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Masters Program in Public Health, Universitas Sebelas Maret

Meta-analysis

Meta-Analysis of the Effect of Pelvic Floor Muscle Training in Reducing Urinary Incontinence and Elevating Quality of Life in Women

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ABSTRACT

Background: Urinary incontinence is a complaint of involuntary loss of urine and often occurs in women due to bladder dysfunction or weakened pelvic floor muscles. Pelvic floor muscle training (PMFT) is an exercise to treat urinary incontinence. This study aimed to analyze the effectiveness of pelvic floor muscle training to reduce urinary incontinence and improve quality of life in women.

Subjects and Method: This was a systematic review and meta-analysis. The data was obtained through journal databases including PubMed, Science Direct, and Google Scholar by selecting articles published in 2010-2020. The keywords used were ("pelvic floor muscle training" OR "pelvic floor exercise" OR "kegel") AND ("urinary incontinence" OR "leaking urine" OR "urinary leakage") AND ("women" OR "female") AND "quality of life" AND "randomized controlled trial". The inclusion criteria were full paper articles with the Randomized Controlled Trial (RCT) research method. The size relationship used's of Mean SD, the intervention given was pelvic floor muscle training; female research subjects were 20-75 years old and experienced urinary incontinence. Search articles were done by using the PICO model. Population= Women with urinary incontinence, Intervention= pelvic floor muscle training, Comparison= not given PMFT, and Outcome= decreased urinary incontinence and improved quality of life. Articles were collected by using PRISMA flow diagrams and analyzed using the Revman 5.3 application.

Results: Meta-analysis of 7 articles showed that pelvic floor muscle training could reduce urinary incontinence by 0.56 times higher compared to other interventions or no intervention (SMD= -0.56; 95% CI= -1.03 to -0.09; p= 0.020). Meta-analysis of 9 articles showed that pelvic floor muscle training improved quality of life by 0.32 times higher compared to other interventions or no intervention (SMD= -0.32; 95% CI= -0.66 to 0.02; p=0.070).

Conclusion: Pelvic Floor Muscle Training (PMFT) reduces urinary incontinence and improves the quality of life in women.

Keywords: pelvic floor muscle training, urinary incontinence, quality of life

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BACKGROUND

The International Continence Society defined urinary incontinence as the involuntary loss of urine (Aly et al., 2020). Urinary incontinence is more common in women than men and increases with age, and impacts the quality of life (Bardsley, 2016).

The prevalence of urinary incontinence increases with age, occurring in about 26.6% of women aged 65 to 74 years old and 41.8% of women over the age of 75 years old (Dumoulin and Le Berre, 2020). Women over 20 years old showed a rate of about 17%, and women aged 30-50 years old were around 38%. According to a survey conducted in 2009-2010, it is estimated that 6.8 million women have the main complaint of urinary incontinence. Despite its high prevalence, urinary incontinence is underdiagnosed and treated. Only 25% of women have complaints to seek care, and less than half receive treatment (Lukacz et al., 2017). Stress urinary incontinence is the most common incontinence in women and occurs in about 50% of women who experience urinary incontinence (Agarwal et al., 2017).

Urinary incontinence tends to cause changes in routine, avoid the social circles due to shyness and loss of self-confidence. Therefore, there is a decrease in the quality of personal, social, and professional life for fear of others knowing their condition is considered unfavorable and forced to change lifestyles which will have a negative impact on socialization, as well as changes in sexual activity, even anxiety disorders (Radzimińska et al., 2018). In addition, many urinary incontinence sufferers do not report their complaints to seek professional help because they feel embarrassed (Kessler et al., 2018).

The National Institute for Health and Care Excellence (NICE) recommends conservative treatment of pelvic floor exercises and bladder training before secondary treatment such as surgery (Bardsley, 2016). For this reason, a conservative approach is needed, which can be the most important method in the treatment of urinary incontinence. In addition, the Agency for Health Care Policy and Research clinical practice guidelines for individuals with urinary incontinence explained that harmless methods should be the first choice in treatment. One of the conservative treatments that can be used is pelvic floor muscle training (Topuz and Seviğ, 2016).

