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REVIEW

NEUROMUSCULAR FUNCTION IN PELVIC FLOOR MUSCLE TRAINING (PFMT) FOR ELDERLY INDIVIDUALS WITH URINARY INCONTINENCE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Nurul Hidayah[1,2], Deswaty Furqonita[1]

[1] Department of Anatomy, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia
[2] Departement of Anatomy, Faculty of Medicine, Universitas Darussalam Gontor, Ponorogo, Indonesia

Corresponding author's e-mail: deswaty.furqonita@ui.ac.id

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Contributions: NH and DF developed the research idea and designed the systematic review protocol. NH performed the literature search, data extraction, and quality assessment. DF supervised the project, provided methodological guidance, and contributed to the interpretation of the findings and quality assessment. NH drafted the manuscript, and DF critically reviewed and revised it for important intellectual content. Both authors read and approved the final version of the manuscript. DF is the corresponding author.
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LEVEL OF EVIDENCE: 1a

ABSTRACT

Background: Pelvic floor muscle training (PFMT) is widely recommended for managing urinary incontinence (UI), especially in aging populations. However, the evidence of neuromuscular function following PFMT remains limited. The objective of this study is to investigate the improvement in neuromuscular function after PFMT and assess potential differences based on participants' age.

Method: A systematic review and meta-analysis were conducted by screening randomized controlled trial (RCTs) studies. The selection of studies followed inclusion and exclusion criteria. Subgroup analyses were performed to compare outcomes between studies with the middle-age and elderly group. Meta-analysis was conducted using RevMan 5.4.1 software.

Results: A total 10 RCT studies were included, total participants, number of the middle-age & elderly subgroup. Analyses on the middle-age subgroup, PFMT significantly improved pelvic floor muscle strength (MD = -0.53; 95% CI: -1.04 to -0.03; p = 0.04; I^2 = 58%). In contrast, elderly subgroups showed non-significant (MD = -3.36; 95% CI: -6.83 to 0.12; p = 0.06; I^2 = 97%).

Conclusion: PFMT intervention shows effectiveness in increasing pelvic floor muscle strength in adults 45-59 years old (middle-age group). Meanwhile, the elderly subgroups (≥ 60 years old) did not show a statistically significant benefit, which may be influenced by number of subjects in subgroup and high number of vaginal delivery factors. Additionally, high heterogeneity in elderly subgroups emphasized the need for more targeted and high-quality RCTs that focus specifically on elderly populations.

KEYWORDS

Neuromuscular function, Pelvic Floor Muscle Training, Urinary Incontinence

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INTRODUCTION

Indonesia is the fourth most populous country in the world. Approximately 24.39% are aged 0–14 years, 69.3% people are 15–64 years old, and 6.31% are over 65 years old[1]. The population distribution is dominated by the productive age group, which brings a positive impact for economic development, but also leading to an increase in the number of elderly individuals[1,2]. According to the United Nation Population Fund (UNFPA) (2014), the proportion of the elderly population has been rising annually compared to the number of children and those in the productive age group. This demographic transition has also occurred in others developing countries and has become a major contributor to age-related health issues, particularly urinary incontinence (UI)[3].

UI is a condition characterized by the inability to control urination (micturition)[4]. Reports from the Indonesian Continence Society (Perkina) in 2020 indicate that the prevalence of UI is higher in women (5.5%) compared to men, with urgency UI being the most common type[5]. UI has impacts that extend beyond physical health, affecting psychosocial well-being by causing depression, anxiety, and social isolation. Consequently, UI is a serious public health issue that requires effective management strategies[4,5].

To address this issue, non-invasive approaches such as pelvic floor muscle training (PFMT) have been developed to manage UI[4,6]. These exercises aim to strengthen the pelvic floor muscles and support the pelvic organs and bladder, which physiologically enhances urinary control and reduces the frequency of incontinence episodes[6]. Previous studies have shown that PFMT effectively improves quality of life and reduces incontinence symptoms[7]. However, there is a gap in the literature regarding the impact of PFMT on neuromuscular function post-training, particularly among elderly individuals. This study aims to investigate the improvement in neuromuscular function following PFMT patient with urinary incontinence. It is expected that this study will provide deeper insights into the neuromuscular enhancements after PFMT intervention and its potential in different ages of elderly individuals.

