0.05), comparing the Impact Questionnaire-7 scale mean scores in pregnancy (U=126.0) (p> 0.05) and in the postpartum (U= 16.0) (p> 0.05) it was determined that the difference between them wasn't significant.

Conclusion: Pelvic floor muscle exercises were found to increase pelvic floor muscle strength and prevent stress incontinence, but the difference between the groups wasn't significant. Studies with larger sample sizes and longer follow-up are recommended to examine the effectiveness of pelvic floor muscle exercises during pregnancy and postpartum.

Keywords: Midwife, Pelvic Floor Muscle Exercises Training, Pregnancy, Postpartum, Urinary Incontinence.

ÖZET

Amaç: Gebelik sırasında üriner sistemde anatomik ve fizyolojik pek çok değişiklik meydana gelir. Üriner inkontinansın oluşmasında gebelik ve doğum ile ilgili faktörler; terme ulaşan gebelik sayısı, parite, doğum şekli, doğum komplikasyonları, epizyotomi/yırtık varlığı, bebeğin doğum ağırlığı, doğumdan sonra miksiyon ile ilgili problemlerin önemli rolü vardır. Bu çalışma; gebelikte yapılan pelvik taban kas egzersizlerinin doğum sonu dönemde pelvik taban kas gücüne, stres inkontinansa ve yaşam kalitesine etkisini değerlendirmek amacıyla planlanmıştır.

Yöntem: Araştırma Ege Üniversitesi Tıp Fakültesi Hastanesi Kadın Hastalıkları ve Doğum Anabilim Dalı Ürojinekoloji Polikliniği'nde 01 Ekim 2014 ve 31 Mayıs 2016 tarihleri arasında yapılmıştır (n=32; 14 kontrol and 18 müdahale grubu). Veriler; kadınların sosyo-demografik ve tanımlatıcı bilgilerini içeren anket formu yanı sıra, Incontinence Impact Questionnaire ve Urogenital Distress Inventory ölçekleri kullanılarak, Biofeedback cihazı, elektromyelografi probu, perineometre ve dijital muayene (Modifiye Oxford Skalası) ile kas gücü ölçümleri yapılarak toplanmıştır. Verilerin analizinde SPSS 16.0 paket programı kullanılarak sayı, yüzde, Bağımsız T Testi, Mann Whitney U Testi, Wilcoxon Sıralı İşaretler Testi ve Ki Kare Testi uygulanmıştır.

Bulgular: Müdahale ve kontrol grubundaki kadınların gebelikteki Modifiye Oxford Skalasına göre pelvik taban kas gücü dağılımları incelendiğinde en yüksek oranda %31.2'sinin (n:10) 1 kas gücü seviyesine ve %28.1'inin (n: 9) 2 kas gücü seviyesine, sahip oldukları saptanmıştır. Urogenital Distress Inventory-6 ve Incontinence Impact Questionnaire-7 toplam ölçek puanları incelendiğinde; müdahale grubunda yer alan kadınların gebelikte ve doğum sonu ikinci ayda kas gücünde artma saptanmasına rağmen kontrol grubu ile karşılaştırıldığında aradaki farkın istatistiksel olarak anlamlı olmadığı saptanmıştır.

Sonuç: Araştırmadan elde edilen sonuçlar gebelikte ve lohusalıkta tüm kadınlara pelvik taban kas egzersizleri öğretilmesinin faydalı olduğunu göstermiştir. Pelvik taban kas egzersizlerinin gebelikte ve doğum sonu uzun dönemde etkinliğini incelemek adına daha büyük örneklem sayısı ve daha uzun dönem takipli araştırmalar yapılmasının yararlı olacağı düşünülmektedir.

Anahtar kelimeler: Ebelik, Gebelik, Pelvik Taban Kas Egzersizleri, Postpartum, Üriner İnkontinans.

