

Impact of Pelvic-Floor Muscle Training on Stress Urinary Incontinence – A Narrative Review

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Abstract

Background: Urinary incontinence (UI), characterized by the unintentional loss of urine, is a common health issue among women globally. Stress urinary incontinence (SUI) is the most frequently reported type and can adversely affect daily activities and overall well-being. Various contributing factors, including obesity, pregnancy, and advancing age, are associated with its occurrence. Pelvic-floor muscle training (PFMT) is commonly advocated as a primary conservative management strategy for SUI. **Objective:** To evaluate the efficacy of pelvic-floor muscle training (PFMT) in women with stress urinary incontinence and to identify the most effective PFMT approaches for improving symptoms. **Methods:** A literature review of studies published between 2018 and 2024 was conducted using the PubMed database. The search strategy included the terms urinary incontinence, stress urinary incontinence, pelvic-floor muscle training, biofeedback, and electrostimulation. The review included randomized controlled trials, systematic reviews, and meta-analyses. Studies meeting the predefined inclusion and exclusion criteria were selected, and their methodological quality was evaluated using the PEDro and CASP appraisal tools. **Results:** The reviewed studies consistently demonstrated that PFMT significantly reduces urinary leakage and improves quality of life in women with SUI. Optimal outcomes were observed with training programs lasting 6–12 weeks, with sessions conducted more than three times per week. Supervised PFMT showed better adherence and effectiveness compared to unsupervised programs. Adjunct therapies – such as electroacupuncture and extracorporeal magnetic innervation – enhanced treatment outcomes, whereas biofeedback showed no significant long-term advantage over PFMT alone. **Conclusion:** PFMT is considered an effective and non-invasive first-line management option for stress urinary incontinence. Customized exercise programs combined with supportive therapies may contribute to improved treatment outcomes.

Keywords: Stress urinary incontinence, pelvic-floor muscle training, biofeedback, electrostimulation, women's health, quality of life

INTRODUCTION

The International Continence Society (ICS) and the World Health Organization (WHO) define

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Received Date: May 05, 2026

Accepted Date: July 03 2026

Published Date: August 24, 2026

Citation: Anumol Johns, P. Sneha Balakrishnan. Impact of Pelvic-Floor Muscle Training on Stress Urinary Incontinence – A Narrative Review. Research and Reviews: A Journal of Health Profession. 2026; 16(2): 1–8p.

urinary incontinence as the involuntary leakage of urine through the urethra. Reports from the ICS indicate that nearly 10% of women experience urine leakage on a weekly basis, while approximately 25–45% report occasional episodes of leakage. Stress urinary incontinence (SUI) is commonly identified among younger women and pregnant mothers [1]. In the female population the most common risk factors for UI are obesity, pregnancy, vaginal delivery, age and pelvic surgeries. Few studies are available on risk factors for UI in young nulliparous women. According to 1study, low body mass index (BMI), lack of exercise and eating disorders can lead to UI [2, 3].

There are 5 types of urinary incontinence and they are mentioned below: Stress Urinary Incontinence, Urge Urinary Incontinence, Functional Incontinence, Mixed Incontinence, Overflow Incontinence are the types of urinary incontinence. Stress Urinary Incontinence: is the complaint of urine leaking with exertion or effort, such as coughing or sneezing, because of weakening in the pelvic Floor or urethral sphincter [2, 3].

- *Urge Urinary Incontinence (UI)*: This condition refers to involuntary urine leakage associated with detrusor muscle overactivity and a sudden, compelling urge to void. Such contractions may occur due to bladder irritation or impaired neurological regulation.
- *Mixed Urinary Incontinence (MUI)*: This form combines features of both stress and urge urinary incontinence and is frequently observed in individuals with diabetes mellitus.
- *Overflow Urinary Incontinence*: It is caused when a bladder is over distended due to impairment in the detrusor contractility or bladder outflow obstruction. Impairment in detrusor muscle activity can be due to any neurological conditions like spinal cord injuries and multiple sclerosis. This type of incontinence is also seen in diabetes patients.
- *Functional Urinary Incontinence*: The complaint of leakage of urine due to any environmental or physical barriers to toileting.