METHODS

The methodology used in this review were Systematic Review and Meta-Analysis design with prospero registration number is CRD42024590625. The data sources utilized include three major databases such as Cochrane, ScienceDirect, and PubMed, with a search period spanning from 2019 to 2024, and combining MeSH terms “urinary incontinence” AND “pelvic floor muscles training” AND “elderly”. Article selection including a randomized controlled trials (RCTs), cohort studies, and non-randomized trials, studies involving patient with urinary incontinence, interventions focusing on neuromuscular training or exercises targeting the pelvic floor muscles, studies reporting outcomes related to pelvic floor muscle strength and/or urinary incontinence. Furthermore, studies were divided into two subgroups based on World Health Organization (WHO) classification, where as adult participant 45-59 years old include into middle-age subgroup) and ≥ 60 years old include into elderly subgroup. Moreover, exclusion criterias including studies not focusing on neuromuscular training or pelvic floor exercises, and not reporting relevant outcome measures. For bias risk analysis, assessment was performed using the tool recommended by Cochrane to evaluate the potential bias in the included studies. Subsequently, a meta-analysis was conducted using RevMan 5.4.1 software to aggregate the results from relevant studies, measure the effect of interventions, and compute the effect size quantitatively. To ensure the methodological quality of this review, critical appraisal was performed based on the Joanna Briggs Institute’s (JBI) appraisal checklist, which was used to systematically assess the quality of the studies included in the review. This approach ensures that the findings derived from this review are valid, reliable, and relevant in the broader context of the research.

RESULT AND DISCUSSION

In this study, a total of 73 articles were initially identified through specific search engines including Cochrane (22 articles), ScienceDirect (38 articles), and PubMed (13 articles) *(Figure 1)*. After excluding articles based on various criteria, including duplicate entries, articles in Mandarin, non-full text publications, non-human subject studies, and those unrelated to the study topic, 55 articles were comprehensively analyzed. Of these, 19 articles met the eligibility criteria. After applying a risk of bias analysis, 9 articles were excluded *(Figure 2)*. Eventually, 10 articles were included in the final review, which were considered to meet the methodological standards for this systematic review and meta-analysis.

A total (N) 1,109 participants from 10 articles were included in this study. The basic characteristics of the populations *(Table 1)* divers among men (n = 222) and women (n = 887), with average age and SD (standard deviation) of entire participants are 62.9 ± 10.9 years. All participants were devided into two groups consisting of the middle-age subgroup (45–59 years old, n = 817), and the elderly subgroup (≥ 60 years old, n = 292). Moreover, PFMT intervention was given to participants in various durations. The shortest time have done by Tang et al 2023, Azevedo et al 2024, and Tang et al 2024 for two months intervention. Meanwhile, the longest has done by Hagen et al 2020 for 24 months, and most of the studies have three months PFMT intervention. Risk factors related to UI that evaluated in this study were including prostatectomy history (n = 222), vaginal delivery record (n = 832), metabolic disorder (n = 96), and bad habits such as alcoholic, sedentary lifestyle, and smoking. In addition, participants were diagnosed as menopause also evaluated in this study.

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Characteristic	Number of Participants
Total number of subjects (N)	1,109 participants
Number of Subjects by sex (n)	Men = 222 participants Women = 887 participants
The mean age of all participants (mean ± SD)	62.9 ± 10.9 years
Type of UI	SUI = 869 participants MUI = 240 participants
Prostatectomy history (n ; %)	222 ; 20%
Vaginal delivery record (n ; %)	832 ; 75%
Metabolic disorder (n ; %)	96 ; 8.66%
Alcohol consumption (n ; %)	53 ; 4.78%
Smoking (n ; %)	6 ; 0.54%
Sedentary lifestyle (n ; %)	13 ; 1.17%

Table 1. *Basic Characteristic of Participants.*
SD : standard deviation that reflects the variability of the outcome around the mean, UI : urinary incontinence, SUI : stress urinary incontinence, MUI : mixed urinary incontinence, n

