

# Effects of Pelvic Floor Muscle Exercises on Urinary Incontinence and Quality of Life in Patients with Multiple Sclerosis

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## Abstract

**Background:** Urinary disorders are common problems in patients with multiple sclerosis (MS). Urinary incontinence largely affects the physical, social, and emotional characteristics and activities of these patients.

**Objectives:** This study was conducted to determine the effects of pelvic floor muscle exercises on urinary incontinence and quality of life in patients with MS.

**Patients and Methods:** This quasi-experimental clinical trial adopted a pretest-posttest design. Convenience sampling was used to select 50 MS patients with urinary incontinence who presented to the Iranian Center of Neurological Research. The eligible patients were trained on pelvic floor muscle exercises and asked to practice the exercises for three consecutive months. The International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF) and Qualiveen-30 were administered to measure the patients' level of urinary incontinence and quality of life, respectively. The participants completed the questionnaires before the intervention and at the end of the third month. The data were analyzed using paired t test and Pearson's correlation test.

**Results:** Of the total number of participants, 68.9% were women and 31.1% were men. Participants' mean and standard deviation of age, duration with MS, and duration with urinary incontinence were  $36.33 \pm 9.4$  years,  $9.06 \pm 5.11$  years, and  $2.39 \pm 3.71$  years respectively. The mean ICIQ-UI SF scores and the frequency and amount of urine leakage significantly decreased after the intervention ( $P < 0.001$  for all). Moreover, significant improvements in quality of life and all its domains were observed after the intervention ( $P < 0.001$ ). Moreover, There was a significant inverse relationship between urinary incontinence and all domains of quality of life ( $P < 0.001$ ).

**Conclusion:** Training MS patients with urinary incontinence to perform pelvic floor muscle exercises can reduce the severity of their urinary disorders and promote their quality of life.

**Key words:** Pelvic Floor Muscle Exercises, Urinary Incontinence, Quality of Life, Multiple Sclerosis

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## Background

Multiple sclerosis (MS) is a chronic disease in which patient independence requires training in self-care and self-management [1]. About 2.5 million people around the world [2], and 5-30 individuals per 100,000 people in Iran suffer from MS [3]. The prevalence of the disease is unfortunately on the rise in Iran and the number of MS cases recorded in different medical centers of the country have increased by three-four times over the past several years[4].

MS is characterized by a variety of unpredictable symptoms and periods including impaired coordination and balance, fatigue, visual disturbances, sensory changes, sensitivity to heat, cognitive and emotional disorders, and bladder and bowel dysfunction[5]. About 84% of MS patients complain about lower urinary tract dysfunction[6]. Lesions in the cerebral cortex, suprapontine, and spinal cord are among the neurological causes of urinary disorders in patients with MS[7]. Furthermore, overactive bladder and the consequent urinary incontinence are the most frequent bladder dysfunctions in these patients[8]. Urinary incontinence is a frustrating and debilitating disorder that manifests as obvious involuntary urine leakage. Urinary disorders exacerbate as MS progresses and patient mobility decreases. The proper functioning of the bladder is necessary to prevent life-threatening infections, kidney failure, and formation of kidney and urinary tract stones in patients with MS [7]. Urinary incontinence largely affects patients' physical, social, and emotional characteristics and activities and causes an embarrassing situation which leads to social isolation and reduced quality of life [9]. Considering the chronicity and incurability of MS, promoting patients' quality of life should be regarded as a major care objective[10].

Various treatment methods, such as surgery, hormone therapy, pharmacotherapy, electrical stimulation, pelvic floor muscle exercises, and mechanical devices, have been suggested for urinary incontinence. Pharmacotherapy uses anticholinergics and antimuscarinics, e.g. oxybutynin and tolterodine, and causes a number of side effects including constipation, dizziness, urinary retention, and skin rash [11,13]. Not only do surgical approaches need appropriate facilities, high expenses, and skilled surgeons, but they may also be associated with both complications and the relapse of urinary incontinence[14]. Pelvic floor muscle exercises are essential for the prevention and treatment of urinary incontinence[15]. These exercises are based on the fact that strong contractions of the pelvic floor muscles clamp the urethra and consequently increase urethral pressure and prevent urine leakage in case of a sudden elevation in intra-abdominal pressure[14, 16].