Stress urinary incontinence remains the most prevalent subtype of urinary incontinence. According to the International Continence Society (ICS), stress urinary incontinence is defined as the involuntary leakage of urine that occurs during physical exertion, coughing, sneezing, or other activities that increase intra-abdominal pressure. Among all forms of urinary incontinence, SUI warrants particular attention because of its high prevalence in younger women and its substantial negative influence on quality of life (QOL) (4). SUI is more common than all other chronic diseases combined, although it is primarily underreported and misdiagnosed. Obesity and being overweight are the primary risk factors for stress urine incontinence. The ICS highlights several risk factors for SUI, including parity, pregnancy, birth mode, ethnicity and race, hysterectomy, menopausal replacement therapy, diet, including coffee intake, socioeconomic status, smoking, physical activity, and other co-morbidities such as depression, diabetes, and physical handicap. The fundamental pathophysiology of incontinence is the increase in intravesical pressure above the maximal urethral pressure. Mechanical damage to the bladder neck supports after childbirth, trauma, aging, or the over activity of the detrusor muscles also can be the reason behind the rise in intravesicular pressure [4, 5].

For SUI, a conservative approach is typically employed. There are various forms of this treatment, including electrical stimulation, vaginal cones, biofeedback, physical therapy, and pelvic-floor muscle training (PFMT) [6]. Women who are unable to voluntarily activate their pelvic-floor muscles may benefit from electrostimulation and/or biofeedback therapy. These interventions can improve motivation, increase treatment adherence, and assist in restoring urinary continence by strengthening the pelvic-floor musculature. The exercises focus on achieving effective contraction of the pubococcygeus muscle while minimizing the involvement of the abdominal and gluteal muscles. Pelvic-floor muscle exercises (PFME) are designed to enhance muscle strength, power, endurance, relaxation, or a combination of these components [7, 8].

The pelvic floor is composed of a group of muscles that provide structural support to the pelvic organs. It includes the pelvic diaphragm, a hammock-shaped muscular structure that extends from the symphysis pubis anteriorly to the coccyx posteriorly. The pelvic-floor muscles are primarily formed by the levator ani muscle group, which consists of the puborectalis, pubococcygeus, iliococcygeus, and coccygeus muscles. These muscles are predominantly innervated by the fourth sacral nerve and play a crucial role in maintaining pelvic organ support and urinary continence [9, 10].

Pelvic-floor muscle exercise (PFME), also known as pelvic-floor muscle training (PFMT), pelvic-floor physiotherapy, or pelvic-floor rehabilitation, is considered the cornerstone of behavioral treatment for overactive bladder symptoms, including urinary urgency and urinary incontinence. The process

behind stress urine incontinence involves building up structural support and using a conscious contraction before to or during rises in intra-abdominal pressure [10–12].

Kopańska et al. (2020) reviewed the role of biofeedback as an innovative treatment method for urinary incontinence in women. The authors emphasized that biofeedback therapy helps patients gain better awareness and control of pelvic-floor muscle contractions, thereby improving muscle coordination and continence mechanisms. The review suggested that biofeedback, when combined with pelvic-floor muscle training, may enhance patient motivation, adherence to therapy, and overall treatment effectiveness, particularly in women who have difficulty identifying or activating pelvic-floor muscles correctly [10].

Similarly, Pandey et al. (2019) examined various interventions for stress urinary incontinence and their impact on quality of life. The study highlighted that stress urinary incontinence negatively affects physical, psychological, and social well-being in women. Conservative approaches – such as pelvic-floor muscle training – were identified as effective first-line management strategies due to their ability to reduce urinary leakage and improve quality of life. The authors also noted that timely intervention and individualized treatment programs are essential for achieving better functional outcomes and improving patient confidence and daily activities [11].

Sam et al. (2022) conducted a prospective randomized study to determine whether biofeedback-assisted pelvic-floor muscle training (PFMT) was superior to PFMT alone in women with dysfunctional voiding. The study demonstrated that both interventions significantly improved urinary symptoms and pelvic-floor muscle function; however, the addition of biofeedback resulted in greater improvement in voiding parameters and treatment outcomes, suggesting that biofeedback may enhance patient awareness and muscle coordination during pelvic-floor rehabilitation [13]. Similarly, Ptak et al. (2019) evaluated the effect of pelvic-floor muscle exercises on quality of life in women with stress urinary incontinence and examined its association with vaginal deliveries. Their randomized trial showed that regular pelvic-floor muscle exercises significantly reduced urinary leakage and improved quality of life among women with stress urinary incontinence. The study also highlighted that women with a history of vaginal delivery experienced greater severity of symptoms, emphasizing the importance of early pelvic-floor rehabilitation in this population [14].