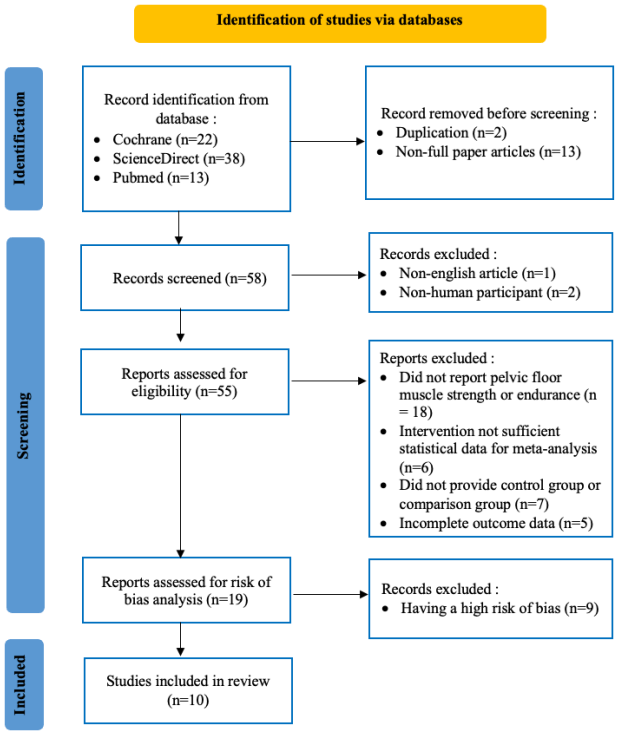
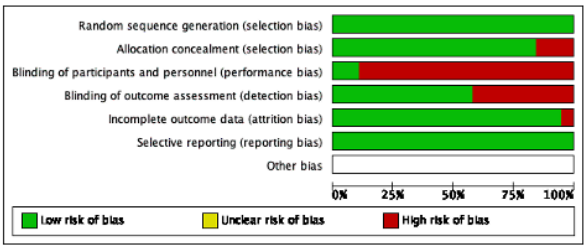


Figure 1. *PRISMA Flowchart.*



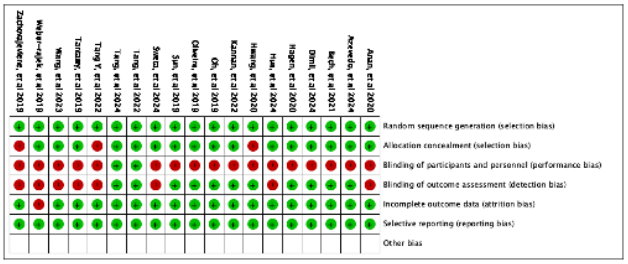


Figure 2. *The result of the risk of bias analysis.*

Meta–analysis of PFMT intervention either in middle-age subgroups and elderly subgroup. In specific analysis of the middle–age subgroup vs elderly subgroups having opposite result, which statistically significant showed in the middle-age subgroup (MD = -0.53; 95% CI: -1.04 to -0.03; p = 0.04) with moderate heterogeneity (I^2 = 58%). In elderly subgroup, the effect was not statistically significant (MD = -3.36; 95% CI: -6.83 to 0.12; p = 0.06) and also has high heterogeneity (I^2 = 97%) *(Figure 3)*. According to *figure 3* the forest plot, the diamond value is mostly located within the PFMT intervention area that increasing pelvic floor muscle strength, indicating a favorable trend toward the intervention. This is supported by several studies that in line with the findings, those are Hagen et al. (2020) (MD = -0.56; 95% CI: -0.85 to -0.27), Oliveira et al. (2019) (MD = -3.56; 95% CI: -6.01 to -1.11), Sun et al. (2020) (MD = -0.40; 95% CI: -1.07 to 0.27), Tang et al. (2023) (MD = -0.20; 95% CI: -0.81 to 0.41), Azevedo et al. (2024) (MD = -10.97; 95% CI: -12.69 to -9.25), Kannan et al. (2022) (MD = -2.15; 95% CI: -4.14 to -0.16), and Tang et al. (2024) (MD = -7.54; 95% CI: -11.56 to -3.52). In contrast, studies conducted by Bech et al. (2021), Dimli et al. (2024), and Oh et al. (2020) reported outcomes that did not support the imporvement of pelvic floor muscle after PFMT intervention[7–9]. Based on that results, the elderly subgroup some studies showed an effect direction opposire to the overall trend such as study by Dimli et al., reported a positive mean difference (MD = +1.30), whereas the pooled estimate suggested a negative effect. These differences may be explained by variations in patients characteristics, differences in intervention protocols including the duration, intensity, and measurement. These factors contributed to the high heterogeneity observed in UI outcomes among the elderly subgroup receiving PFMT.