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**This article was produced from a master's thesis.*

INTRODUCTION

Urinary Incontinence (UI) is a significant problem that affects women's social lives from physical, psychological and economic aspects despite not threatening their lives (Qiu et al, 2011; Pereira et al, 2019), and it is defined as involuntary leakage of urine that becomes a social or hygienic issue and that can be objectively revealed; the prevalence of UI is reported to 5-53% among women (Cerruto et al., 2013; Park, 2013; ICS, 2020). Additionally, stress urinary incontinence (SUI) which is the most common type of urinary incontinence, is defined as involuntary urinary incontinence after increased intra-abdominal pressure. (Park, 2013; ICS, 2020; Sangsawang &, Sangsawang; 2013; Nie et al., 2017). Women with UI may have decreased desires to join the society and suffer from anxiety or depression, and this issue adversely affects women's sexual life, daily activities and quality of life (Pereira et al, 2019; Ptak et al., 2019; Erkal Aksoy et al., 2021a).

Etiology of female SUI has multiple factors. Pregnancy and delivery are among the most important risk factors for the development of SUI as these two processes may damage the neuromuscular and connective tissues supporting the length of the bladder neck and urethra and control their operations (Chen et al., 2020; Wang et al., 2020). A fetus growing during the pregnancy creates increased pressure on the bladder and this pressure may result in temporary leakage of urine; many women with SUI cannot recover from SUI following the pregnancy and develop permanent UI although there are studies indicating that SUI prevalence increases during pregnancy and decreases after the delivery. Accordingly, UI prevalence is higher following the delivery compared to the pre-gestational period (Chen et al., 2020; Süt & Küçükkaya, 2018).

Many methods such as physiotherapy, behavioral treatment, medical and surgical procedures are used for the treatment of UI (Park, 2013; Hay-Smith et al., 2008). Pelvic floor muscle exercises (PFME), defined by Kegel in 1948 as a protective treatment method for stress incontinence, are basically based on the contraction of the levator ani muscles and are used to increase the strength of the periurethral muscles (Dumoulin et al. 2018; Sangsawang &, Sangsawang; 2015). The relevant literature indicates that regular PFME prevents and treats UI, and increases the quality of life (Nie et al., 2017; Ptak et al., 2019).

The postpartum period is when mothers and babies should be closely monitored. In this period, midwives and nurses should be aware of UI, train women so they can protect themselves from UI or reduce the number of symptoms, and help women apply to relevant units in necessary cases (Ege et al. 2007). Leaving the training PFME to the postpartum period may be a delayed action for preventing the formation of UI. Mothers may have difficulties in adapting to their new roles, and they may not be willing enough to receive PFME training. Teaching the importance and implementation of PFME to women no later than the pregnancy and making sure the theory is reflected into practice is critical. Accordingly, midwives can solely remind mothers of the PFME in the postpartum period.

The number of studies examining the effects of PFME provided to women by midwives during pregnancy on SUI in the postpartum period is quite limited. The present study aimed to examine the impacts of PFME performed during pregnancy on postpartum PFM strength, SUI and quality of life.

MATERIALS AND METHODS

This is a descriptive study aiming to perform educational interventions.

Sampling

The study was performed at the Department of Obstetrics and Gynecology within the Ege University Medical Faculty (EUMF); the average monthly number of women who are diagnosed with pregnancy in this clinic is 330. Additionally, the average monthly number of vaginal deliveries is 110, while approximately 140 cesarean section operations occur in a month in the clinic. The population consisted of pregnant women who applied to the polyclinics between 01 October 2014 and 31 May 2016. Sampling was not performed for the women who constituted the intervention group (IG) and control group (CG) (as the target was to reach the whole population). The women who applied to the afore-noted polyclinics, were willing to participate in the study and met the inclusion criteria (being literate, aged 18 years or older, at 20-30th weeks of pregnancy and primipara and having no high risky pregnancy and obstacles preventing them from participating) constituted the sample (**Figure 1**). Randomization was not performed while planning the IG and CG. Data collection process was performed on the days when the researcher was at the hospital (once a week-Monday) by drawing lots; accordingly, data were collected from the CG on the first week, and from the IG on the second week.

Women who did not meet the inclusion criteria, had cesarean section and were not willing to participate in the study were excluded.

