

## CLINICAL TRIAL STUDY

# The Effect of Kegel Exercises and Pelvic Floor Physiotherapy on the Improvements of Stress Urinary Incontinence and Urge Incontinence in Women with Normal Vaginal Delivery

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**Abstract: Objectives:** Pregnancy and normal vaginal delivery, are the main risk factors for urinary incontinence in women. A variety of treatments such as bladder training and pelvic floor exercises are effective for urinary incontinence. This interventional study has been conducted to compare the influence of Kegel exercises and pelvic floor physiotherapy on the improvements of urge and stress incontinence in women with first or second singleton pregnancies, who have experienced normal vaginal delivery.

**Methods:** One hundred fifty women with urinary incontinence in the postpartum period, who were divided randomly into 3 groups of 50 patients, participated in this prospective interventional study. The women were primigravida or it was their second labor. None of them complained of urinary incontinence before pregnancy. All of them had a normal vaginal delivery. The first group included females who were asked to perform Kegel exercises. The second group had 8 weekly physiotherapy appointments. The control group, included mothers who received routine care. We compared the prevalence of urge and stress incontinence between groups.

**Results:** We found that the relative risk of urge and stress incontinence among mothers in the control group was more than in the intervention groups, but this difference was only statistically significant in the subject of stress incontinence between the Kegel and control groups. The reduction of urge incontinence prevalence among mothers in the Kegel and physiotherapy groups, was more than control group, although this reduction was not significant.

**Conclusion:** There is a significant decrease in the prevalence of stress urinary incontinence at the end of the 8th and 12th weeks postpartum compared to the control group. Although the prevalence of urge incontinence among women in intervention groups was lower than in the control group, it was not significant. It seems the effect of Kegel exercises and pelvic floor physiotherapy, in reducing stress incontinence at the end of the 8th week, is almost equal.

**Keywords:** Pelvic floor, physical therapy modalities, postpartum period, urinary incontinence, urge incontinence, vaginal delivery.

## 1. INTRODUCTION

Stress and urge incontinence are one of the most common disorders in women defined as involuntary urine leakage while increasing abdominal pressure such as moving heavy objects, or after a sudden change in body position, coughing, or sneezing. This issue is often not diagnosed, nor treated perfectly after diagnosis. Urge incontinence is having a sudden, intense urge to urinate followed by an involuntary leakage. Urinary incontinence is a multifactorial

disorder [1]. It has been hypothesized that damage to the bladder neck supporting muscles and bladder sphincter during labor are the most important causes of urinary incontinence. However, pregnancy and hormonal status changes itself, urogenital tract damage or both can be the main causes of this disorder. Other risk factors include fetal overweight, operative vaginal delivery, episiotomy, vaginal tearing, diabetic mothers, obesity, and underlying diseases [2]. More than one-third of women complain of urinary incontinence [3]. However, it is not easy to assess the true prevalence of urinary incontinence due to cultural and social reasons. Pregnancy and childbirth, especially normal vaginal delivery are the most important risk factors for urinary incontinence among women. Multi parity, age of more than 35 years, obesity, and overweight have been

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mentioned as main risk factors for urge incontinence in a meta-analysis, and multiparity can double the risk of urge incontinence [4]. Urinary incontinence can be associated with many physical, psychological, and social problems for the patients and families and even society. Women with this disorder are prone to urinary tract infections, skin rashes, fragile skin, increased risk of hospitalization, psychological problems, limited social relationships, decreased quality of life, and sexual activity avoidance [3]. A variety of treatments such as bladder training and pelvic floor exercises are effective on stress incontinence, or urge or mixed incontinence, as well as an overactive bladder [5, 6]. Kegel, a gynecologist from the United States, emphasized pelvic floor exercises for functional rehabilitation after childbirth. Since then women in developed countries have been encouraged to perform exercises that strengthen the pelvic floor muscles [7]. National Institute of Clinical Excellence has suggested that pregnant women do pelvic floor exercises for the prevention of stress incontinence [8].