Pelvic floor muscle exercise is a non-pharmacological and non-surgical treatment to reduce urinary incontinence by strengthening the pelvic floor muscles because urinary incontinence is associated with weakening of the pelvic floor muscles due to aging (Lee et al., 2017). This muscle plays an important role in maintaining urinary continence. The pelvic floor consists of muscles, ligaments, and fascia that support the bladder, reproductive organs, and rectum (Eickmeyer, 2017). This exercise refers to repeated and regular exercises to train ODP contractions (Dumoulin and Le Berre, 2020). The above conservative treatment options aim to improve lower urinary tract support by increasing pelvic floor muscle strength and promoting involuntary closure of the urethra by contraction of the periurethral muscles.

Based on the background above, it is known that exercise is effective in managing and preventing urinary incontinence. The researchers were interested in studying the effectiveness of pelvic floor muscle training for reducing urinary incontinence and improving the quality of life in women. The data obtained were analyzed by using meta-analysis by synthesizing the results of studies conducted to reduce bias.

SUBJECTS AND METHOD

1. Study Design

The study design used in this study was a systematic review and meta-analysis, using the PRISMA flow diagram guidelines. Article searches were carried out using a journal database which included: PubMed, Science Direct, Google Scholar by selecting

articles published in 2010-2020. The keywords used are ("pelvic floor muscle training" OR "pelvic floor exercise" OR "kegel") AND ("urinary incontinence" OR "leaking urine" OR "urinary leakage") AND ("women" OR "female") AND "quality of life" AND "randomized controlled trial".

2. Inclusion Criteria

In this study, the inclusion criteria were full paper articles with Randomized Controlled Trial (RCT) study methods. The relationship measure used was Mean SD. The intervention given was pelvic floor muscle training. Female research subjects had an age range of 20-75 years old and experienced urinary incontinence.

3. Exclusion Criteria

Exclusion criteria for this study included articles published other than English and Indonesian, women with a medical history including pelvic cancer, endometriosis, use of uterine contraceptives, and women with neurological or metabolic disorders associated with bladder and sphincter dysfunction.

4. Definition of Operational Variables

In formulating study problems, the researchers used PICO. The population was women with urinary incontinence. Intervention was pelvic floor muscle training, with the comparison was not given PMFT, and the outcomes were a decrease in urinary incontinence and an increase in the quality of life.

Pelvic floor muscle training is a modality that is often used for physical therapy in urinary incontinence patients, which aims to restore the function of the pelvic floor muscles, which can increase pressure so that urethral closure occurs and prevents urinary incontinence.

Urinary Incontinence is a condition in which the sufferers experience loss of urine which can be a common social and hygiene problem in women and increases with age.

Quality of life is overall general well-being, which includes physical, material, and emotional well-being and levels of personal development and purposeful, meaningful, and valuable activities.

5. Study Instrument

An assessment of the quality of research articles was carried out by using the Critical Appraisal Skills Program (CASP).

6. Data Analysis

Data analysis used the Review Manager application 5.3. Data were analyzed based on variations between studies by determining the use of random effects analysis models. In this study, I^2 was used to quantify the dispersion. The results of data analysis are in the form of the effect size of the heterogeneity of the study, which later the results of the analyzed data are interpreted in forest plots and funnel plots.

RESULTS

Research from primary studies related to the effectiveness of pelvic floor muscle training for reducing urinary incontinence and improving quality of life in women contained 11 articles. Articles were obtained from 3 continents: eight studies from the Asian continent, the Americas, and one from the Australian two continents. Each study had a sample of fewer than 100 participants.

The article search was carried out using a database based on the PRISMA flow diagram, as shown in Figure 1. The study quality assessment was carried out qualitatively and quantitatively. Quality assessment used a critical appraisal skills program (CASP). After assessing the quality of the study, a total of 11 articles included in the quantitative synthesis process of the meta-analysis were analyzed using RevMan 5.3.