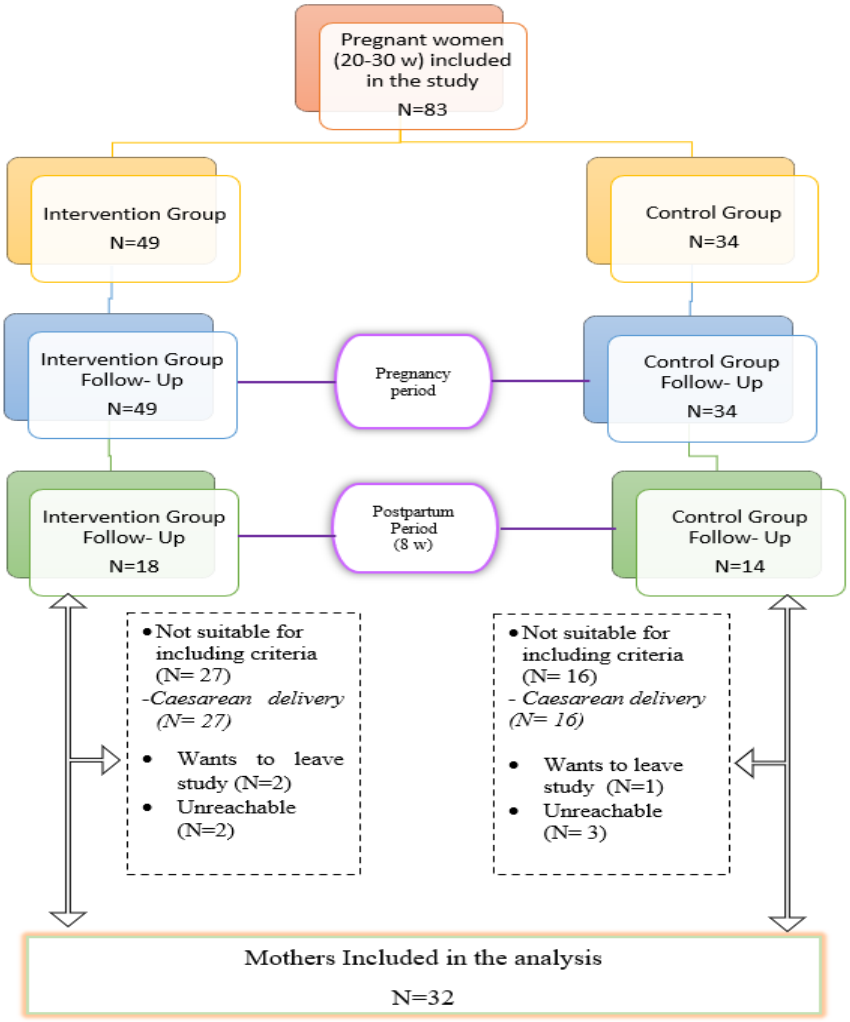


Figure 1. Consort Flow Diagram

Data Collection

The data were collected through the face-to-face interview method. Additionally, a questionnaire form containing items for the socio-demographic and descriptive characteristics of the pregnant women in the sample, Incontinence Impact Questionnaire (IIQ-7) and Urogenital Distress Inventory (UDI-6) were used. PFM strength of the women in both groups was measured during pregnancy and in the postpartum eighth week.

Questionnaire Form

This is a form prepared in accordance with the literature by the researchers for the socio-demographic and descriptive characteristics of the participants in the study, and it has 24 items questioning women's age, educational and employment status, income, current pregnancy and postpartum period (Dinç et al., 2009; Marques at al., 2013; Erkal Aksoy et al., 2021b).

Determining the Presence of Incontinence and Quality of Life

UDI-6 and IIQ-7 were developed by Shumaker et al. in 1994, and short forms of these were again formed by them in 1995. The Turkish validity and reliability study of these tools was performed by Cam et al. in 2007, and Cronbach's alpha coefficient was 0.74 for UDI-6 and 0.87 for IIQ-7 (Cam et al., 2007). UDI-6 is a six-item tool that can be used to determine the type and frequency of incontinence. Higher scores from this tool indicate higher number of urinary complaints. IIQ-7 is a seven-item tool measuring how much incontinence complaints distort one's comfort. Higher scores indicate lower quality of life (Balık et al., 2016). In our study Cronbach's alpha coefficient was 0.76 for UDI-6 and 0.96 for IIQ-7.