Various studies report that UI is caused by a decrease in the strength of the pelvic floor muscles, particularly the pelvic diaphragm[10,11]. This conditions are influence by various factors such as age, vaginal delivery, menopause in women, medical record including abdominal or pelvic surgery, obesity, and diabetes mellitus[12]. These factors contribute to the onset of UI and align with the data in this study. Muscle strength reduction can also be affected by a history of surgery, such as hysterectomy in women and prostatectomy in men, as well as by neurological diseases like multiple sclerosis, Parkinson's disease, or dementia, and urinary tract infections (UTIs).

10 articles included in these study shows the causes of pelvic floor weakness and UI appear to different by sex.

In men, prostatectomy was identified as the primary factor (n = 222), whereas in women with vaginal delivery was the main caused of pelvic floor weakness (n = 832). These was caused by surgical procedure in prostatectomy that involves disruption of the external urethral spinchter and sometimes injured to the pudendal nerves, which leading to impaired sphincter control[13]. In women, the risk of pelvic floor weakness is higher in multiparous because vaginal delivery caused stretching and tearing of pelvic floor muscles, nerve injured, and weakening of connective tissue support for urinary control[14].

Pelvic Floor Muscle Training (PFMT) and Its Effect on Muscle Strength

Pelvic Floor Muscle Training (PFMT) is a non-invasive technique to strengthen the strength and endurance of the pelvic floor muscles. Its main goal is to strengthen the pelvic floor muscles that support important pelvic visceral organs such as the urinary bladder and urethra in relation to urinary continence control. The pelvic floor muscles (also known as the pelvic diaphragm muscles) are a group of muscles located at the base of the pelvic cavity (Latin: *cavum pelvis*) and play a crucial role in supporting the pelvic viscera, such as the urinary bladder and male accessory glands surrounding the bladder, as well as

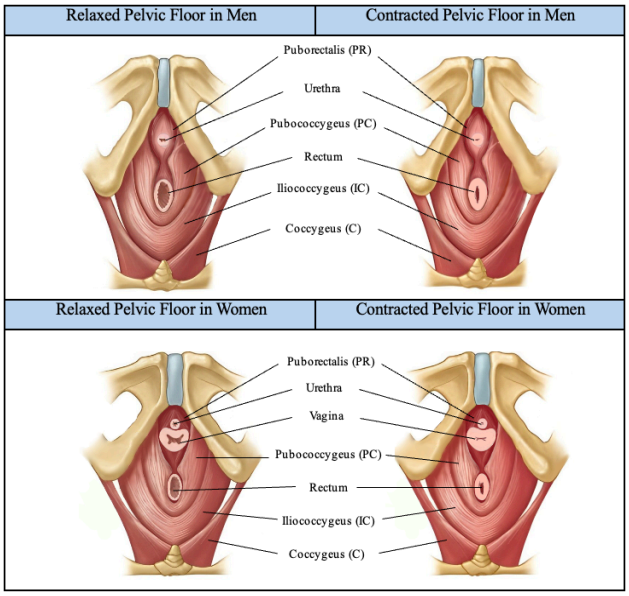
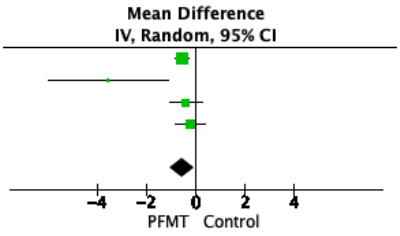


Figure 3. *Anatomical changes in pelvic floor during pelvic floor muscle training (PFMT), adapted from Moore, Persaud, & Torchia (2014).*

Middle–Age Subgroup							
Author(s), Year	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Mean Difference IV, Random, 95%CI**
Hagen et al., 2020	8.94	2.14	313	9.5	1.5	313	-0.56 [-0.85, -0.27]
Oliveira et al., 2019	1.38	1.5	22	4.94	5.66	22	-3.56 [-6.01, -1.11]
Sun et al., 2020	3.9	3.03	178	4.3	3.44	178	-0.40 [-1.07, 0.27]
Tang et al., 2023	3.3	4.6	304	3.5	2.9	304	-0.20 [-0.81, 0.41]

