

# Effect of Kegel Exercises on The Recurrence of Lower Urinary Tract Infection in Multiparity

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Received August 3, 2019, accepted September 9, 2019.

doi: 10.47104/ebnrojs3.v1i4.108

## ABSTRACT

**Context:** Urinary problems are common in females, affecting approximately one-third of adult women. Multiple deliveries Reduced pelvic floor strength affects the bladder function because the bladder does not completely empty, leaving a 'pool' of urine, which can lead to recurrent urinary infection. Kegel exercises are the most widely used method for strengthening muscles in the pelvic floor. Patients can do them at any time, anywhere, while doing other work and without regular visits to hospitals.

**Aim:** The study aims to assess the effects of Kegel Exercises on the recurrence of Lower Urinary Tract Infection in Multiparity.

**Methods:** A convenience sample of 100 patients suffer from recurrent urinary tract infection (UTI) and (Multiparity) had more than three normal deliveries, assigned randomly and alternatively into two equal groups, 50 in each. The first group (control group) received standard hospital nursing care. The second group (study group) taught Kegel exercises. Outcome measurements included the use of UTI Symptoms Assessment Questionnaire, administered pre and two months post regular Kegel exercises, to assess the severity and bothersome of the most frequently reported symptoms of UTI.

**Results:** Regarding the degree of symptoms for urinary tract infection in the first visit, the majority of patients in both groups had a maximum degree of symptoms. Regarding all symptoms, the patient suffering from frequency, urgency of urination, pain or burning when passing urine, inability to empty the bladder completely, pain or uncomfortable pressure in lower abdomen/pelvic area, low back pain, and blood in urine with a non-statistically significant difference between both groups. On the other hand, in the second visit, there was a statistically significant difference between patients who received hospital care and study group who practice Kegel exercise regarding all symptoms. There was a statistically significant difference between both groups regarding the severity of urinary tract infections.

**Conclusion:** Women with recurrent urinary tract infection symptoms exhibit self-reported cure or improvement of urinary tract infection symptoms after the regular performance of Kegel exercises. Applying educational sessions by nurses is recommended for females after normal delivery and caesarian section delivery.

**Keywords:** Kegel exercises, lower urinary tract infection, signs, and symptoms of UTI, multiparity

## 1. Introduction

Urinary tract infection (UTI) is a common reason for women to seek medical advice in general practice. Acute cystitis refers to infection of the bladder (lower urinary tract) among sexually active young women. The frequency of symptomatic urinary tract infection (UTI) is high. UTI is the most common bacterial infection. More than 50% of women suffer at least one incidence of UTI during their lifetime, counting for more than eight million office visits and one million emergency department visits each year in the United States, eventually resulting in approximately 100,000 hospitalizations. The overall number of office visits for UTIs is twice as common among women of all ages compared with men (Foxman, 2003; Gupta et al., 2011).

Studies have shown that 1 in 5 adult women experience a UTI at some point, confirming that it is an exceedingly common worldwide problem. The epidemiology of UTI in the tropics is less well documented. UTIs appear to be

common and associated with structural abnormalities (Schaeffer & Schaeffer, 2012; Barclay 2013; Adeghate, 2016). Recurrent UTI associates several factors. Most commonly, these are sexual intercourse, the use of contraceptives, especially spermicides, diaphragms, oral contraceptives, and family history (Foxman, 2003).

The bony pelvis is composed of two hip bones. They connected posteriorly by the sacrum and by the pubic symphysis anteriorly. The female pelvis is wider compared to the male pelvis to accommodate childbirth. However, this creates a predisposition for pelvic floor weakness. The pelvic diaphragm comprises the muscles of the levator ani and the coccygeus. It is the fusion of the posterior fibers of the pubococcygeus muscles with the iliococcygeus muscle that forms the levator plate, a structure between the anus and the coccyx that the pelvic organs rest upon them (Ashton & DeLancey, 2007).

Dysfunctions at any of these levels, and usually a combination of two or all three of them, resulted in typical prolapse of the anterior compartment (cystocele), which may predispose to UTI. Rarely, a significant posterior compartment prolapsed (rectocele) may press anteriorly on

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the bladder neck and urethra, causing obstructive voiding, urgency/frequency or high post-void residuals, in turn raising the possibility of recurrent UTI (Herschorn, 2004).