Revealing the Pelvic Floor Muscle Strength

Initially, measurement was performed through the vaginal electromyography (EMG) probe of biofeedback (BF) device. After the probe was covered with ultrasound gel to ensure conductivity, was positioned into the vagina of pregnant women at lithotomy position. The contraction and resting durations were set at 10 seconds on the device; pregnant women were asked to totally relax their PFM upon the command of "relax", and to draw the vaginal sensor in without contracting their abdominal, iliacus and quadriceps femoris muscles, without holding their breath upon the command of "contract". The process was repeated for three times, and mean value of these measurements was used. Measurements were performed when vaginal EMG probe was in pressure mode (sensitivity:200µV, threshold value:0µV) (Sondermed; 2014).

Secondly, perineometer, a vaginal dynamometer, was used. The probe of the device is pushed into the vagina for 5 cm, and pregnant women were asked to contract their perineal muscles for 10 seconds. The process was repeated for three times and mean value of these was used. The normal pressure is between 30-60 cmH_2O [19]. For the measurements, the biofeedback device with a vaginal EMG probe and perineometer (Enraf Nonius Myomed 632) was used.

Lastly, The Modified Oxford Scale was used to assess the PFM strength through vaginal examination. The Levator ani muscle, entrance of vagina and perineum are assessed at vaginal palpation and lithotomy positions, and the number of contractions without muscular resistance and muscle fatigue is measured. Based on the scale, a scoring between 0 (none) and 5 (very strong) can be performed (Cangöl et al., 2013).

Training for Pelvic Floor Muscle Exercises

Training for PFME was performed verbally, and it covered the mission of PFM and how exercises were to be done as well as the conditions and frequency for performing the exercises. The training was performed in four sets: 10 fast PFM contractions in a set (one second of contraction and one second of relaxation), 10 slow contraction (contracting the PFM and holding it in this manner for 10 seconds, and relaxation of the muscle for 10 seconds). The training lasted 20 minutes on average.

An exercising chart was handed to the pregnant women to guide them in their exercising activities at home (regarding how many times they are supposed to perform the exercises in a day). Before handing these charts to the women, the experts consulted for their ideas on the cart included the following: two obstetrics and gynecology specialists, two instructors from the Obstetrics and Gynecology Nursing Department, three midwives who were working in a delivery room, a Family Health Center and as a self-employed midwife, and two other midwives. Then, the preliminary stage regarding the chart was conducted on five midwives and the final form was used after all recommendations and revisions.

The pregnant women in the IG were called once a week to check the exercises they did at home.

No intervention was made for the CG, but this group was provided PFME training to ensure the ethical aspect of the data collection phase. All participants who performed delivery in the last phase of the study were called to the polyclinic in the postpartum eighth week and re-monitored. Their PFM strength values were measured, and UDI-6 and IIQ-7 scales were administered.

Analysis

The data were coded on Statistical Package for Social Sciences 16.0; additionally, number-percentage distributions were performed and Independent Samples *t* Test, Mann-Whitney U Test, Wilcoxon Signed Ranks Test and Chi-Square Test — some of non-parametric tests — were used. In addition, Fisher's Exact test was used to determine the significance level. The statistical analysis results were examined at 95% confidence interval and $p<0.05$ significance level.

Ethical Considerations

Ethical Committee of Clinical Researches within Ege University Medical Faculty (Decision No:14-9.1/7) and management from the Hospital of EUMF (letter numbered 69631334-1840-22748) gave their permissions to the researcher to conduct the study. Permissions regarding the UDI-6 and IIQ-7 scales used in the study were received from the relevant authors. Moreover, pregnant women were informed in certain topics such as the study objective or benefits of the study in the pre-interview period, and their written and verbal consents were received.

RESULTS

The number of pregnant women in this study was 32 (18 in IG, 14 in CG). Mean age of the women in the IG was $\bar{x}$23.77±4.64 (min=18-max=35), while the mean age of the CG was $\bar{x}$23.21±3.49 (min=18-max=31). Certain socio-demographic data of the women are presented in *Table 1*.