OBJECTIVES

To evaluate and determine the effectiveness of pelvic-floor muscle training in individuals with stress urinary incontinence.

METHODOLOGY

Search Strategy

An electronic web search for studies from 2014 to 2024 was conducted in databases PubMed. The Keywords used in this search are: Urinary incontinence, Stress urinary incontinence, Female stress urinary incontinence, pelvic-floor muscle training, biofeedback, PFES, along with their medical subject headings (MeSH) terms.

SEARCH TECHNIQUES

The search techniques used for extracting articles for this literature review were performed using the Boolean operators AND as well as OR.

STUDY SELECTION

Inclusion Criteria

Types of studies included: randomized controlled trials, systematic reviews and meta-analysis.

- *Timeline:* articles published from 2018 to 2024.
- Studies stating the role of pelvic-floor muscle rehabilitation in the management of stress urinary incontinence in female population.

Exclusion Criteria

- Articles published in languages other than English.
- Articles where full text was not available.
- Articles which do not meet the inclusion criteria.
- Article which was found to be of poor quality

PROCEDURE

A web-based literature source was done and the database included was PubMed. The search aimed to yield studies which establish the role of pelvic-floor muscle rehabilitation in the management of Stress Urinary Incontinence. A search strategy was developed to establish the same using the keywords. chosen was from 2018–2024. Articles were chosen by using critical appraisal tools like PEDro for RCTs and CASP for other types of studies.

Secondary searching where the reference lists of the included studies were also conducted were scanned for relevant citations. A detailed study of the chosen articles was done, and the citations were downloaded into the reference manager.

RESULT

The study selection process is illustrated in Figure 1.

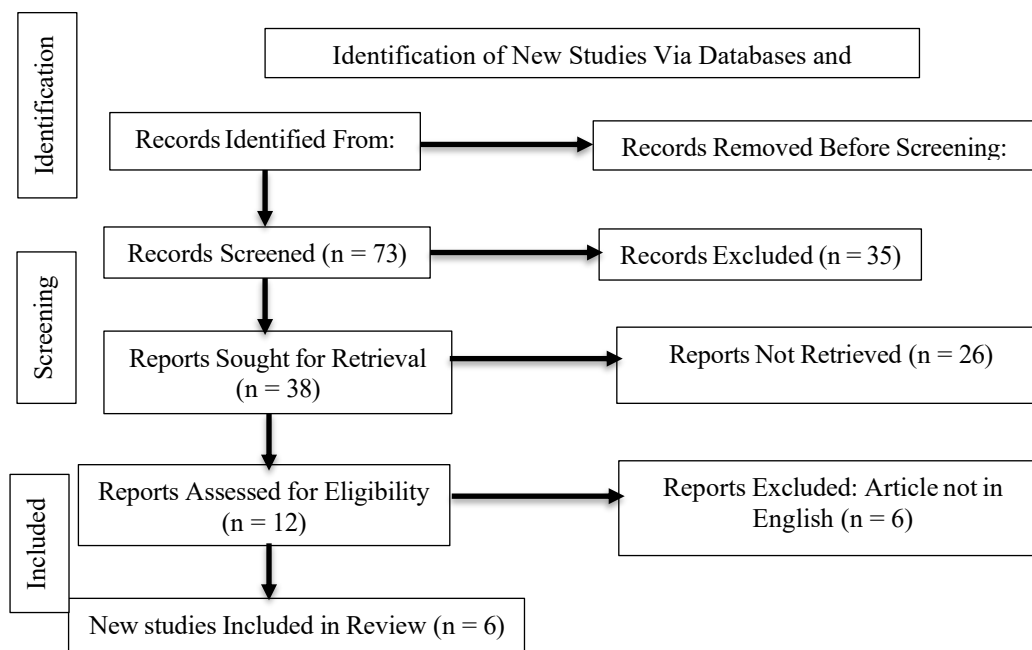


Figure 1. PRISMA 2020 flow diagram illustrates the process of study identification, screening, eligibility assessment, and inclusion of studies in systematic review.