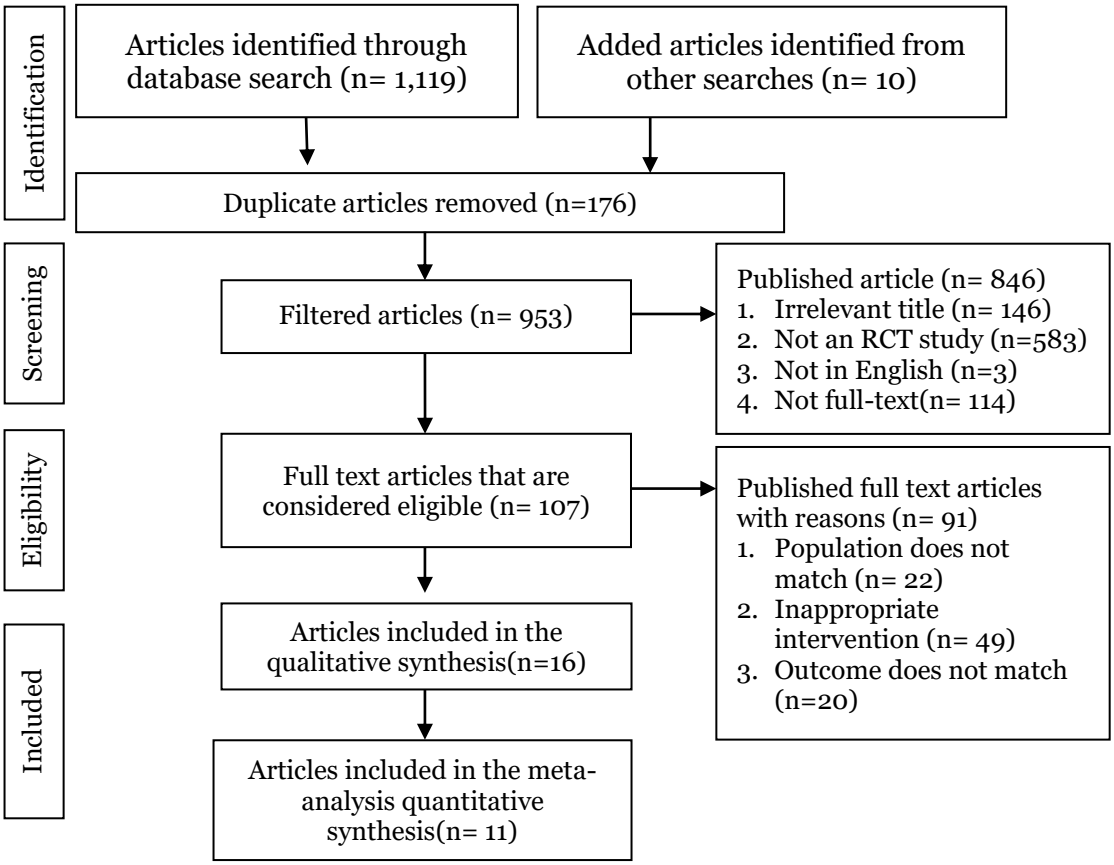

Figure 1. PRISMA flow diagram

1. Decreased Urinary Incontinence

There are 7 articles from the review that fulfill the requirements as a source for meta-analysis of the effect of pelvic floor muscle training on reducing urinary incontinence from the continents of Asia, America and Australia, consisting of various countries including South Korea, Turkey, Australia, Brazil, Hong Kong, Iran, and Oman can be seen in Table 1.

a. Forest Plot

The interpretation of the meta-analysis process can be seen through the forest plot. Figure 2 showed seven articles reporting that pelvic floor muscle training can reduce urinary incontinence in women compared to other interventions or no intervention. Meanwhile, there was a high heterogeneity of the experiment (I^2= 78%; p<0.001). Thus, the Random Effect Model is used to analyze the data in the forest plot. Performing pelvic floor muscle training is able to reduce urinary incontinence by 0.56 times compared to other interventions or no intervention (SMD= -0.56; 95% CI= -1.03 to -0.09; p= 0.020).