Table 1. Distribution of Women by Some Socio-demographic Characteristics

Properties	IG		CG		χ^2/p
Age Groups	n	%	n	%	
24≤	11	61.1	10	71.4	4.33/0.36
25≥	7	39.0	4	28.5	
Education					
Primary School≤	5	27.9	7	50.0	9.19/0.10
High school≥	13	72.2	7	50.0	
Working Status					
Yes	7	38.9	2	14.3	2.35/0.12
No	11	61.1	12	85.7	
Profession					
Housewife (unemployed)	11	61.1	12	85.7	0.12/0.23
Worker	7	38.9	2	14.3	
Income Status					
Earn less than income	3	16.7	2	14.3	2.74/0.25
Income equal to the expenses	12	66.7	12	85.7	
Earn more than income	3	16.7	0	0	
Total	18	100.0	14	100.0	

The specific sociodemographic data of the women in both groups (age, education, employment, income status and occupation) were homogeneous (p>0.05) and similar in terms of BMI, receiving PFME training and doing PFME.

The mean Body Mass Index (BMI) of the women in the IG was $\bar{x}$24.99±3.58 (min=20.22-max=32.42); 61.1% had "normal" BMI. The mean BMI value of the women in the CG was $\bar{x}$26.73±4.45 (min=19.24-max=33.45), and 42.9% had "normal" BMI.

The obstetric data of the women were examined and mean pregnancy week of the women in the IG was $\bar{x}$24.5±3.09 when PFME trainings were provided, while the mean pregnancy week of the women in the CG was $\bar{x}$25.42±3.15 in the same period. Of the women in the IG, 94.4% did not have a miscarriage before, while this rate was 92.9% for those in the CG. None of the women in the IG underwent abortion procedure before, while those in the CG who did not undergo this procedure before constituted 92.9%. Nobody in both groups had a gynecological procedure, suffered a chronic disease or used a drug regularly before.

Episiotomy was performed on all of them during the delivery. Vacuuming was performed on one pregnant woman in the IG (5.6%) during delivery. One woman in the CG (7.1%) had postpartum anal fissure, but no women in both groups developed postpartum infections.

The mean pregnancy week of all women was $\bar{x}$39.37±1.07 (min=36, max=41), and the mean weight of newborns was $\bar{x}$=3403±335.6 grams (min=2555, max=4200).

Table 2. Comparison of Women's Pregnancy and Mean Postpartum PFM Strength Values

	n	**IG**		**n**	**CG**		**U/p***
		$\bar{x}$	**SD**		$\bar{x}$	**SD**	
Modified Oxford Scale							
Pregnancy	18	1.98	1.37	14	1.92	1.43	85.5/0.11
Postpartum	18	2.77	1.16	14	1.71	1.43	64.0/0.15
Difference		0.11	0.90		-0.21	1.42	103.5/0.36
Wilcoxon signed-rank test		Z=0.53,p=0.59			Z=0.3,p=0.75		
Perineometer (cmH_2O)							
Pregnancy	18	21.44	15.58	14	16.64	12.33	101.0/0.34
Postpartum	18	21.38	10.94	14	13.42	12.81	69.0/0.09
Difference		-0.05	9.91		-3.21	12.75	77.0/0.06
Wilcoxon signed-rank test		Z=0.78,p=0.43			Z=1.64,p=0.10		