There is no consensus that pelvic floor muscle exercises can prevent postpartum urinary incontinence. This interventional study has been conducted to compare the influence of Kegel exercises and pelvic floor physiotherapy on the improvement of urge and stress incontinence in women after their first or second normal vaginal delivery.

## 2. MATERIALS AND METHODS

One hundred fifty women with urinary incontinence in the postpartum period, who were divided randomly into 3 groups of 50 patients, participated in this prospective interventional study with Randomized controlled trial registry number, IRCT201220215009014N326, in Fatemeh hospital, Hamadan, Iran, in 2021. All of the enrolled patients were aware of our study goals and signed the consent form. It was their first or second singleton normal vaginal delivery. None of them complained of urinary incontinence before pregnancy. For the diagnosis of stress incontinence, all of the participants with a pre-weighed pad were asked to drink 1 liter of water within 30 minutes, then jump up and down for 30 seconds, and cough three times. After this procedure, the pad was weighed. Test-retest reliability was tested in 10 women before applying this procedure. The correlation coefficient was 0.97 ( $p = 0.004$ ). The cut-off for a positive pad test was 3 grams. The first group included mothers who were trained and asked to do Kegel exercises. Kegel exercises should be done in three sets of 15-20 repetitions, three days a week, for an eight-week period. They all exercised together under the supervision of a physiotherapist. The correct way to do Kegel exercises was explained. They were asked to lie down and tighten their pelvic floor, without flexing the muscles of the abdomen, thighs, or buttocks. They had to hold this contraction for 10 seconds, followed by a 10-second relaxation. The second group had weekly sessions of pelvic floor muscle physiotherapy under the supervision of an experienced physiotherapist for 8 weeks, beginning within one week after childbirth. Each session consisted of a 15-minute electrical stimulation of the pelvic floor muscle (stimulating-current characteristics: biphasic rectangular form; frequency 50 Hz; pulse width 250 microseconds; duty cycle, 6 seconds on and 18 seconds off for the first 4 weeks

and 8 seconds on and 24 seconds off for the last 4 weeks; maximal tolerated current intensity<sup>10</sup>. The control group included mothers who received routine care and received customary written postpartum instructions from the hospital. These included encouragement to perform daily contractions of the pelvic floor muscle, but they were not trained and supervised directly by an experienced healthcare provider. We compared the prevalence of urge and stress incontinence between groups at the end of the trial and 12 weeks postpartum. These items were defined as inclusion criteria: age ranged between 18-35 years old, first or second singleton pregnancy, negative history of urinary incontinence before pregnancy, and term normal vaginal delivery. Exclusion criteria were introduced as diabetes, preeclampsia, operative vaginal delivery, prolonged recovery after exercises, and unable to perform exercises due to pain. After collecting data, it was entered into SPSS software version 19 and analyzed. The results were presented as mean  $\pm$  SD for quantitative variables and percentage for qualitative variables. Data were analyzed by the ANCOVA method. Also, a  $P$  value  $< 0.05$  was considered significant.

## 3. RESULTS

The patients enrolled in this interventional study were approximately 24 years old, primigravida mostly, with a body mass index between 25-26 kg/m<sup>2</sup>, and birth weight of the neonates around 3 kg. Kruskal-Wallis test showed samples originate from the same distribution. Demographic data between the three groups have been compared and summarized in Table 1 and 2.

We found that the relative risk of urge and stress incontinence among mothers in the control group was more than the Kegel and physiotherapy groups at the end of the 8th week postpartum, but the difference was only statistically significant in stress incontinence between the Kegel group and control group  $p = 0.02$ , Table 3 and 4. Although, both the Kegel exercises and pelvic floor physiotherapy reduced the prevalence of urge and stress incontinence, compared with the control group at the 12th week postpartum, this reduction was only significant in stress incontinence between the Kegel and control group,  $p = 0.01$ . We found an approximately equal reduction of the incidence of stress incontinence among two groups of Kegel and physiotherapy at the end of the 8th week, Table III. However, patients in the control group avoided social interactions more than the intervention groups, this was not statistically significant ( $p = 0.13$ ).