Health personnel, including nurses, can easily train patients with MS on pelvic floor muscle exercises as a non-pharmacological, non-invasive, and cost-effective method to control urinary disorders. Numerous studies have shown the effectiveness of pelvic floor muscle exercises on urinary incontinence [6, 9, 14, 18, 31]. Performing these exercises

can be effective in different positions, but the correct technique determines its efficacy. There is no scientific evidence indicating superiority of a particular pelvic floor muscle strengthening regimen in urinary incontinence, and reports in this field are contradictory [17]. However, in order to ensure the effectiveness of pelvic floor muscle exercises, nurses should constantly encourage and support patients and provide both oral and written instructions[18]. Despite the significance of nursing interventions in the treatment and care of patients with chronic diseases and the high prevalence of urinary incontinence in MS patients, people's perception of the quality of life, which is affected by their beliefs and culture, can be different in different societies. Similar studies have mostly been conducted on women in western societies. So little research has been conducted in this regard.

## Objectives

Therefore, the present study aimed to determine the effects of pelvic floor muscle exercises training on urinary incontinence and quality of life in patients with MS.

## Patients and methods

This quasi-experimental study adopted a single-group, pretest-posttest design. Convenience sampling was used to select 50 male and female eligible patients between February 2014 and July 2014 presenting to MS clinics of the Iranian Center of Neurological Research (Imam Khomeini Hospital, Tehran, Iran). According to previous studies[19], a significance level of 95% and a test power of 90% (based on the difference of mean and standard deviation of urinary incontinence) used in the following formula

$$n = \frac{(z_1 - \alpha / z + z_1 - \beta)^2 \times s_d^2}{d^2}$$

the sample size was calculated as 42 patients ( $d=10$ ,  $s_d=6.32$ ). With a sample loss rate of 20%, the number of participants was increased to 50 patients.

Adult, literate patients (age: 18-50 years) who had been diagnosed with urinary incontinence caused by MS (confirmed by a neurologist) were included if they scored lower than seven on the Expanded Disability Status Scale (EDSS). EDSS is a neurological scale that grades the level of disability in MS with a score that ranges from 0 (normal neurological findings) to 10 (death due to MS). Other inclusion criteria were the absence of severe cognitive disorders, chronic heart and pulmonary diseases, urinary tract infection, and excessive fatigue which prevented the patient from doing the exercises. Patients with a history of diabetes, gynecological and prostate surgery, benign prostatic hyperplasia, Cesarean section or vaginal delivery during the past six months, disease attacks during the past three months, and changes in the dosage of drugs affecting urinary incontinence during the past month, were not included. Moreover, pregnant or postmenopausal women, as well as individuals receiving diuretics or antihypertensive drugs, were not eligible for participation. The exclusion criteria were unwillingness to continue

participation (regardless of the reason), the incidence of acute medical conditions or acute disease attacks during the course of the study, and any changes in the dosage of drugs affecting urinary incontinence over the study period.

Data were collected using a demographic questionnaire (Demographics questionnaire had two sections: general information including age, sex, height, weight, Body Mass Index (BMI), place of residence, marital status, employment, economic status, type of insurance, and the need for assistance with daily activities, and MS information including type of MS, duration of having MS, frequency of recurrence in the past year, medication history, medication used for urinary incontinence, disability before and after intervention), the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF), and the Qualiveen-30.

The ICIQ-UI SF consists of four items: frequency of urinary incontinence ("0" never, "1" once a week, "2" two or three times a week, "3" once a day, "4" a few times a day, "5" always), volume ("0" none, "2" small amount, "4" moderate amount, "6" large amount), how much urine leakage affects your daily life (Visual analogue scale ranging from 0 "Not at all" to 10 "A great deal") and fourth item included eight questions related to the symptoms to determine the type of urinary incontinence. The scores range between 0 and 21 and higher values indicate more severe symptoms of urinary incontinence. This questionnaire has been used in numerous studies[20, 21] and its reliability and validity have been confirmed in Iran (Cronbach's alpha = 0.75) [22].