D = -0.53; 95% CI [-1.04, -0.03], p = 0.04, I^2 = 58%, Z = 2.07



Elderly Subgroup							
Author(s), Year	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Mean Difference IV, Random, 95%CI**
Azevedo et al., 2024	47.18	3.91	60	58.15	5.58	60	-10.97 [-12.69, -9.25]
Bech et al., 2021	2.3	0.6	20	2	1	20	0.30 [-0.21, 0.81]
Dimli et al., 2024	7.1	1.9	30	5.8	1.2	30	1.30 [0.50, 2.10]
Kannan et al., 2022	3.6	2.84	20	5.75	3.54	20	-2.15 [-4.14, -0.16]
Oh et al., 2020	38.8	141.2	82	19.5	57.2	82	19.30 [-13.67, 52.27]
Tang et al., 2024	59.66	14.75	80	67.2	10.93	80	-7.54 [-11.56, -3.52]

MD = -3.36; 95% CI [-6.83, 0.12], p = 0.06, I^2 = 97%, Z = 1.89

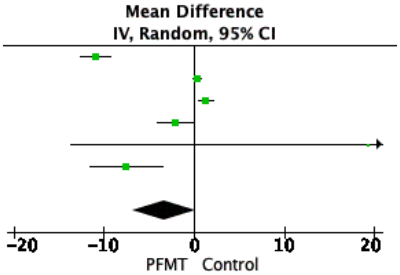


Table 2. *Pelvic Floor Muscle Strength after PFMT.*

MD : Mean difference, SD : Standard deviation, CI : Confidence interval. Mean : represents the average value of the reported outcome of pelvic floor muscle strength or improvement in urinary incontinence in each study group. SD : the statistical value that representing the degree of spread of the outcomes relative to the mean. Total : the number of participants included in that study.

the uterus and vagina in women[15]. The anatomy of the pelvic floor muscles in men and women shares several similarities but also has important differences, adapted to their specific reproductive and structural functions *(Figure 4)*. In both sexes, the pelvic floor muscles primarily consist of the levator ani muscle (LA) and the coccygeus muscle (C). The levator ani (LA) itself is composed of several parts, including the pubococcygeus muscle (PC) and the iliococcygeus muscle (IC). These muscles attach anteriorly to the pubic bone (os pubis) and extend posteriorly to the ischial spine, thickening at the obturator fascia (arcus tendinous of the levator ani). These muscles stretch between the anterior, lateral, and posterior walls of the minor pelvis, forming a hammock-like structure capable of lifting and supporting the pelvic organs, as well as assisting in the control of urinary bladder function[15]. The coccygeus muscle is smaller and helps support the position of the levator ani muscle, working together to regulate voluntary urine flow[15,16].

The first step in performing PFMT is identifying the correct muscles, which can be done by trying to stop the flow of urine during urination. The next exercise involves tightening the pelvic diaphragm muscles, holding them for two seconds, and then relaxing them for two to six seconds, while ensuring that the abdominal, thigh, or buttock muscles do not tense up and breathing remains stable[17–20]. It is recommended to perform three sets of exercises each day, with each set consisting of 15–20 repetitions for three to six months[18,19]. PFMT can be performed in various positions, such as lying down with knees bent, sitting upright, or standing, providing flexibility and allowing muscle activation from different angles[21]. Consistency and duration of exercises are key factors, with regular training over weeks to months required to see significant improvements in muscle strength and function *(Table 3)*. In addition to functional benefits, PFMT also helps improve sexual life by enhancing sensation and the ability to contract muscles during sexual activity, as well as serving as an important preventive method to maintain pelvic muscle strength, especially for post–vaginal delivery or elderly individuals[9,17–20,22,23].

The main difference between men and women's pelvic floor muscle *(Figure 4)* lies in the structure of the pubococcygeus muscle (PC). In men, the PC structure consists of the puborectalis (PR) and puboprostaticus (PP) muscles. While in women, the PC consists of the puborectalis (PR) and pubovaginalis (PV) muscles[15]. There are differences in the configuration and orientation of the pelvic diaphragm muscles between the two sexes, adapted to functional needs. In women, the pelvic diaphragm plays a role in supporting the uterus, especially during pregnancy and childbirth. As a result, the muscle structure is more concave and broader compared to men, who have a flatter and narrower structure. Both men and women have a urogenital hiatus, but in women it is wider due to the passage of the vaginal structure, which is absent in men[15,21]. This difference explains the women are more susceptible to pelvic floor muscle dysfunction, leading to uterine prolapse, and urinary incontinence[11,22,24]. Despite the difference structure of pelvic floor muscle, there is similarity in sensory input and motor responses controlled by the central nervous system. The pelvic floor muscles are innervated by the pudendal nerve (somatomotor), which originates from the sacral plexus (nerve fibers from spinal segments sacral (S) 2 to 4) and carries both sensory and motor fibers[16]. Stretch receptors on the walls of the fully filled urinary bladder are activated, triggering afferent pathways that carry sensory information about the stretch to the pons. From the pons, this information is processed and relayed to the cerebral cortex, where it is further processed resulting in an efferent motor response sent to the bladder muscles to contract and the urethral sphincter muscles to relax for bladder emptying. Since urine expulsion is not possible, contraction of the pelvic floor and external urethral sphincter muscles occurs to maintain urinary continence[6]. A well-balanced process is achieved through the efficient coordination between sensory input and motor output, which regulates the muscles and ligaments around the pelvic cavity. This mechanical integrity is essential not only for the successful process of micturition but also to prevent conditions such as pelvic organ prolapse and to control urinary continence[16].