## 4. DISCUSSION

This randomized controlled trial has been conducted to evaluate the effect of Kegel exercises and pelvic floor physiotherapy on urge and stress incontinence among mothers with normal vaginal delivery, at the end of the 8th and 12th week postpartum. According to our results, urge and stress incontinence are less common in the intervention groups, compared to the control group. The prevalence of stress incontinence in the Kegel group was significantly lower than in the control group, at both the 8th and 12th week after delivery. We found a decrease in urge incontinence after the

Table 1. Demographic data between groups.

-	Kegel Group mean±SD	Physiotherapy Group mean±SD	Control Group mean±SD	p-value
Age (year)	24.4±3.4	24.7±4.9	24.0±3.2	0.39
Gestational age (weeks)	38.3±2.2	39.8±1.2	38.7±3.7	0.06
BMI $\alpha$ (Kg/m $^2$ ) $\infty$	26.0±1.3	25.6±1.3	25.5±0.9	0.08
Birth weight (gr) $\text{£}$	3400.2±130.4	3100.2±116.6	3200.8±122.9	0.53

SD: standard deviation.  $\alpha$ BMI:body mass index,  $\infty$ Kg/m $^2$ : kilogram/ square meter,  $\text{£}$ gr: gram

Table 2. Qualitative variables comparison between groups.

-		Kegel Group Number (%)	Physiotherapy Group Number (%)	Control Group Number (%)	p-value
Gravidity	1	33 (66)	32 (64)	28 (56)	0.55
	2	17 (34)	18 (36)	22 (44)	
Education	Less than high school graduated	35 (70)	34 (68)	37 (74)	0.92
	High school graduated	11 (22)	10 (20)	9 (18)	
	college	4 (8)	6 (12)	4 (8)	
Smoker $\text{£}$		3 (6)	3 (6)	2(4)	0.87
Economic status	Poor $\infty$	39 (78)	42 (84)	45 (90)	0.26
	Moderate $\alpha$	11 (22)	8 (16)	5 (10)	

Passive smoker or less than 3 cigarettes a day,  $\infty$  less than 10 Million Rials monthly,  $\alpha$  10-30 Million Rials monthly

Table 3. Prevalence of stress incontinence.

-	Incidence Number (%)	Relative Risk	p-value
End of the 8th week			
Kegel group	16 (32)	1	-
Physiotherapy group	18 (36)	1.19	0.67
Control group	27 (54)	2.49	0.02
End of the 12th week			
Kegel group	18 (36)	1	-
Physiotherapy group	19 (38)	1.08	0.83
Control group	30 (60)	2.66	0.01

interventions, however, it was not statistically significant compared to the control group, which can be due to the limited sample size. According to our results, the Kegel exercises and pelvic floor physiotherapy have an approximately equal effect on reducing stress incontinence at the end of the 8th week. It has been investigated that women who did pel-

vic floor exercises during pregnancy, were 30% less likely to develop urinary incontinence [9-11]. In a meta-analysis of 14 articles, it has been concluded that the Kegel exercises led to diminishing urinary incontinence significantly [12]. The effect of pelvic floor exercises on quality of life, urinary incontinence treatment, and decline in costs, has been

**Table 4. Prevalence of urge incontinence.**

-	Incidence Number (%)	Relative Risk	p-value
<b>End of the 8th week</b>			
Kegel group	5 (10)	1	-
Physiotherapy group	7 (14)	1.46	0.54
Control group	9 (18)	1.97	0.22
<b>End of the 12th week</b>			
Kegel group	5 (10)	1	-
Physiotherapy group	7 (14)	1.46	0.54
Control group	9 (18)	1.97	0.22

reported in some investigations [13, 14]. Pregnancy is associated with pelvic floor muscle weakness, so pelvic floor training during pregnancy and postpartum can improve muscle strength and urinary tract performance [15]. A 6-week supervised pelvic floor muscle exercise program is effective in preventing stress urinary incontinence in late pregnancy in primigravida women, (27.3% of the intervention group developed urinary incontinence, compared to 53.6% of the control group) [16]. A study on 268 primigravida women with bladder neck mobility at 20 weeks of gestation, showed that pelvic floor training during pregnancy can reduce urinary incontinence, (19.2% of the intervention group developed urinary incontinence, compared to 32.7% of the control group) [17]. Pelvic floor exercises are associated with the strengthening of muscles and the improvement of urinary incontinence [6, 18, 19]. There is still no agreement on the duration of the exercises. There is no consensus on how many muscle contractions should be considered in each session, how many times a day, and for how long. It seems intensive exercise under healthcare professional supervision and weekly follow-ups, are accompanied by more improvement [20, 21]. In spite of the above reports, some experts are not sure these methods can be applied in real life, due to the necessity of following up and training by experienced specialists [22].