Table 1. Description of the Primary Study of the Effect of PMFT on Reducing Urinary Incontinence

Author, Year	Location	Sample size	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)
Yoon et al. (2003)	South Korea	13	50 women with an age range of 35-55 years old.	The intervention group was given Kegel exercises.	Bladder Training	Kegels significantly increase pressure on ODP after 4 weeks of exercise.
Aksac et al. (2003)	Turkey	20	50 patients with SUI.	PFMT via digital palpation as a home program. Patients were evaluated after 8 weeks.	Biofeedback	PFM exercises taught through digital palpation are effective for the treatment of SUI.
Sherburn et al. (2011)	Australia	41	Women over 65 years with SUI.	PFMT with digital vaginal palpation once a week for 20 weeks.	Bladder Training	PMFT exercise was more effective than BT in the treatment of SUI in older women.
Leong & Mok (2015)	Hong Kong	27	55 women over 65 years with mild to moderate IU symptoms.	Participants received 8 sessions of a 12-week urinary continental physiotherapy program.	Provided advice and educational pamphlets about IU.	Significant improvement in IU symptoms in the intervention group and improvement in quality of life.
Kargar et al. (2015)	Iran	24	50 women aged 60-74 years old with SUI.	Participants contracted the pelvic floor muscles correctly 8-12 contractions. The exercise was carried out for 2 months.	Self-esteem	ICIQ scores have a significant difference. ODP practice improves women's quality of life and self-esteem.
Bertotto et al. (2017)	Brazil	15	49 post-meno-pausal women with SUI aged 50-65 years old.	ODP training is conducted twice a week with 8 training sessions for one month.	Biofeedback	Significant improvement using the Oxford scale and an increase in the ICIQ-SF score.
Al Belushi et al. (2020)	Oman	36	159 women with SUI aged 20-50 years old.	PFMT was conducted for 12 weeks.	Lessons given without PFM practice.	ICIQ scores were significant in both groups. Home-based PMFT is effective in reducing the severity of symptoms.

Table 2. Description of the Primary Study of the Effect of PMFT on Improving Quality of Life

Author, Year	Location	Sample size	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)
Castro et al. (2008)	Brazil	26	118 women with SUI and no excessive detrusor activity.	ODP training was given 3 times a week for 6 months.	Vaginal Cones	Statistically significant reduction in test pads, number of urinary stress episodes and improvement in quality of life.
Wischnitzer et al. (2012)	Israel	66	245 women with SUI aged 20-65 years old.	PMFT duration 30 minutes once a week, for 4 weeks.	Paula Method	Effectiveness of two exercise methods on SF and QoL in SUI women.
Wischnitzer et al. (2009)	Israel	123	245 women with SUI aged 20-65 years old.	PMFT for 30 minutes once a week for 4 weeks.	Paula Method	Urinary incontinence decreased for the treatment of women with SUI.
Sherburn et al. (2011)	Australia	41	Women aged 65 years old and over with SUI.	PFM exercises were performed once a week for 20 weeks.	Bladder Training	PMFT is more effective than BT in the treatment of SUI in older women.
Bertotto et al. (2017)	Brazil	15	49 postmenopausal women with SUI aged 50-65 years old.	ODP training is conducted twice a week with 8 training sessions a month.	Biofeedback	A significant improvement using the Oxford scale and an increase in the ICIQ-SF score.
Al Belushi et al. (2020)	Oman	36	159 women with SUI aged 20-50 years old.	PMFT exercise was carried out for 12 weeks.	Lessons given without PFM practice.	ICIQ scores were significant in both groups.
Farzinmehr et al. (2015)	Iran	22	46 women with SUI aged 36-68 years old.	PMFT lasts for 4 weeks.	Whole Body Vibration Training (WBVT).	Both exercises were effective in strengthening ODP, reducing the severity of IU, and increasing the IQOL.
Leong & Mok (2015)	Hong Kong	27	55 women over 65 years old with mild to moderate IU symptoms.	8 sessions of a 12 week urinary continental physiotherapy program.	Provided advice and educational pamphlets about IU.	Significant improvement in IU symptoms in the intervention group and improvement in quality of life.
Kargar et al. (2015)	Iran	24	50 women aged 60-74 years old with SUI.	ODP contracting exercise was carried out for 2 months.	Self-esteem	ICIQ scores have a significant difference. ODP practice improves women's quality of life and self-esteem.