LIMITATION

This study has several limitations including the non-significant benefit of PFMT in elderly individual ($p = 0.06$) and the high heterogeneity ($I^2 = 97\%$) which is partly due to the large standar deviations reported in some studies. Moreover, the lack of measurement methods across studies, the presence of large sizes such as in Azevedo et al., has number of MD was -10.97, and wide confidence intervals suggesting variability or potential outliers such as study by Oh et al. These factors limit the interpretability of the pooled results. Future studies are recommended to use standardized outcome measures and focus only elderly populations, in order to reduce variability and strengthen the evidence base for this subgroup.

CONCLUSION

Pelvic floor muscle training applied to middle–age individuals (45–59 years old) appears to be more effective to improve pelvic floor muscle strength compared to elderly population (≥ 60 years old). Several factors may influence this outcome such as vaginal delivery history, abdominal or pelvic floor surgeries, duration of PFMT intervention for at least three months, and also the obedience to the treatment are played a critical role in the effectiveness of PFMT.

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REFERENCES

1. Khairunnisah, Fitriyani A.L. Bonus Demografi dan Visi Indonesia Emas 2045. Badan Pusat Statistika. 2023;01(2):1–10.
2. Adioetomo SM, Mujahid G. UNFPA Indonesia Monograph Series: Indonesia on the Threshold of Population Ageing. Jakarta: United Nation Population Fund (UNFPA); 2014.
3. John Junior Purba A, Mirsya Warli S, Dharma Kadar D, Chairani Eyanoer P. Prevalence and Correlated Factors of Urinary Incontinence in Geriatric. Sumatera Medical Journal (SUMEJ). 2023;6(2):123–31. Doi: 10.32734/sumej.v6i2.11030.
4. Arlandis S, Bø K, Cobussen-Boekhorst H, Costantini E, de Heide M, Farag F, et al. European Association of Urology Guidelines on the Management of Female Non-neurogenic Lower Urinary Tract Symptoms. Part 2: Underactive Bladder, Bladder Outlet Obstruction, and Nocturia. Eur Urol. 2022;82(1):60–70. Doi: 10.1016/j.eururo.2022.01.044.
5. Perkumpulan Kontinensia Indonesia (PERKINA). Panduan Tata Laksana Inkontinensia Urine pada Dewasa. 2nd ed. Rahardjo HE, editor. Jakarta: Ikatan Ahli Urologi Indonesia; 2018.
6. Alhasso A, Fernando A. Urinary Incontinence. 1st ed. Rijeka: INTECH; 2012.
7. Bech SR, Villadsen D, Laursen HH, Toft A, Reinau HS, Raasted TH, et al. The effect of group or individualised pelvic floor exercises with or without ultrasonography guidance for urinary incontinence in elderly women - A pilot study. J Bodyw Mov Ther. 2021;28:34–41. Doi: 10.1016/j.jbmt.2021.07.032.
8. Oh JJ, Kim JK, Lee H, Lee S, Jin Jeong S, Kyu Hong S, et al. Effect of personalized extracorporeal biofeedback device for pelvic floor muscle training on urinary incontinence after robot-assisted radical prostatectomy: A randomized controlled trial. Neurourol Urodyn. 2020;39(2):674–81. Doi: 10.7759/cureus.64966.
9. Dimli BO, Mutlu EK, Altac DS, Taskiran H. Comparison of the effects of pelvic floor muscle training and modified pilates exercises in elderly women with stress urinary incontinence: A randomized clinical trial. European Journal of Obstetrics and Gynecology and Reproductive Biology. 2024;300:327–36. Doi: 10.1016/j.ejogrb.2024.07.033.