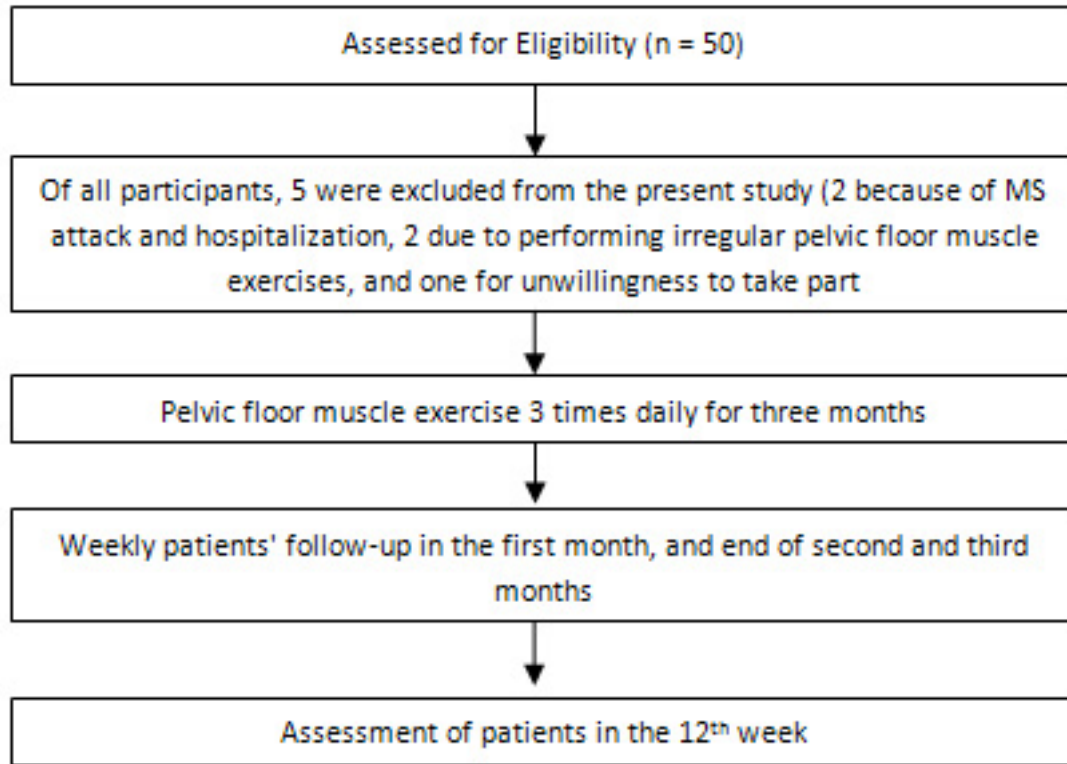
Qualiveen-30 evaluates patients' health-related quality of life through 30 specific items in four distinct domains: Bother with limitations (nine items), frequency of limitations caused by urinary disorders (eight items), fear (eight items) and feelings (five items). The items are scored on a five-point Likert scale with values ranging from 0 (no impact) to 4 (great negative impact) and greater total scores suggest poorer quality of life. The mean score of the items in each domain indicates the score for that domain and the overall score of Qualiveen is the mean of the four domains. This instrument has been used in various studies [19,23, 24]. Its validity and reliability in Iranian patients with spinal cord injury and MS have been previously confirmed (Cronbach's alpha = 0.82-0.95) [25].