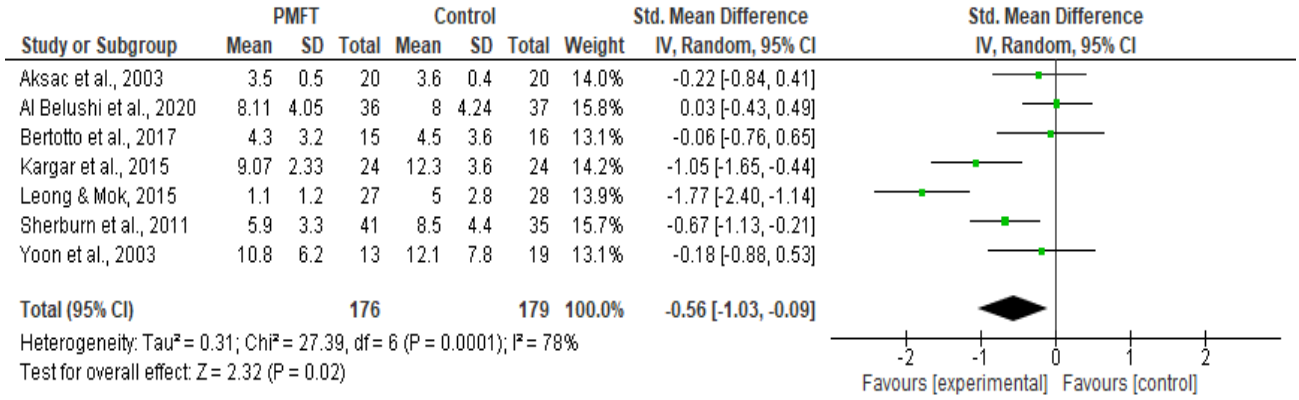

Figure 2. Forest plot of pelvic floor muscle training on decreased urinary incontinence

b. Funnel Plot

A funnel plot is a plot that describes the approximate size of the effect of each study on its estimated accuracy, which is usually the standard error. Figure 3 funnel pelvic floor muscle training to reduce urinary incontinence in women showed a fairly symmetrical distribution of effects, so it did not indicate publication bias.