SUMMARY OF LITERATURE

Nicole S. Parra et al. (2023) conducted a systematic review and meta-analysis to evaluate the effectiveness of pelvic-floor muscle training (PFMT) in urinary incontinence. Relevant randomized controlled trials (RCTs) published during the previous ten years were identified through searches in PubMed, Google Scholar, and the Cochrane Library. A fixed-effects model was used to calculate pooled incidence, risk ratio, and 95% confidence intervals. From 98,013 initially identified studies, only 10 studies met the eligibility criteria for final analysis after screening and removal of duplicates. The review demonstrated that PFMT had a protective effect against urinary incontinence, particularly in postpartum women. Individualized PFMT was found to be more effective than group-based training, and PFMT combined with transversus abdominis (TrA) training showed superior improvement in

muscle strength, endurance, and functional activities. However, three included studies reported no statistically significant difference between PFMT and control interventions [2].

Agnieszka Radzimińska et al. (2018) published a systematic review examining the influence of pelvic floor muscle training on the quality of life of women with urinary incontinence. Databases including PubMed, Embase, and the Cochrane Library were searched for English-language studies published between 1990 and 2017. The review followed PRISMA guidelines, and methodological quality was assessed using the Jadad scale. Studies involving biofeedback, electrical stimulation, medical management, or surgical treatment were excluded, as were studies with Jadad scores below 3. A total of 24 studies were included in the review. The findings indicated that PFMT is an effective non-surgical intervention, especially for women with stress urinary incontinence, and significantly improves quality of life. The authors recommended supervised PFMT as a first-line conservative treatment, either alone or in combination with other therapies [3].

Esther García-Sánchez et al. (2019) investigated the optimal pelvic floor muscle training load required to reduce urine leakage in women with stress urinary incontinence. Searches were performed in PubMed, Web of Science, and the Cochrane database for randomized controlled trials involving women above 18 years with SUI who underwent PFMT. Among 1,831 identified articles, 10 RCTs involving 293 women fulfilled the inclusion criteria. The meta-analysis demonstrated that PFMT significantly reduced urine leakage regardless of the protocol used. Greater improvements were associated with programs lasting 6–12 weeks, involving more than three sessions per week, with session durations below 45 minutes. The authors concluded that PFMT involving short but frequent sessions may produce the most beneficial outcomes in women with SUI [1].

Suzanne Hagen et al. (2020) conducted a multicenter parallel-group randomized controlled trial to compare the effectiveness of PFMT with electromyographic biofeedback versus PFMT alone in women with stress or mixed urinary incontinence. The study included 600 women recruited from continence care centers in Scotland and England. Participants were randomly allocated to either a PFMT plus biofeedback group or a PFMT-alone group, with both groups receiving supervised training over 16 weeks. Outcome measures included the International Consultation on Incontinence Questionnaire–Urinary Incontinence Short Form (ICIQ-UI SF), pelvic-floor function, quality of life, and treatment adherence. At 24 months, no statistically significant difference was observed between the groups in urinary incontinence severity. The study concluded that routine incorporation of electromyographic biofeedback with PFMT may not provide additional long-term benefits compared with PFMT alone [15].

Magdalena Weber (2020) evaluated the effectiveness of pelvic-floor muscle training and extracorporeal magnetic innervation (ExMI) in women with stress urinary incontinence through a randomized controlled trial involving 128 participants. Women were assigned to PFMT, ExMI, or control groups. Outcomes were assessed using the Revised Urinary Incontinence Scale (RUIS), Beck Depression Inventory (BDI-II), General Self-Efficacy Scale (GSES), and King's Health Questionnaire (KHQ). Both intervention groups demonstrated significant reductions in urinary incontinence severity and depressive symptoms, along with improvements in quality of life. The ExMI group also showed enhanced self-efficacy. The authors concluded that both PFMT and extracorporeal magnetic innervation are beneficial in improving physical and psychosocial outcomes in women with stress urinary incontinence [4].

Kangmin Tang et al. (2022) investigated the effectiveness of combining pelvic-floor muscle training with electroacupuncture (EA) in women with stress urinary incontinence. This prospective multicenter randomized controlled trial included 304 women who were allocated to either PFMT combined with EA or PFMT combined with sham EA for eight weeks. The primary outcome was urine leakage measured using a one-hour pad test. Results showed that the PFMT plus EA group experienced greater

reductions in urine leakage and a higher proportion of participants achieving at least 50% symptom improvement compared with the sham EA group. Improvements in self-reported symptom severity and therapeutic outcomes were also significantly better in the intervention group. The study concluded that combining electroacupuncture with PFMT may enhance treatment outcomes in women with stress urinary incontinence [5].