## CONCLUSION

There is a significant decrease in the incidence of stress urinary incontinence in both intervention groups at the end of the 8th and 12th week postpartum compared to the control group. Also, although urge incontinence among women in the intervention groups was lower than in the control group, it was not statistically significant. It seems the effect of Kegel exercises and pelvic floor physiotherapy, in reducing stress incontinence at the end of the 8th week, is almost equal.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This article is approved by the Vice Chancellor for Research and Technology of Hamadan University of

Medical Sciences with the ethics code number IR.UMSHA.REC.1398.646 and the Iranian clinical trial registration code number IRCT201220215009014N326.

## HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

All of the enrolled patients were aware of our study goals and signed the consent form

## STANDARDS OF REPORTING

CONSORT guidelines were followed.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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## REFERENCES

- [1] Kim Y, Kwak Y, Brubaker L, Cornu JN, Daly JO, Cartwright R. Urinary incontinence in women in relation to occupational status. *Women Health* 2017; 57(1): 1-18.  
<http://dx.doi.org/10.1080/03630242.2016.1150387> PMID: 26853676
- [2] Lukacz ES, Santiago-Lastra Y, Albo ME, Brubaker L. Urinary incontinence in women: A review. *JAMA* 2017; 318(16): 1592-604.  
<http://dx.doi.org/10.1001/jama.2017.12137> PMID: 29067433