Pelvic floor dysfunctions (PFD) are common, affecting approximately one-third of adult women, with a significant impact on their quality of life, emotional well-being, and ability to actively participate in society. Etiologic risk factors and associations contributing to PFD include vaginal parity, aging, hormonal status, pelvic surgery, collagen diseases, and depression (Goh, 2003; Wald, 2007; Rortveit et al., 2003).

Silent trauma to the pelvic floor in the case of multiple vaginal deliveries, like unattended home deliveries and various gynecological and obstetric surgeries, compound the urinary problems and reduced pelvic floor strength which affects bladder function because, in some cases, the bladder does not completely empty, leaving a 'pool' of urine, which can lead to infection (Mathur et al., 2017; Ashton & DeLancey, 2007; Amaro, Moreira, De Oliveira Orsi Gameiro, & Padovani, 2005; Ozdemir & Makar, 2015).

Kegel exercises are the most common approach for strengthening pelvic floor muscles and are non-invasive treatment so that they do not involve any vaginal weights/cones being placed. US gynecologist Anold Kegel first described them in 1948. These are the most cost-effective treatment and differ from other treatments because, at any moment, wherever, while doing other jobs, and without regular hospital visits, the patients can do them by themselves. Patients merely need to be trained in how their pelvic floor muscles contract. The study was done by Hay-Smith, Bø Berghmans, Hendriks, de Bie, & van Waalwijk van Doorn (2001) showed that Kegel exercises steadily reinforce the pelvic muscles.

## 2. Significance of the study

Urinary problems are common in Egyptian females, which adversely affect their quality of life. More than 50% of women suffer at least one incidence of UTI during their lifetime due to Pelvic Floor Dysfunctions (PFD) (Al Bader & AlShaikh, 2013). It is commonly influenced by social stigmata and general apathy towards women's health. Such patients usually present after chronic suffering and several trials of household and unscientific remedies. Ignorance and illiteracy further add to the problem (Mody & Juthani-Mehta, 2014).

Hence the study intended to improve pelvic floor muscles by training multiparous females on Kegel exercises and examine the effect on management of the recurrent UTI and the severity of the symptoms.

## 3. Aim of the study

This study intended to assess the effects of Kegel exercises on the recurrence of lower Urinary tract infection in multiparous.

## 3.1. Research Hypotheses

Multiparous women with recurrent urinary tract infection symptoms who keep trained on Kegel exercises will exhibit self-reported cure or improvement of urinary tract infection symptoms compared to controls.

## 3.2. Operational definition

*Kegel exercises* defined as a program of repeated voluntary pelvic floor muscle contractions taught and supervised by a health care professional.

*Recurrent UTIs*, which include relapses and reinfection, defined as uncomplicated UTIs  $\geq 3$  infections within the preceding year.

## 4. Subjects and Methods

### 4.1. Research design

A quasi-experimental study (study/control group) used to achieve the aim of this study. Quasi-experiment is an empirical interventional study used to estimate the causal effect of the intervention on the target population without randomization. Quasi-experimental research shares similarities with conventional experimental design or randomized controlled trials, but it explicitly lacks the feature of random treatment or control assignment (Polit, 2004)

### 4.2. Research setting

This study was conducted at the urology outpatient clinic affiliated to one of the leading university hospitals of Alexandria Faculty of Medicine. Urology outpatient clinic located at the one-day hospital. The clinic is dedicated to delivering free quality and contemporary care to urology patients, serving Alexandria, ElBahera, Kafer ElSheikh, and Matruh Governorates.

### 4.3. Subjects

The study included a convenience sample of 100 patients who were multiparity (they had more than three normal deliveries) attending urology outpatient clinics suffering from recurrent lower UTI (more than three times last year). An appointment with the patient to explain the study verbally and in writing. Patients were then asked to give written informed consent. Each consenting patient was randomly allocated to one of two groups. The randomization was from a computer-generated randomized table (Random Number Generator 2018) (Stat 2018). Each group includes fifty patients. Both groups received medical treatment for urinary tract infection. The study group (I) received educational sessions and training Kegel exercises for two months, and the control group (II) received routine treatment.