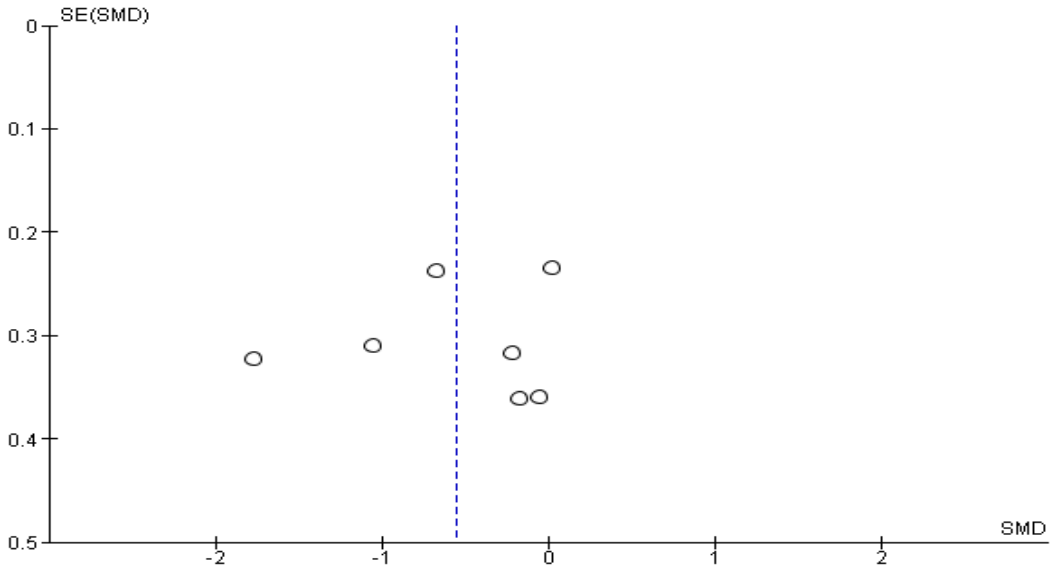

Figure 3. Funnel plot of pelvic floor muscle training on decreased urinary incontinence

2. Quality of life improvement

There are 9 articles from the review that fulfill the requirements as a source for meta-analysis of the influence of pelvic floor muscle training on improving the quality of life from the continents of Asia, America, and Australia, consisting of various countries including Brazil, Israel, Australia, Hong Kong, Oman, and Iran can be seen in Table 2.

a. Forest Plot

The interpretation of the meta-analysis process can be seen through the forest plot. Figure 4 showed 9 articles reporting that pelvic floor muscle training can improve the quality of life in women compared to

other interventions or no intervention. Meanwhile, there was a high heterogeneity of the experiment (I^2= 79%; p<0.001). Thus, the Random Effect Model was used to analyze the data in the forest plot. The implementation of pelvic floor muscle training can improve the quality of life by 0.32 times higher compared to other interventions or no intervention, but it was not statistically significant (SMD= -0.32; 95% CI= -0.66 to 0.02; p= 0.070).

b. Funnel Plot

Based on Figure 5 regarding the funnel plot of the effect of pelvic floor muscle training to improve the quality of life in women, it showed no publication bias indicated by the fairly symmetrical distribution of right and left plots.

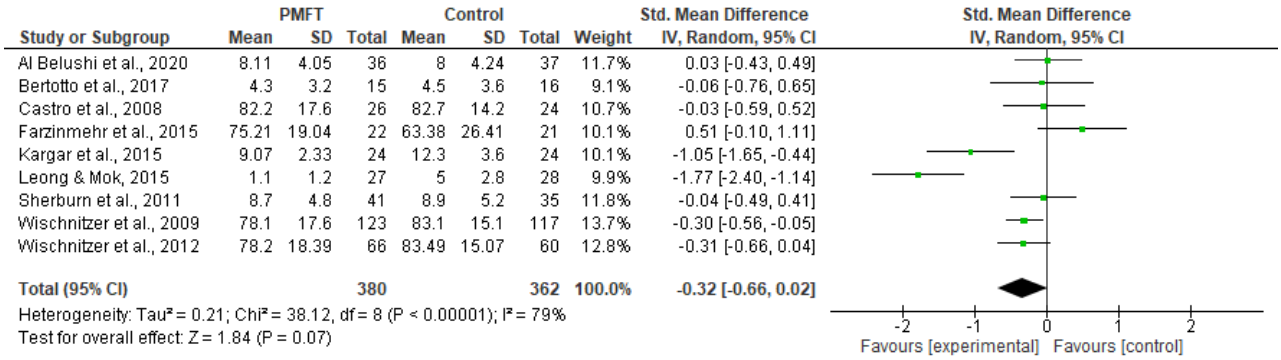

Figure 4. Forest plot of pelvic floor muscle training towards improving the quality of life