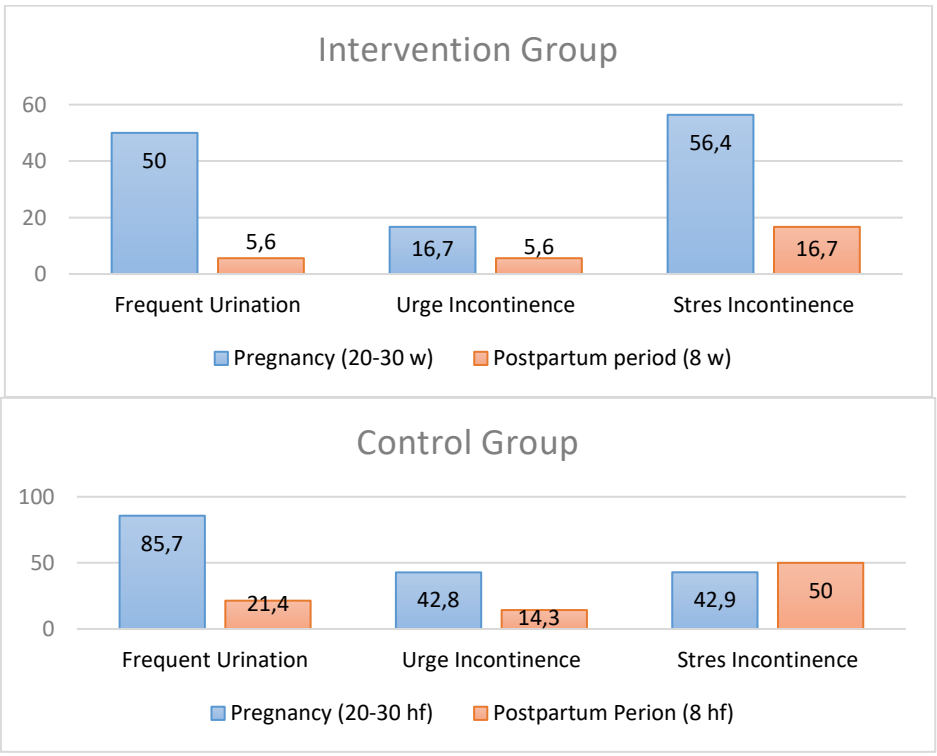
EMG BF (mcV)							
Pregnancy	18	11.11	10.47	14	8.42	8.48	103.0/0.38
Postpartum	18	12.05	6.46	14	6.85	5.88	62.5/0.055
Difference		0.94	7.55		-1.57	9.39	75.5/0.054
Wilcoxon signed-rank test		Z=1.54,p=0.12			Z=1.10,p=0.27		

*Mann Whitney U test

Table 2 presents the comparison of mean PFM strength values of the women during pregnancy and postpartum periods. Based on the Modified Oxford Scale, the average muscle strength of the women in the intervention group increased by 0.11 in the postpartum period compared to the pregnancy period, and decreased by 0.21 in the women in the control group. However, this difference was not statistically significant. The members of groups were particularly assessed within their own groups and the difference between the PFM strength value of the women in both groups was not statistically significant in the period between the pregnancy and postpartum periods, based on the Modified Oxford Scale (***Table 2***).

According to the results of pelvic floor muscle strength measurement performed with perineometer, it was determined that the difference in pregnancy and postpartum muscle strength was not statistically significant between the intervention and control groups. Members of groups were particularly assessed within their own groups, and no statistically significant difference was found between the PFM strength values of the women in both groups during the measurements performed through perineometer in the pregnancy and postpartum (***Table 2***).

Based on the Electromyographic Biofeedback (EMG BF) measurements, the average muscle strength of the women in the intervention group increased by 0.94 mcV in the postpartum period compared to the pregnancy period, and decreased by 1.57mcV in the women in the control group. In spite of that the difference between the PFM strength values of IG and CG in the pregnancy and postpartum periods was not statistically significant. Members of groups were particularly assessed within their own groups, and no statistically significant difference was found between the PFM strength values of the women in both groups during the measurements performed through EMG in the pregnancy and postpartum periods (***Table 2***).



Graph 1. Distribution of urinary complaints of women in pregnancy postpartum period

According to the graph, 50% of the women in the IG reported frequent urination during pregnancy, while 16.7% complained about urge incontinence (UUI) and 56.4% defined stress incontinence (SUI) in the same period. In the postpartum period, 5.6% reported frequent urination while 5.6% mentioned UUI and 16.7% defined SUI. Of the women in the CG, 85.7% reported frequent urination during the pregnancy, while 42.8% complained about UUI and 42.9% defined SUI in the same period. In the postpartum period, 21.4% reported frequent urination while 14.3% mentioned UUI and 50.0% defined SUI (***Graph 1***).