The participants then completed the demographic questionnaire. Items related to BMI, type of MS, and EDSS scores before and after the training were marked by the researcher. Before the initiation of the study, the patients' EDSS scores were determined by a neurologist (as mentioned earlier, only individuals with scores lower than seven were included). The absence of urinary tract infection was confirmed through the normal results of urinalysis or urine culture. The subjects were also requested to fill out the ICIQ-UI SF and Qualiveen-30. The questionnaires were completed in the presence of the researcher in MS clinic after the patient was visited by the neurologist so that potential questions could be answered.

The researcher and research assistant had been trained about the exercises based on reliable resources and under the supervision of a nurse specialized in wounds, ostomy and continence. All training was performed according to the adult learning theory. This approach takes the living conditions and mental, physical, and experiential development of adults into account and allows the learners to learn what they need through self-control[26, 27]. The patients received individual, face-to-face training for about 20 minutes at the MS clinics. Patients were trained for pelvic floor exercises by a same-sex trainer. The subjects first received explanation about the anatomy and function of the urinary tract and the etiology, symptoms, complications, and treatment methods of urinary incontinence in MS patients. They were then provided with relevant pamphlets and pictures and lectured about pelvic floor muscle exercises. In order to identify muscles involved in urination, the patients were instructed to stop their flow of urine midstream for three seconds (but not to repeat this exercise too often). They were then asked to lie in a supine position with their knees bent and to squeeze the same muscles (as they did to stop urination) while they were breathing gently through the mouth and keeping all other pelvic muscles relaxed. They could gradually do the exercises in sitting and standing positions, as well. The subjects were recommended to start by holding the squeezes for three seconds and resting for five seconds. The goal was to increase the duration of each contraction to 10 seconds and to do 90-100 contractions a day (depending on each patient's ability and level of fatigue). The participants had to do the exercises three times a day (the timing was determined by the patients) for 12 consecutive weeks at home. Educational pamphlets about urinary incontinence in MS patients and pelvic floor muscle exercises were also distributed among the subjects.

In order to facilitate follow-up, each patient was provided with self-report checklists containing the number of muscle contractions at each time of practice, total number of muscle contractions per day, and the total time dedicated to the exercises. The participants were asked to complete the checklists every day. To resolve any problems and ensure the execution of the exercises, the researcher attended the MS clinic once a week and also phoned the patients weekly during the first month and at the end of the second and third months of the intervention.

The ICIQ-UI SF, Qualiveen-30, and self-report checklists were collected after three months (Figure 1). The patients who were not willing to continue participation or did not do the exercises regularly (less than 5 days a week) were excluded from the study. The questionnaires were completed by the patients when they went to the MS clinic without researcher's presence. Then the researcher collected the completed questionnaire.

**Figure 1: Consort Flow Diagram**

### Ethical Considerations

The present study was approved by the ethics committee of Tehran University of Medical Sciences (92/D/130/2715). It was also registered in the Iranian Registry of Clinical Trials (ID: IRCT2014010416063N1). All samples were at liberty to take part or withdraw, and were assured of confidentiality of data. The researcher ensured cooperation of authorities of Imam Khomeini hospital and MS clinic by presenting a letter of introduction from School of Nursing and Midwifery of Tehran University of Medical Sciences. Upon their recruitment, the patients were asked to sign an informed consent form and to provide their phone numbers (for follow-up).

### Data Analysis

Once the trial was terminated, the data were entered into SPSS 13 (SPSS Inc., Chicago, IL, USA). Normality of the data was confirmed using Kolmogorov-Smirnov test (all data were normal), so paired t-test was used to compare total scores of ICIQ-UISF, quality of life and its dimensions before and after intervention, and Pearson's correlation test to determine the relationship of total score of quality of life and its dimensions with urinary incontinence, age, BMI, duration of MS, duration of urinary incontinence and EDSS score. Statistical tests were performed at the significance level of  $P < 0.05$ .

### Results

The mean and standard deviation of age, BMI, duration of having MS and urinary incontinence in participants were  $36.33 \pm 9.4$  years,  $24.22 \pm 4.63$  kg/m<sup>2</sup>,  $9.06 \pm 5.1$  years and  $2.39 \pm 3.71$ , respectively.