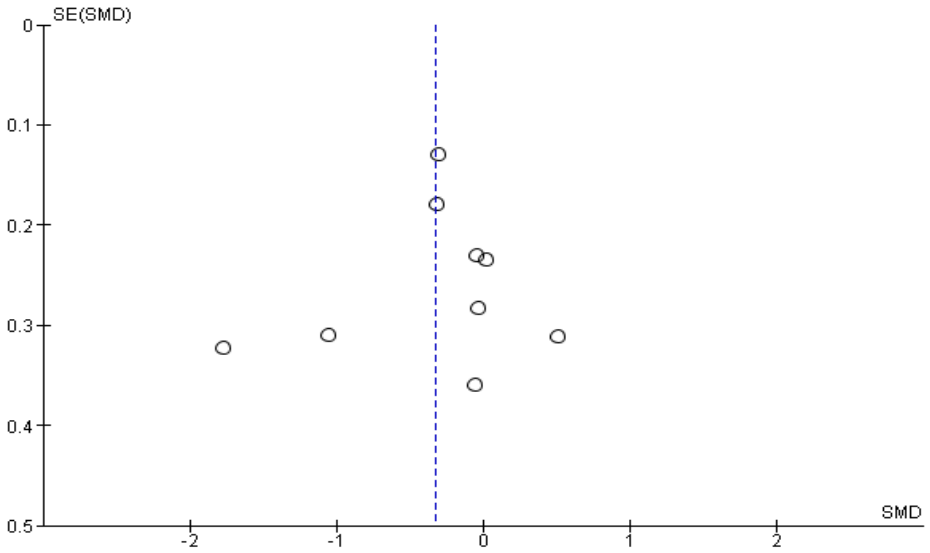

Figure 5. Funnel plot of pelvic floor muscle training towards improving the quality of life

DISCUSSION

Urinary incontinence is a complaint of involuntary loss of urine. This condition occurs in both genders but is more common in women and is usually due to bladder dysfunction or weakened pelvic floor muscles. This dysfunction appears during pregnancy or childbirth or at menopause (Aoki

et al., 2017). Urinary incontinence has a serious impact on women's health-related quality of life. Because urinary incontinence is a sensitive issue, many women tend not to report their condition (Pedersen et al., 2017). Recent epidemiological data showed an overall prevalence of 17% in women older than 20 years old and 38% in women over 60 years old (Lukacz et al., 2017).

Many treatments have been used to manage urinary incontinence, including conservative interventions such as physical therapy, lifestyle, behavioral exercise, medications, and surgery. One of the conservative exercises for exercise therapy that can be used is pelvic floor muscle training (Murray, 2019). This exercise aims to improve the function of supporting or supporting the pelvic organs and assists in the closing mechanism of the urethral sphincter. In general, this exercise creates repetitive contractions of the pelvic floor muscles, leading to increased muscle tone and perineal support and increased muscle strength (Sánchez et al., 2016).

PMFT is the most commonly used intervention for women with urinary incontinence and has three main components. The first is to ensure that the subject can contract and relax the ODP. Second, the subjects were able to perform set exercises, and the third with neuromuscular involvement. This contraction will increase the urethral closure pressure, which will prevent urine leakage. Thus, women may reduce cases of urinary incontinence (Hall and Woodward, 2015).

1. Decreased urinary incontinence

The systematic review and meta-analysis results were presented in the form of forest plots and funnel plots. The results of the forest plot showed that pelvic floor muscle training was able to reduce urinary incontinence by 0.56 times higher compared to other interventions or no intervention (SMD= -0.56; 95% CI= -1.03 to -0.09; p= 0.020).

The results of this study are in line with Cavkaytar et al. (2015) explained that simple Kegel exercises performed at home are effective in the short-term treatment in women with stress disorder urinary incontinence and mixed urinary incontinence. In this study, the assessment of pelvic floor muscles using the Oxford scale increased pelvic floor muscle strength significantly in both groups. The study conducted by Dumoulin et al. (2014) reported that PMFT improved urinary incontinence symptoms in all types of incontinence.

Since this exercise was proven to be effective in the treatment of stress urinary incontinence in women in 1948, various types of PMFT have been proposed in the treatment of urinary incontinence, such as biofeedback, electrical stimulation, vaginal cones, and vaginal balls. But low patient compliance, high costs, and the need for routine control have been the first concern about the PMFT program. This simple exercise has become an alternative option for treating urinary incontinence.