Table 3. Comparison of Women's UDI-6 and IIQ-7 Scale Scores

	IG		**CG**		**U/p***
UDI-6 Total	$\bar{x}$	**SD**	$\bar{x}$	**SD**	
Pregnancy	2.05	1.58	3.35	1.82	77.0/0.055
Postpartum	0.66	1.87	0.92	1.07	87.0/0.91
Difference	-1.38	2.25	-0.42	2.24	97.0/0.26
Wilcoxon signed-rank test	Z=2.52 **p=0.012***		Z=2.78 **p=0.005***		
IIQ-7 Total	$\bar{x}$	**SD**	$\bar{x}$	**SD**	**U/p***
Pregnancy	0	0	0	0	126.0/1.00
Postpartum	0.61	2.59	0.14	0.36	116.0/0.45
Difference	0.61	2.59	0.14	0.36	116.0/0.45
Wilcoxon signed-rank test	Z=1.00, p=0.31		Z=1.41 p=0.15		

*Mann Whitney U test

Table 3 presents the comparison of Women's UDI-6 and IIQ-7 Scale Scores. There was no statistically significant difference between the UDI-6 and IIQ-7 scale scores of the women in both groups during pregnancy and postpartum period (Table 3). However, when the groups were evaluated within themselves, it was found that the total score of the UDI-6 scale during pregnancy was higher than the total score of the scale in the postpartum period in both the intervention group and the control group, and this increase was statistically significant (Table 3).

DISCUSSION

PFM strength and quality of life, no statistical evidence was found in this regard, which might have arisen from the limited number of cases. The fact that the researcher was working as a midwife in the delivery room and could spare only one day for the study might be another factor in this regard.

Sangsawang and Sangsawang (2013) found that the most common UI type during pregnancy is SUI and that it impairs the quality of life of women (Sangsawang & Sangsawang; 2013). Dinç et al. (2009) reported that PFME applied during pregnancy and postpartum period is quite effective in UI treatment by strengthening PTK (Dinç et al., 2009). Our study results are in line with the literature, although the number of cases is small; and that there is an increase (7.1%) in the rate of SUI in the postpartum period in the group who did not receive PFM training compared to the gestational and postpartum period.

The literature has studies examining the relationship between pregnancy and delivery type and UI. Child et al. (2013) reported that delivery may loosen the pelvic floor as a result of the contraction and weakening of muscular and connective tissue Child et al., 2013), while Morkved et al. (2003) and Zengin (2010) stated that delivery may distort the supportive structure and positions of pelvic organs, damage the pelvic nerves, and cause involuntary leakage of urine by increased intra-abdominal pressure Morkved et al.2003; Zengin; 2010). Polat et al. (2012) and DeLancey et al. (2012) reported that vaginal delivery was an important factor in the development of pelvic floor relaxation (Polat et al., 2012; DeLancey et al., 2012). Sangsawang and Sangsawang (2013) examined the impact of six-week PFM exercise program on SUI in the last periods of pregnancy and found that women who performed exercises had fewer complaints regarding involuntary leakage of urine compared to those who did not

perform exercises (Sangsawang & Sangsawang; 2013). According to the results, the postpartum decrease in the types of incontinence seen in the group that received PFME training supports the literature.

Frixtel et al. (2015) conducted a study to examine the impact of PFME performed alongside a supervisor on preventing UI and reported no significant difference between the muscle strength values of women who performed exercises with a supervisor and who only received written information on how to do the exercises (Frixtel et al., 2015). Similarly, in the present study, the PFM strength values of groups who verbally received information on these exercises and who performed PFME were examined based on Modified Oxford Scale, and no significant difference was found although the group that performed PFME had an increase of 0.11 points in the postpartum period compared to pregnancy.

Dinç et al. (2009)-36 found the PFM strength values of women who performed these exercises higher than those who did not perform in the 20-34th pregnancy week, 36-38th pregnancy week and postpartum 6-8th week (Dinç et al., 2009). Sut and Kaplan (2016) examined the impact of PFME on PFM activities and urination functions during pregnancy and postpartum periods and reported that the PFM strength measured through perineometer decreased in both groups during the late pregnancy period and that there was no significant difference regarding the PFM strength values between the groups, one of which performed exercises while the other did not. Additionally, they also examined the changes in the PFM strength and found that the group which performed exercises had fewer changes in their strength values compared to the group that did not perform. Sut and Kaplan (2016) found a significant difference between the PFM strength values of the groups, one of which performed exercises while the other did not, in the postpartum period (Sut & Kaplan, 2016). The assessments performed through perineometer in the present study indicates no changes in PFM strength in the group that received PFME training in the postpartum period. In the group that did not receive PFME training, the H2O level decreased by 3.32 cm in the PFM strength, as understood from perineometer measurement, during the pregnancy and postpartum period. The difference between the results of the present study and literature might be explained with the limited size of sample in the present study.