DISCUSSION

Pelvic-floor muscle exercise (PFME) has been extensively recognized as an effective conservative intervention for urinary incontinence in women. The systematic review and meta-analysis conducted by Nicole S. Parra highlighted the significant effectiveness of PFMT in improving urinary incontinence symptoms, supporting its role as a primary non-invasive management strategy. Similarly, Agnieszka Radzimińska and colleagues emphasized that PFMT substantially improves the quality of life of women with urinary incontinence, demonstrating both physical and psychosocial benefits [2, 3].

The review by Esther García-Sánchez emphasized the importance of optimizing PFMT training load to maximize therapeutic outcomes. Their findings suggested that structured programs with appropriate frequency, duration, and intensity are associated with greater reductions in urine leakage. In contrast, the randomized controlled trial by Suzanne Hagen found no significant long-term advantage of adding electromyographic biofeedback to standard PFMT, indicating that PFMT alone remains highly effective for many patients [1, 15].

Further evidence from Magdalena Weber demonstrated that combining PFMT with extracorporeal magnetic innervation can improve both urinary symptoms and quality of life. Likewise, the trial conducted by Kangmin Tang showed that integrating electroacupuncture with PFMT resulted in superior symptom improvement compared to PFMT alone. These findings collectively suggest that adjunctive therapies may enhance the therapeutic benefits of PFMT in selected individuals [4, 5].

Overall, the available literature supports pelvic-floor muscle training as an effective first-line conservative treatment for stress urinary incontinence. Tailored exercise protocols and the use of supportive interventions – such as biofeedback, extracorporeal magnetic innervation, and electroacupuncture – may further improve patient outcomes and treatment adherence (Table 1).

Table 1. Summary of Pelvic-Floor Muscle Training Interventions, Reported Benefits, and Levels of Evidence for Urinary Incontinence Management.

Author	Intervention	Benefit	Evidence level
Nicole S. Parra et al. (2023) [2]	Pelvic-floor Muscle Exercise (PFME)	Significant improvement in urinary incontinence, non-invasive treatment, enhances quality of life.	Level I
Agnieszka Radzimińska, et al. (2018) [3]	Pelvic-floor Muscle Training (PFMT)	Improves quality of life, reduces symptoms of urinary incontinence, holistic benefits beyond physical.	Level I
Esther García-Sánchez et al. (2019) [1]	Optimal PFMT Load	Tailored training loads maximize therapeutic outcomes, minimize urine loss in stress urinary incontinence.	Level I

Suzanne Hagen, et al. (2020) [15]	PFMT with and without	PFMT with biofeedback offers superior benefits, enhances treatment efficacy, significant symptom reduction.	Level II
	Electromyographic		
	Biofeedback		
Magdalena Weber et al. (2020) [4]	PFMT and Extracorporeal Magnetic Innervation (ExMI)	Combination enhances results, effective in stress urinary incontinence, non-invasive and complementary approach	Level II
Kangmin Tang, et al. (2022) [5]	PFMT with Electroacupuncture		Level II

CONCLUSION

The reviewed studies collectively support the effectiveness of pelvic-floor muscle exercise (PFME) in the management of urinary incontinence among women. Systematic reviews and meta-analyses conducted by Nicole S. Parra and Agnieszka Radzimińska reported significant improvements in urinary symptoms and overall quality of life following PFME interventions.

Esther García-Sánchez and colleagues further emphasized that appropriate training intensity, duration, and frequency are important factors in achieving optimal therapeutic outcomes. Studies by Suzanne Hagen and Magdalena Weber demonstrated that additional interventions – such as biofeedback and extracorporeal magnetic innervation – may enhance the effectiveness of pelvic-floor muscle training in selected patients.

Moreover, the randomized clinical trial conducted by Kangmin Tang indicated that combining PFME with electroacupuncture produced greater improvement in stress urinary incontinence symptoms compared with PFME alone. Collectively, these findings suggest that PFME is an effective first-line conservative treatment for urinary incontinence, and adjunctive therapies may further improve clinical outcomes.