Since five patients were excluded during the course of the study (two due to MS attacks and hospitalization, two for their failure to do the pelvic floor muscle exercises regularly, and one for unwillingness to participate), 45 patients completed the study. Table 1 provides the demographic and clinical characteristics of the participants.

There were significant differences in total scores of ICIQ-UI SF before and after the intervention ( $P < 0.001$ ) (Table 2). The total scores of quality of life, as well as the scores of all its domains, decreased after the intervention ( $P < 0.001$ ), i.e. the patients' quality of life improved after the intervention (Table 2).

The scores of ICIQ-UI SF had a significant direct relationship with scores of quality of life and all its domains ( $P < 0.001$ ). In other words, the patients' quality of life decreased significantly with an increase in urinary incontinence. There were also significant direct relationships between EDSS scores and the scores of quality of life and all its domains. In fact, higher EDSS scores were associated with lower quality of life.

A significant direct correlation was also detected between the duration of MS and the frequency of limitations ( $P = 0.02$ ). The patients' quality of life and its domains were not significantly related with their age, BMI, and duration of urinary incontinence.

Table 1: Demographic and clinical characteristics of the participating patients with multiple sclerosis (MS)

| Variable                                    | Frequency (percent)   |          |
|---|-----------------------|----------|
| Age   | 18-30 years           | 14(31.1) |
|   | 31-40 years           | 11(24.4) |
|   | 41-50 years           | 20(44.4) |
| Body mass index                             | 15-18.5               | 4(8.9)   |
|   | 18.51-24.9            | 23(51.1) |
|   | Over 24.9             | 18(40)   |
| Type of MS                                  | Relapsing-remitting   | 38(84.4) |
|   | Secondary progressive | 7(15.6)  |
| Duration of MS                              | 1-6 years             | 18(40)   |
|   | 7-13 years            | 17(37.8) |
|   | 14-20 years           | 10(22.2) |
| Duration of urinary incontinence            | Under one year        | 14(31.1) |
|   | 1-3 years             | 20(44.4) |
|   | 3-5 years             | 8(17.8)  |
|   | Over 5 years          | 3(6.7)   |
| Use of drugs for urinary incontinence       | Yes                   | 14(31.1) |
|   | No                    | 31(68.9) |
| Expanded Disability Status Scale score      | 0-2                   | 13(28.9) |
|   | 2.5-4.5               | 22(48.9) |
|   | 5-6.5                 | 10(22.2) |
| Frequency of MS relapses over the past year | Without relapse       | 23(51.1) |
|   | Once                  | 16(35.6) |
|   | Twice                 | 3(6.7)   |
|   | More than twice       | 3(6.7)   |

Table 2: Urinary incontinence and quality of life and its domains before and after the intervention

| Questionnaire scores                                 | Variable                             |                                     | P Value <sup>b</sup> | CI95%            |
|--|--------------------------------------|-------------------------------------|----------------------|------------------|
|  | before the intervention <sup>a</sup> | After the intervention <sup>a</sup> |                      |                  |
| Total scores of ICIQ-UI SF                           | 10.48±4.65                           | 4.93±3.58                           | P < 0.001            | 4.65072, 6.46039 |
| Bother with limitations                              | 1.64±0.83                            | 1.19±0.84                           | P < 0.001            | .29805, .59578   |
| Frequency of limitations caused by urinary disorders | 1.45±1.37                            | 1.1±0.77                            | P < 0.001            | .21481, .47408   |
| Fear   | 1.9±1                                | 1.34±.96                            | P < 0.001            | .36537, .75421   |
| Feelings   | 1.21±1                               | 0.87±0.86                           | P < 0.001            | .25085, .46915   |
| Total scores of Qualiveen-30                         | 1.55±0.8                             | 1.13±0.75                           | P < 0.001            | .32588, .5296    |

<sup>a</sup> Values are expressed as mean ± standard deviation.