- [3] Wood LN and Anger JT. Urinary incontinence in women. *BMJ* 2014; 349(sep15 4): g4531. <http://dx.doi.org/10.1136/bmj.g4531> PMID: 25225003
- [4] Barbosa L, Boaviagem A, Moretti E, Lemos A. Multiparity, age and overweight/obesity as risk factors for urinary incontinence in pregnancy: A systematic review and meta-analysis. *Int Urogynecol J Pelvic Floor Dysfunct* 2018; 29(10): 1413-27. <http://dx.doi.org/10.1007/s00192-018-3656-9> PMID: 29754281
- [5] Dumoulin C, Hay-Smith J. Pelvic floor muscle training *versus* no treatment for urinary incontinence in women. A Cochrane systematic review. *Eur J Phys Rehabil Med* 2008; 44(1): 47-63. PMID: 18385628
- [6] Dumoulin C, Hay-Smith J, Habée-Séguin GM, Mercier J. Pelvic floor muscle training *versus* no treatment, or inactive control treatments, for urinary incontinence in women: A short version Cochrane systematic review with meta-analysis. *Neurourol Urodyn* 2015; 34(4): 300-8. <http://dx.doi.org/10.1002/nau.22700> PMID: 25408383
- [7] Fowler SB. Pelvic floor muscle training *versus* no treatment, or inactive control treatments, for urinary incontinence in women. *Clin Nurse Spec* 2011; 25(5): 226-7. <http://dx.doi.org/10.1097/NUR.0b013e31822b41ce> PMID: 22649843
- [8] National Institute for Health and Care Excellence. Urinary incontinence in women: Management Clinical guideline. National Institute for Health and Care Excellence Manchester 2013. CG171
- [9] Mørkved S, Bø K. The effect of postpartum pelvic floor muscle exercise in the prevention and treatment of urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 1997; 8(4): 217-22. <http://dx.doi.org/10.1007/BF02765817> PMID: 9449300
- [10] Dumoulin C, Seaborne DE, Quirion-DeGirardi C, Sullivan SJ. Pelvic-floor rehabilitation, Part 2: Pelvic-floor reeducation with interferential currents and exercise in the treatment of genuine stress incontinence in postpartum women--a cohort study. *Phys Ther* 1995; 75(12): 1075-81. <http://dx.doi.org/10.1093/ptj/75.12.1075> PMID: 7501710
- [11] Boyle R, Hay-Smith EJC, Cody JD, Mørkved S. Pelvic floor muscle training for prevention and treatment of urinary and fecal incontinence in antenatal and postnatal women: A short version Cochrane review. *Neurourol Urodyn* 2014; 33(3): 269-76. <http://dx.doi.org/10.1002/nau.22402> PMID: 23616292
- [12] Park SH, Kang CB, Jang SY, Kim BY. [Effect of Kegel exercise to prevent urinary and fecal incontinence in antenatal and postnatal women: Systematic review]. *J Korean Acad Nurs* 2013; 43(3): 420-30. <http://dx.doi.org/10.4040/jkan.2013.43.3.420> PMID: 23893232
- [13] Radzimińska A, Strączyńska A, Weber-Rajek M, Styczyńska H, Strojek K, Piekorz Z. The impact of pelvic floor muscle training on the quality of life of women with urinary incontinence: A systematic literature review. *Clin Interv Aging* 2018; 13: 957-65. <http://dx.doi.org/10.2147/CIA.S160057> PMID: 29844662
- [14] Dumoulin C, Cacciari LP, Hay-Smith EJC. Pelvic floor muscle training *versus* no treatment, or inactive control treatments, for urinary incontinence in women. Cochrane database of systematic reviews 2018; 2018(10) <http://dx.doi.org/10.1002/14651858.CD005654.pub4>
- [15] Kahyaoglu Sut H, Balkanli Kaplan P. Effect of pelvic floor muscle exercise on pelvic floor muscle activity and voiding functions during pregnancy and the postpartum period. *Neurourol Urodyn* 2016; 35(3): 417-22. <http://dx.doi.org/10.1002/nau.22728> PMID: 25648223
- [16] Sangsawang B, Sangsawang N. Is a 6-week supervised pelvic floor muscle exercise program effective in preventing stress urinary incontinence in late pregnancy in primigravid women?: A randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol* 2016; 197: 103-10. <http://dx.doi.org/10.1016/j.ejogrb.2015.11.039> PMID: 26720598
- [17] Reilly ETC, Freeman RM, Waterfield MR, Waterfield AE, Steggle P, Pedlar F. Prevention of postpartum stress incontinence in primigravidae with increased bladder neck mobility: A randomised controlled trial of antenatal pelvic floor exercises. *BJOG* 2014; 121(Suppl. 7): 58-66. <http://dx.doi.org/10.1111/1471-0528.13213> PMID: 25488090
- [18] Marques J, Botelho S, Pereira LC, *et al.* Pelvic floor muscle training program increases muscular contractility during first pregnancy and postpartum: Electromyographic study. *Neurourol Urodyn* 2013; 32(7): 998-1003. <http://dx.doi.org/10.1002/nau.22346> PMID: 23129397
- [19] Turkan A, Inci Y, Fazli D. The short-term effects of physical therapy in different intensities of urodynamic stress incontinence. *Gynecol Obstet Invest* 2005; 59(1): 43-8. <http://dx.doi.org/10.1159/000081133> PMID: 15459518
- [20] Mørkved S, Bø K, Schei B, Salvesen KÅ. Pelvic floor muscle training during pregnancy to prevent urinary incontinence: A single-blind randomized controlled trial. *Obstet Gynecol* 2003; 101(2): 313-9. <http://dx.doi.org/10.1097/00006250-200302000-00018> PMID: 12576255
- [21] Glazener CMA, Herbison GP, Wilson PD, *et al.* Conservative management of persistent postnatal urinary and faecal incontinence: Randomised controlled. *BMJ* 2001; 323(7313): 593-6. <http://dx.doi.org/10.1136/bmj.323.7313.593> PMID: 11557703
- [22] Freeman RM. Can we prevent childbirth-related pelvic floor dysfunction? *BJOG* 2013; 120(2): 137-40. <http://dx.doi.org/10.1111/1471-0528.12092> PMID: 23240795

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