10. Irwin DE, Kopp ZS, Agatep B, Milsom I, Abrams P. Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. BJU Int. 2011. 108(7). Doi: 10.1111/j.1464-410X.2010.09993.x.
11. Pizzol D, Demurtas J, Celotto S, Maggi S, Smith L, Angiolelli G, et al. Urinary incontinence and quality of life: a systematic review and meta-analysis. Aging Clin Exp Res. 2021;33(1):25–35.
12. Alonezy MF, Metwally AS, Alhazmi OA, Alrehaili AO, Almohammadi AA, Aljuhani AS, et al. The Prevalence and Related Risk Factors of Urinary Incontinence Among Adult Women in Al Medina Al Munawara, Saudi Arabia. Cureus. 2024; 16(7). Doi: 10.7759/cureus.64966.
13. Jing Q, Gu J, Li Z, Sun X, Chen Q, Li S, et al. Prostatectomy postoperative urinary incontinence: From origin to treatment. Precision Medical Sciences. 2023;12(4):224–32. Doi : 10.1002/prm2.12121.
14. DeLancey JOL, Masteling M, Pipitone F, LaCross J, Mastrovito S, Ashton-Miller JA. Pelvic floor injury during vaginal birth is life-altering and preventable: what can we do about it?. Am J Obstet Gynecol. 2024;230(3). Doi : 10.1016/j.ajog.2023.11.1253.
15. Moore KL, Dalley AF, Agur AMR. Moore Clinically Oriented Anatomy. 7th ed. Philadelphia: Wolters Kluwer; 2014.
16. Schuenke M, Schulte E, Schumacher U. Thieme Atlas of Anatomy: General Anatomy and Musculoskeletal System. New York: Thieme Medical Publishers; 2010.
17. Hagen S, Bugge C, Dean SG, Elders A, Hay-Smith J, Kilonzo M, et al. Basic versus biofeedback-mediated intensive pelvic floor muscle training for women with urinary incontinence: The opal RCT. Health Technol Assess. 2020;24(70):1–143. . Doi: 10.3310/hta24700.
18. Tang A, Zhang Y, Dong L, Xu F. Observation of the Therapeutic Effect of Transcutaneous Electrical Stimulation Combined with Pelvic Floor Muscle Training on Post-Radical Prostatectomy Urinary Incontinence. Altern Ther Health Med. 2024;30(8):306–11. PMID: 38064606.
19. Tang K, Su T, Fu L, Chen Z, Liu G, Hou W, et al. Effect of Electroacupuncture Added to Pelvic Floor Muscle Training in Women with Stress Urinary Incontinence: A Randomized Clinical Trial. Eur Urol Focus. 2023;9(2):352–60. Doi: 10.1016/j.euf.2022.10.005.
20. Azevedo C, Ferreira da Mata LR, Cristina de Resende Izidoro L, de Castro Moura C, Bacelar Assis Araújo B, Pereira MG, et al. Effectiveness of auricular acupuncture and pelvic floor muscle training in the management of urinary incontinence following surgical treatment for prostate cancer: A randomized clinical trial. European Journal of Oncology Nursing. 2024;68. Doi: 10.1016/j.ejon.2023.102490.
21. Cameron AP. Female Urinary Incontinence. Female Urinary Incontinence. Springer International Publishing; 2022.
22. Kannan P, Hsu WH, Suen WT, Chan LM, Assor A, Ho CM. Yoga and Pilates compared to pelvic floor muscle training for urinary incontinence in elderly women: A randomised controlled pilot trial. Complement Ther Clin Pract. 2022;46. Doi: 10.1016/j.ctcp.2021.101502
23. Sun Y, Liu Y, Liu S, Wang W, Liu Z. Electroacupuncture for women with urgency-predominant mixed urinary incontinence: secondary analysis of a randomized noninferiority trial. World J Urol. 2020;38:1035–42. Doi: 10.1007/s00345-019-02828-1.
24. Jansson MH, Franzén K, Tegerstedt G, Hiyoshi A, Nilsson K. Stress and urgency urinary incontinence one year after a first birth—prevalence and risk factors. A prospective cohort study. Acta Obstet Gynecol Scand. 2021;100(12):2193–201. Doi: 10.1111/aogs.14275.

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