#### 4.4. Tools of the study

Two tools were used for data collection:

##### 4.4.1. Structured interview questionnaire

It developed by the researcher after reviewing related literature (Nathan, Lindsay, Alistair, Danial, & Ross, 2017) to assess socio-demographic characteristics and clinical conditions of patients. It consisted of two sections:

The first section included questions regarding socio-demographic information of the patients such as age, educational status, occupation, and area of residence. The second section included questions regarding a clinical condition. It included current diagnosis, associated diseases, history of pelvic surgery, type of delivery, number of parties, frequency of UTIs/year, and body mass index.

##### 4.4.2. Urinary Tract Infection Symptoms Assessment Questionnaire (UTISA)

It is a self-administered questionnaire designed to evaluate the severity and bothersome of the signs and symptoms of urinary tract infection that are most frequently reported (Colgan, Keating, & Dougouih, 2004). The questionnaire assessed seven symptoms, including frequency, urgency, burning, and pain during urination (dysuria), incomplete emptying of the bladder, pain or discomfort in the lower abdomen, low back pain, and urine leakage.

The UTISA questionnaire was administered at the first visit, and finally, after two months. UTISA questionnaire had high internal consistency with an alpha coefficient of 0.77, implying a homogeneous composition of symptoms in women with UTI. The UTISA questionnaire's domains revealed an excellent discriminant validity that could discriminate between women with various clinical conditions. UTISA's responsiveness has also been excellent, with high correlations between changes in domain scores and clinical assessment.

##### Scoring system

Levels of 'severity' and 'bothersome' for each symptom scored against four points Likert-type scale. The 'severity' symptom response options being 'did not have,' 'mild,' 'moderate,' 'severe,' that scored from 0–3; and the bothersome symptoms scored as being 'not at all,' 'a little,' 'moderately,' 'a lot,' that scored from 0–3.

#### 4.5. Procedures

The study was conducted as follows:

The Dean of the Faculty of Nursing, Modern University, the directors, and the nursing directors of the urology unit issued permission to conduct the current study.

Content validity for the study tool was established by a jury of five expert professors from Medical-Surgical nursing, a urologist, and necessary modifications were done.

Phase I was the assessment phase. Initial assessment of all patients was carried out immediately before the beginning of the implementation of interventions using the tool "UTISA" to collect baseline data.

Phase II was the implementation. Each group received intervention for two months. Patients in group 1 (control) were given a standard intervention (medical treatment and routine nursing care). Patients in group 2 (study) were taught Kegel exercises and had educational sessions (how to prevent UTI). They also received written instruction pamphlet to direct themselves at home with (medical treatment).

Teaching sessions for women carried in the urology clinic for 30 minutes. The sessions included

Group II (study): received standard intervention (medical treatment and routine nursing care), general instruction session, and teaching session about Kegel exercises training for 30 minutes. Educational sessions included two sessions, encompassed general instructions to prevent UTI and training sessions on Kegel exercises. Follow up session was done after one week to evaluate the continuation of Kegel exercises and answer the women's questions. The evaluation session included evaluation for the effect of the intervention. Both groups using UTISA questionnaire to assess improvement UTI symptoms.

The general instruction session to prevent recurrent infection included instruction about diet, fluid, frequent urination, preventive measures related to sexual intercourse, personal hygienic care. Kegel exercises training sessions include an explanation of what are Kegel exercises, benefit from doing Kegel exercises, how to do Kegel exercises, find the right muscles. The researcher explained how to identify pelvic floor muscles, then instructed the patient on how to use the urination act as a home exercise. Participants were instructed to start and stop midstream urine flow and not to repeat it frequently as it may weaken the muscles of the pelvic floor. The women instructed to concentrate on the act feels. When urination is complete, the patient is instructed to do the same movement again and hold for 2 seconds. The patient should feel the squeezing of the pelvic muscle (Wilson, 2019).

The technique to do Kegels, ask the patient to imagine she is sitting on a marble and tighten her pelvic muscles as if she is lifting the marble. Try it for three seconds each time, and then relax for a count of three (Conte, 2019). Alternatively, the patient had been told to be in a lying crook posture. The researcher told the patients to squeeze and let it go. This technique should be repeated five times. It is a quick contraction followed by a slow relaxation in which they asked to try to draw up and inward their vagina and anus. Contract the pelvic floor muscle and hold the contraction for 5 seconds and relax for 5 seconds, repeat this for five times. This instruction is done in one session. Increase this regime up to 10 seconds. Contraction and relaxation took 10 seconds. The subjects were to breathe freely during exercises.