REFERENCES

- García-Sánchez E, Ávila-Gandía V, López-Román J, Martínez-Rodríguez A, Rubio-Arias JÁ. What pelvic floor muscle training load is optimal in minimizing urine loss in women with stress urinary incontinence? A systematic review and meta-analysis. *Int J Environ Res Public Health*. 2019;16(22):4358. doi: 10.3390/ijerph16224358.
- Parra NS, Jaramillo AP, Zambrano J, Segovia D, Castells J, Revilla JC. The effectiveness of pelvic floor muscle exercise in urinary incontinence: A systematic literature review and meta-analysis. *Cureus*. 2023;15(9):e45011. doi: 10.7759/cureus.45011.
- 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. doi: 10.2147/CIA.S160057.
- Weber-Rajek M, Strączyńska A, Strojek K, Piekorz Z, Pilarska B, Podhorecka M, et al. Assessment of the effectiveness of pelvic floor muscle training (PFMT) and extracorporeal magnetic innervation (ExMI) in treatment of stress urinary incontinence in women: A randomized controlled trial. *Biomed Res Int*. 2020;2020:1019872. doi: 10.1155/2020/1019872.
- 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.
- Huebner M, Riegel K, Hinninghofen H, Wallwiener D, Tunn R, Reisenauer C. Pelvic floor muscle

- training for stress urinary incontinence: A randomized, controlled trial comparing different conservative therapies. *Physiother Res Int*. 2011;16(3):133–40. doi: 10.1002/pri.489.
7. Weber-Rajek M, Strączyńska A, Strojek K, Piekorz Z, Pilarska B, Podhorecka M, et al. Assessment of the effectiveness of pelvic floor muscle training (PFMT) and extracorporeal magnetic innervation (ExMI) in treatment of stress urinary incontinence in women: A randomized controlled trial. *Biomed Res Int*. 2020;2020:1019872. doi: 10.1155/2020/1019872.
 8. Qi X, Shan J, Peng L, Zhang C, Xu F. The effect of a comprehensive care and rehabilitation program on enhancing pelvic floor muscle functions and preventing postpartum stress urinary incontinence. *Medicine (Baltimore)*. 2019;98(35):e16907. doi: 10.1097/MD.00000000000016907.
 9. Imamura M, Hudson J, Wallace SA, MacLennan G, Shimonovich M, Omar MI, et al. Surgical interventions for women with stress urinary incontinence: Systematic review and network meta-analysis of randomised controlled trials. *BMJ*. 2019;365:l1842. doi: 10.1136/bmj.l1842.
 10. Kopańska M, Torices S, Czech J, Koziara W, Toborek M, Dobrek Ł. Urinary incontinence in women: Biofeedback as an innovative treatment method. *Ther Adv Urol*. 2020;12:1756287220934359. doi: 10.1177/1756287220934359.
 11. Pandey D, Maturi C, Dhakar BPS, Jain G, Kyalakond K. Interventions and quality of life in stress urinary incontinence. *Gynecol Minim Invasive Ther*. 2019;8(3):106–12. doi: 10.4103/GMIT.GMIT_72_18.
 12. Tran LN, Puckett Y. Urinary incontinence. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2022.
 13. Sam E, Cinislioglu AE, Yilmazel FK, Demirdogen SO, Yilmaz AH, Karabulut I. Is biofeedback-assisted pelvic floor muscle training superior to pelvic floor muscle training alone in the treatment of dysfunctional voiding in women? A prospective randomized study. *Int Braz J Urol*. 2022;48(3):501–11.
 14. Ptak M, Ciećwież S, Brodowska A, Starczewski A, Nawrocka-Rutkowska J, Diaz-Mohedo E, et al. The effect of pelvic floor muscles exercise on quality of life in women with stress urinary incontinence and its relationship with vaginal deliveries: A randomized trial. *Biomed Res Int*. 2019;2019:5321864. doi: 10.1155/2019/5321864.
 15. Hagen S, Elders A, Stratton S, Sergenson N, Bugge C, Dean S, et al. Effectiveness of pelvic floor muscle training with and without electromyographic biofeedback for urinary incontinence in women: Multicentre randomised controlled trial. *BMJ*. 2020;371:m3719. doi: 10.1136/bmj.m3719.