Marques et al. (2013) examined the PFM contractility during the pregnancy and postpartum periods through electromyographic method; they included women in a 10-session exercising program during the pregnancy and postpartum periods, and measured women's PFM strength values seven day before and after the program. They found that muscle strength increased during pregnancy and postpartum period compared to pre-exercise, and this increase was statistically significant (Marques et al., 2013). The mean PFM strength value of the IG in the present study was $\bar{x}$1.98 ±1.37 during pregnancy, and this value was $\bar{x}$=2.77±1.16 for the CG in the postpartum period, and no statistically significant difference was found between these groups ($p>0.05$). Different results of the present study and of the research conducted by Marques et al. might have arisen from the limited data in the present study and extended data collection activities of Marques et al. who conducted the process with 33 women and collected data through 10 personal sessions during home visits, each lasting 60 minutes, to these women.

Mason et al. (2010) conducted a randomized controlled study, examined the effect of antenatal PFME on preventing postpartum SUI and used the Bristol Female Lower Urinary Tract Symptom Scale. They found that 35.1% of the women had the same problem at the 20th week of pregnancy, 48.4% at the 36th week, 36.7% of the women had the same problem in the third month after delivery. And they found that there was no significant difference between the groups that applied and did not exercise.

Palaez et al. (2014) performed a randomized controlled study where they examined the impact of PFME performed during pregnancy on preventing UI and found that the group that performed exercises had fewer UI complaints and higher quality of life index score compared to the group that did not perform these exercises. Balık et al. (2016) examined the lower urinary system symptoms and UI during pregnancy and compared the groups one of which suffered from involuntary leakage of urine while the other did not; they found the IIQ total scale score was lower among the women who suffered from the afore-mentioned issue compared to those who did not. Such an analysis was not performed in the present study as the total score of IIQ-7 used to assess the quality of life was calculated as zero for all women.

Sut and Kaplan (2016) used UDI-6 and IIQ-7 scales to assess the UI and quality of life, and assessed the IG and CG. The UDI-6 and IIQ-7 scores did not change compared to the initial periods during the late pregnancy period in the IG, while the scale scores improved in the postpartum period. Regarding the CG, scale scores significantly worsened in the late pregnancy period compared to the

initial periods and no improvement was seen during the postpartum period (Sut & Kaplan, 2016). In the present study, a significant decrease regarding the complaints of frequent urination, UUI and SUI was seen among the IG members between the periods of pregnancy and postpartum period, while the SUI increased in the CG.

The limitations of the present study included the obligation to complete the study in a certain period of time as it was a master's thesis (inability to spare a longer time than 20 months to increase the sample size), inclusion of women who were solely primipara and performed vaginal delivery, unwilling attitudes of pregnant women in terms of participating in the study as they did not want to stay in the clinic any longer after their examinations or women's requests to leave the study later. Moreover, telephone calls were found to be insufficient in terms of assessing whether women performed their exercises correctly at home. In adition, the fact that the study was conducted in a single center and could not be generalized to Turkey is among the limitations. This study is important as it will guide the future studies.

CONCLUSION

Having been conducted to assess the impact of PFME training provided during pregnancy on postpartum PFM strength, SUI and quality of life, this study reflected no statistically significant differences between the groups, one of which received PFME training while the other did not, although PFM strength increased and thus prevented the development of SUI among the former. Accordingly, teaching the PFME to all women during pregnancy and postpartum period will be beneficial and positively affect women's quality of life in the long term. To examine the effectiveness of PFME during pregnancy and postpartum period, it is recommended that studies with greater sample and longer follow-up periods be conducted, that exercise follow-up programs be created at home or hospital, that follow-up programs be conducted face-to-face with visits to women's homes, and that women's awareness of PFME be raised. Morover, it may be recommended to conduct comprehensive studies in which quantitative studies are supported by qualitative methods.

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Conflict of Interest

The author declares no conflict of interest.

Author Contributions

Plan, design: E.B., B.K.S.; **Material, methods and data collection:** E.B., B.K.S.; **Data analysis and comments:** E.B., B.K.S.; **Writing and corrections:** E.B., B.K.S.

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