The researcher also instructed the patients to repeat the set of exercise three times a day, targeting at least three sets of 10 to 15 repetitions a day (Soni, Rahule, & Sagdeo 2014; Abrams et al., 2002; Choarelli & Kafe 1981; Castro et al., 2008).

Phase III involves the evaluation of the intervention. This phase carried out after two months of regular Kegel

exercises. Patients re-evaluated by using the "UTISA" tool to determine the effectiveness of exercise on patients' severity and bothersome of symptoms and signs of UTI, and a comparison between the study group and control group was made. All data was collected recorded and analyzed.

**Ethical considerations:** The researcher obtained informed consent from all patients after the explanation of the aims of the study before starting the study. Confidentiality, anonymity, and privacy were assured. Participation was on a voluntary basis. All the patients had the right to withdraw from the study at any time without any drawbacks.

#### 4.6. Data analysis

Data was fed to a personal computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Qualitative variables presented as frequency and percentage. Quantitative data presented a mean and standard deviation. The significance of the obtained results was considered at the 0.05 level. The used tests were: Paired t-test: For normally distributed quantitative variables, to compare between the control group and the intervention group. Fisher exact test and Chi used in the analysis of contingency tables.

### 5. Results

Table 1 demonstrates the comparison between study and control groups regarding their sociodemographic characteristics. The patients' mean age was  $45.88 \pm 7.87$  years and  $48.06 \pm 8.58$  years for the patient who received hospital care and Kegel exercise groups, respectively. Concerning the occupational status, the highest percentage in both groups was housewives (68.0 % and 72.0 %) of the patients received hospital care and Kegel exercise groups, respectively. Concerning patients' area of residence, the highest percentages in both groups were from a rural area (66.0 % and 58.0 %) of the patient received hospital care and Kegel exercise groups, respectively.

A non-statistically significant difference was revealed between both groups regarding their sociodemographic characteristics regarding age, occupational status and area of residence ( $t = -1.324$   $P = 0.189$ ), (FET = 1.28  $P = 0.55$ ), ( $\chi^2 = 0.679$ ,  $P = 0.53$ ) respectively. On the other hand, regarding patient education, the highest percentage in-hospital care group (38.0 %) was read and write while in the Kegel exercise group (48.0%) had a primary education school certificate. There was a statistically significant difference between both groups (FET = 9.675  $P = 0.019$ ).

Table 2 represents the comparison between the hospital care group and the Kegel exercise group. The highest percentages of patients in both groups had cystitis 60.0% and 74.0% for hospital care and Kegel exercise groups, respectively. Concerning associated diseases, the highest percentages in both groups had no associated disease 84.0% and 78.0% for hospital care and Kegel exercise groups, respectively. However, hypertension and diabetes mellitus were associated disorders among the rest of the participated

patients. Regarding the history of pelvic surgery, the majority of the patient had no pelvic surgery 62.0 % and 82.0 % for hospital care and Kegel exercise groups, respectively.

Concerning the type of delivery, more than half of patients in the hospital care and Kegel exercise groups, 64.0% and 80.0 % were delivered normally. Regarding the number of parties, 40.0% and 54.0% of hospital care and Kegel exercise groups delivered three times.

As regards the frequency of urinary tract infection, more than half of the patients have a three-time recurrent urinary tract infection, 54% and 62% of hospital care and Kegel exercise groups. Concerning body mass index, (48.0% and 54.0%) of patients who received hospital care and Kegel exercise group respectively were overweight, with a non-statistically significant difference between both groups regarding all medical history except pelvic surgery.