A study conducted by Soni et al. (2014) observed a significant increase in the average perineometer strength and muscle endurance after a full month of subjects doing Kegel exercises. Pelvic floor muscle exercises, electrical stimulation, and vaginal cones were equally effective for managing stress urinary incontinence compared to no treatment. Pelvic floor muscle training should be offered as the first treatment choice for stress urinary incontinence (Castro et al., 2008).

Pelvic floor muscle exercise program is effective for treating stress urinary incontinence compared to placebo or no treatment, with a cure rate of 28-84%, especially in postmenopausal women. PMFT increases maximal strength and con-

traction endurance and improves function, reducing leakage in stress urinary incontinence patients. The theoretical basis for dysfunctional pelvic floor muscle strength training is based on increasing structural support, prolonging activation time, and increasing precontraction, which can reduce leakage or prevent leakage. In terms of muscle strength, this exercise has physiological advantages that can be achieved with at least 5 months of training (Bertotto et al., 2017).

Another study conducted by Sherburn et al. (2011) showed that the 20-week PMFT program was more effective than bladder training in older women. In the PMFT group, the increase was significantly greater than the bladder training group in the reduction in the amount of urine lost by the pad test, the number of episodes of leakage per week, and symptom severity as well as the reduced impact of urinary incontinence on the subjects' lives with cure rates ranging from 57% to 67% despite the presence of its limited effectiveness in older women due to low exercise, lack of functional application of training or combining the two exercises. The study also showed that older women could improve their incontinence symptoms with a program that combines motor learning, strength, endurance, and functional training.

2. Quality of life improvement

The results of a meta-analysis on 9 articles regarding the effect of pelvic floor muscle training on improving the quality of life showed that pelvic floor muscle training was able to improve the quality of life by 0.32 times higher compared to other interventions or no intervention was given, but it was not statistically significant (SMD= -0.32; 95% CI= -0.66 to 0.02; p= 0.070).

Castro et al. (2008) reported that PMFT exercise could improve women's continence and healthy quality of life. Urinary incontinence is a common health problem among women and is associated with poor self-assessment of health, decreased quality of life, social isolation, and depressive symptoms. The results of the IQOL questionnaire in this study after six months, the treatment group showed a significant change in the quality of life compared to the control group that was not given exercise. Quality of life increased in the PMFT group by 32.4%. The significant improvement in quality of life demonstrated in this trial is important because it can help understand the clinical relevance of changes to pad tests and voiding diaries.

The study of Farzinmehr et al. (2015) was conducted to investigate the short-term effects of whole-body vibration training (WBVT) and PMFT on the quality of life of subjects for 4 weeks. Both groups' overall score and sub-scores such as avoidance, behavioral restriction, social impact, and shyness showed significant differences between pre and post-intervention. Although there was no significant difference between the two groups, the PMFT group increased by 60%. Based on the IQOL, the social shyness sub-score increased compared to the other sub-scores, which subscores, an improved's ability to participate in social activities.

Another study was conducted in America for three months with samples of women and men aged 40 to 60 years old with PMFT intervention in the experimental and control groups with Botanical and Oxybotin drugs. The results showed that significant changes occurred in the physical and spiritual dimensions of the experimental group's quality of life and are associated with an increase in the subject's social interactions (Goode et al., 2011). The benefits of PMFT for women who were given intervention in a study conducted by Lausen et al. (2018) included increased self-

esteem, reduced shame in the social environment, increased personal relationships, and less urinary incontinence impact on daily activities, especially in women with lower severity of symptoms.

AUTHOR CONTRIBUTION

Ragil Aidil Fitriasari Addini is the main researcher who selected the topic, searched, and collected the data. Eti Poncorini Pamungkasari and Bhisma Murti analyzed data and reviewed study documents.

FUNDING AND SPONSORSHIP

This study used personal funds from the main researcher.

CONFLICT OF INTEREST

There was no conflict of interest.

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