Table 3 demonstrates the comparison between the study and control group regarding the degree of the presenting symptoms for urinary tract infection. About the first visit, the majority of patients in both groups had the maximum degree of symptoms(A lot) for all symptoms including; frequency, urgency of urination, pain or burning when passing urine, ability to empty bladder completely, pain or uncomfortable pressure in lower abdomen/pelvic area, low back pain and blood in urine and there was no statistically significant difference between both groups. On the other hand, in the second visit, there was a statistically significant difference between patient's received hospital care and Kegel exercise group regarding all symptoms

Table 4 reveals the comparison between the study and control group regarding the patient's rating to the overall severity of UTI symptoms after two months. The overall rating for the hospital care group; 68 % of the hospital care group had moderate symptoms compared to 40% of the Kegel exercise group had no symptoms at all after two months of intervention. There was statistically significant difference between both groups (FET = 55.64,  $P = 0.000$ ). Patients rated these changes in UTI symptoms as 56% of the control group moderately better compared to 78% of the study group rated as a very great deal better changes (FET = 122.34,  $P = 0.000$ ).

Table 5 clarifies the association between the study and control group regarding the overall improvement in reducing urinary symptoms and body mass index in second visits. There was no significant association between body mass index ((BMI) and improvement in UTI symptoms in both groups ( $P = 0.482, 0.948$ ), respectively.

Table 6 represents the association between the overall rating of the severity of urinary tract infection symptoms and body mass index category among hospital care and Kegel exercise groups in second visits. There was no significant association between body mass index ((BMI) and overall severity of urinary tract infection (FET= 1.888,  $P 9.00$ ). Regarding the Kegel exercise group, there was no significant association between body mass index ((BMI) and overall severity of urinary tract infection (FET = 0.857  $P = 1.000$ ).

Table (1): Comparison of the study and control group regarding their Sociodemographic characteristics.

Bio-socio-demographic characteristics	Hospital care Group (n=50)		Kegel exercise Group (n=50)		Significance test	p-value
	Number (N)	Percent (%)	Number (N)	Percent (%)		
Age (Mean ± SD)	45.88 ± 7.87		48.06 ± 8.58		T = -1.324	P = 0.189
<b>Educational Level</b>						
Illiterate	9	18.0	5	10.0	FET = 9.675	P = 0.01
Read and Write	19	38.0	8	16.0		
Primary	16	32.0	24	48.0		
Secondary	6	12.0	13	26.0		
<b>Occupation</b>						
Laborer	11	22.0	7	14.0	FET = 1.28	P = 0.558
Clerical	5	10.0	7	14.0		
Housewife	34	68.0	36	72.0		
<b>Area of residence</b>						
Rural	33	66.0	29	58.0	$\chi^2 = 0.679$	P = 0.537
Urban	17	34.0	21	42.0		

$\chi^2$  = Chi-square test, FET = The Fisher's exact test, Significant difference at P level  $\leq 0.05$ .

Table (2): Comparison of the study and control group regarding their medical history.

Medical history	Hospital care Group (n=50)		Kegel exercise Group (n=50)		Significance test*	p-value
	Number (N)	Percent (%)	Number (N)	Percent (%)		
<b>Current diagnosis</b>						
Cystitis	30	60.0	37	74.0	FET = 3.260	0.312
Cystocele	13	26.0	7	14.0		
Rectocele	5	10.0	3	6.0		
Pelvic tumor	2	4.0	3	6.0		
<b>Associated diseases</b>						
No	42	84.0	39	78.0	FET = 0.657	0.736
Hypotension	3	6.0	4	8.0		
Diabetes	5	10.0	7	14.0		
<b>Pelvic surgery history</b>						
No	31	62.0	41	82.0	FET = 4.960	0.044
Yes	19	38.0	9	18.0		
<b>Type of delivery</b>						
Normal	32	64.0	40	80.0	$\chi^2 = 3.175$	0.118
Cesarean section	18	36.0	10	20.0		
<b>Number of parities</b>						
Three	20	40.0	27	54.0	FET = 3.236	0.562
Four	15	30.0	13	26.0		
Five	10	20.0	6	12.0		
Six	4	8.0	2	4.0		
Seven	1	2.0	2	4.0		
<b>Frequency of UTI/ per year</b>						
Three times	27	54.0	31	62.0	FET = 1.922	0.643
Four times	20	40.0	16	32.0		
Five times	3	6.0	2	4.0		
Six times	0	0.0	1	2.0		
<b>Body Mass Index (BMI)</b>						
Overweight	24	48.0	27	54.0	FET = 0.758	0.721
Moderate Obese	23	46.0	19	38.0		
Severely Obese	3	6.0	4	8.0		
Mean BMI ± SD	30.67 ± 3.055		29.94 ± 2.90		T = 1.223	0.224

\* $\chi^2$  = Chi-square test, FET = The Fisher's exact test, Significant difference at P level  $\leq 0.05$ .

**Table (3): Comparison between the study and control groups regarding their symptom presence at first and second visits.**

Degree of symptoms	1 <sup>st</sup> Visit				Test	p-value	2 <sup>nd</sup> visit				Test	P-value
	Hospital care (50)		Kegel exercise (50)				Hospital care (50)		Kegel exercise (50)			
	No.	%	No.	%			No.	%	No.	%		
<b>Frequency of urination</b>												
Not at all	0	0.0	0	0.0	$\chi^2 = 0.33$	0.56	0	0.0	5	10.0	FET = 78.66	0.00
A little	0	0.0	0	0.0			3	6.0	40	80.0		
Moderate	8	16.0	6	12.0			42	84.0	5	10.0		
A lot	42	84.0	44	88.0			5	10.0	0	0.0		
<b>Urgency of urination</b>												
Not at all	0	0.0	0	0.0	-	-	0	0.0	6	12.0	FET = 62.46	0.00
A little	0	0.0	0	0.0			6	12.0	38	76.0		
Moderate	0	0.0	0	0.0			39	78.0	6	12.0		
A lot	50	100	50	100			5	10.0	0	0.0		
<b>Pain or burning when passing urine</b>												
Not at all	0	0.0	0	0.0	-	-	0	0.0	6	12.0	FET = 74.11	0.00
A little	0	0.0	0	0.0			4	8.0	39	78.0		
Moderate	0	0.0	0	0.0			41	82.0	5	10.0		
A lot	50	100	50	100			5	10.0	0	0.0		
<b>Ability to empty the bladder completely</b>												
Not at all	0	0.0	0	0.0	FET = 0.12	1.00	0	0.0	6	12.0	FET = 87.72	0.00
A little	0	0.0	0	0.0			3	6.0	41	82.0		
Moderate	5	10.0	4	8.0			42	84.0	3	6.0		
A lot	45	90.0	46	92.0			5	10.0	0	0.0		
<b>Pain or uncomfortable pressure in lower abdomen/ pelvic area</b>												
Not at all	0	0.0	0	0.0	-	-	0	0.0	6	12.0	FET = 88.25	0.00
A little	0	0.0	0	0.0			2	4.0	40	80.0		
Moderate	0	0.0	0	0.0			45	90.0	4	8.0		
A lot	50	100	50	100			3	6.0	0	0.0		
<b>Low back pain</b>												
Not at all	0	0.0	0	0.0	FET = 0.34	1.00	0	0.0	6	12.0	FET = 82.03	0.00
A little	0	0.0	0	0.0			7	14.0	43	86.0		
Moderate	2	4.0	1	2.0			40	80.0	1	2.0		
A lot	48	96.0	49	98.0			3	6.0	0	0.0		
<b>Blood in urine</b>												
Not at all	0	0.0	0	0.0	$\chi^2 = 0.10$	1.00	15	30.0	45	90.0	FET = 39.57	0.00
A little	0	0.0	0	0.0			29	58.0	5	10.0		
Moderate	5	10.0	6	20.0			6	12.0	0	0.0		
A lot	45	90.0	44	88.0			0	0.0	0	0.0		

**Table (4): Comparison of the study group and control group regarding the overall rating of the severity of Urinary tract infection symptoms after two months of intervention.**

Overall rating of severity	Hospital care N= 50		Kegel exercise N= 50		Test	P-value
	No.	%	No.	%		
<b>Overall rating of the severity of urinary tract infection symptoms</b>						
No symptoms at all	0	0.0	20	40.0	FET = 55.64	P = 0.000
Mild	14	28.0	26	52.0		
Moderate	34	68.0	4	8.0		
Severe	2	4.0	0	0.0		
Better (overall improvement)	48	96.0	50	100.0		
<b>Changes in urinary tract infection symptoms</b>						
Very great deal better	0	0.0	39	78.0	FET = 122.34	P = 0.000
Great deal better	0	0.0	9	18.0		
Good deal better	0	0.0	2	4.0		
Moderately better	28	56.0	0	0.0		
Somewhat better	20	40.0	0	0.0		
A little better	2	4.0	0	0.0		



Regarding the history of pelvic surgery, the majority of the patient had no pelvic surgery for control and Kegel exercise groups, respectively, that pelvic surgery increased the incidence of UTI in females due to the increasing weakness of pelvic muscles. Also, *Dawson, Cramer, Thompson, and Vakili (2018)* found that almost 12% of patients develop a UTI after pelvic reconstructive surgery.

More than half of the patients in the hospital care and Kegel exercise groups were delivered normally. Regarding the number of parities of control and Kegel exercise groups, the highest percentage was delivered at least three times. So, increasing the number of normal delivery than three times lead to increasing weakness of pelvic muscles hence increased incidence of UTI. Also, *Mazor-Dray, Levy, Schlaeffer, and Sheiner (2009)* stated that multiparity was associated with more severe acute cystitis. *Besides, Gundersen et al. (2017)* findings are contradicting to the current study that women with intended cesarean delivery had a significantly increased risk of postpartum urinary tract infection compared with women with intended vaginal delivery.

Concerning body mass index, of control and Kegel exercise group respectively, around half of them were overweight, and more than the third is moderately obese. Obesity leads to an increased incidence of UTI in multipara. *Barber (2012)* stated that obesity, as measured by body mass index (BMI), is associated with increased risk for urinary tract infection (UTI) and pyelonephritis in both sexes, according to a retrospective, cross-sectional study.

Regarding the degree of improvement in reducing UTI signs and symptoms for urinary tract infection, there was a statistically significant difference between patients of control and the Kegel exercise group regarding all symptoms compared to the non-significance difference between the two groups in the first visit. The patients in the second visit after continue training and practicing Kegel exercises for two months gained an improvement of UTI signs and symptoms and bothersome from these signs and symptoms including; frequency, urgency of urination, pain or burning when passing urine, ability to empty bladder completely, pain or uncomfortable pressure in lower abdomen/pelvic area, low back pain and blood in urine.

Also, there was an improvement of overall symptoms of UTI in Kegel exercises group compared to controls; and degree of improvement symptoms among patients' control group and Kegel exercise group, there were statistically significant differences between both groups. In this venue, *Lúcio et al. (2011)* stated that the improvement of lower urinary tract symptoms had a positive impact on women who underwent pelvic floor muscle training. The treatment group reported fewer storage and voiding symptoms than the control group.

The evaluation of the impact of Kegel exercises on the recurrence of urinary tract infection and reduce UTI symptoms that were carried out in the presented study. The study showed that the statistically highest improvement in overall UTI symptoms occurred after regular Kegel exercises, improvement UTI symptoms including;

frequency, urgency of urination, pain or burning when passing urine, ability to empty bladder completely, pain or uncomfortable pressure in lower abdomen/pelvic area, low back pain and blood in urine due to effects of Kegel exercises on strengthening of pelvic floor muscle after two months of continuous supervised training compared with control group. *Fan, Chan, Law, Cheung, and Chung (2013)* results revealed a significant improvement of the UTI in the experimental group compared with the control group after a 6-week training program. Whereas *Ferreira and Santos (2013)* showed those six months following the treatment, the UTI symptoms were improved. *De Paepe et al. (2002)* found that pelvic-floor exercise therapy seems a reasonable and meaningful component in the treatment of recurrent UTIs in girls. The current research hypothesis is supported.

## 7. Conclusion

The current study finding showed that women with recurrent urinary tract infection symptoms who keep trained on Kegel exercises exhibited self-reported cure or improvement urinary tract infection symptoms compared to controls.

The improvement of UTI symptoms including; frequency, urgency of urination, pain or burning when passing urine, ability to empty bladder completely, pain or uncomfortable pressure in lower abdomen/pelvic area, low back pain and blood in urine had a positive effect on UTI signs, and symptoms in women performed regular Kegel exercises compared with a control group.

## 8. Recommendations

- Applying educational sessions by nurses for females after normal delivery and caesarian section delivery to improve the strength of the pelvic floor muscles.
- Further researches concerning the effect of novel interventions in reducing the recurrence of UTIs.

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