<sup>b</sup> paired t test

**Table 3: Correlation of quality of life and its domains with urinary incontinence and other demographic and clinical variables in patients with multiple sclerosis (MS)**

| Domain of the quality of life                        | Variable                          |         |       |      |                 |      |                |      |                                  |      |            |         |
|--|-----------------------------------|---------|-------|------|-----------------|------|----------------|------|----------------------------------|------|------------|---------|
|  | Urinary incontinence (ICIQ-UI SF) |         | Age   |      | Body mass index |      | Duration of MS |      | Duration of urinary incontinence |      | EDSS score |         |
|  | r                                 | p       | r     | P    | r               | P    | r              | P    | r                                | P    | r          | P       |
| Bother with limitations                              | 0.50                              | < 0.001 | 0.09  | 0.51 | 0.21            | 0.15 | 0.23           | 0.12 | 0.06                             | 0.65 | 0.32       | 0.02    |
| Frequency of limitations caused by urinary disorders | 0.50                              | < 0.001 | 0.15  | 0.31 | 0.18            | 0.23 | 0.33           | 0.02 | 0.13                             | 0.37 | 0.55       | < 0.001 |
| Fear   | 0.48                              | 0.01    | 0.14  | 0.34 | 0.17            | 0.26 | 0.03           | 0.79 | 0.02                             | 0.85 | 0.28       | 0.05    |
| Feelings   | 0.46                              | 0.01    | 0.003 | 0.98 | 0.11            | 0.44 | 0.15           | 0.31 | 0.03                             | 0.82 | 0.34       | 0.02    |
| Total scores of Qualiveen-30                         | 0.56                              | 0.001   | 0.03  | 0.84 | 0.19            | 0.19 | 0.21           | 0.16 | 0.05                             | 0.71 | 0.43       | 0.003   |

ICIQ-UI SF: the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form

EDSS: Expanded Disability Status Scale; a Pearson's correlation test

## Discussion

In the present research, total scores of urinary incontinence were significantly lower after three months of practicing pelvic floor muscle exercises. There were also significant reductions in the frequency and amount of urine leakage and the effect of urinary incontinence on patients' quality of life after the intervention. Similarly, Lucio et al. reported training on pelvic floor muscle exercises to significantly decrease the mean scores of ICIQ-UI SF in women with MS(19). Likewise, in a study on elderly women, Seyedrasouli et al. concluded that three months of pelvic floor muscle exercises along with bladder training and lifestyle modification significantly reduced not only the frequency and amount of urine leakage, but also the effects of urine leakage on patients' quality of life and the total scores of ICIQ-UI SF[28].

Golmakani et al. measured the amount of urine leakage eight weeks before and eight weeks after using vaginal cones and a behavioral intervention program (consisting of exercises to strengthen both the pelvic floor muscles and the bladder). The mean variations in the amount of urine leakage were significantly higher in the group receiving the behavioral intervention program than the group using vaginal cones[29].

Lower urinary tract disorders in patients with MS include urinary urgency, uncontrolled urination, and symptoms of urinary retention. Although the symptoms of lower urinary tract disorders have different prevalence, the presence or absence of symptoms is not a reliable indicator of the extent of bladder dysfunction[30]. Various studies have suggested pelvic floor muscle exercises as the first conservative treatment for patients with any type of urinary incontinence (including stress, urge, and mixed incontinence). Nevertheless, these exercises have been found to be more beneficial to individuals with stress urinary incontinence, as well as younger patients(14).

Some studies have indicated the higher efficacy of guided pelvic floor muscle exercises, such as the use of vaginal

cones, electrical stimulation, and biofeedback[14]. However, a controlled trial found vaginal cones, electrical stimulation, and pelvic floor muscle exercises to have similar effectiveness in the management of urinary incontinence[31].

Kashanian et al. compared two groups of patients who performed pelvic floor muscle exercises either unaided or by using a KegelMaster device. While the two groups had no significant differences in the incidence of complications during the course of study, the severity of urinary incontinence showed greater improvement in the group that did not use the KegelMaster device[14].

In the current study, the mean scores of quality of life and all its domains decreased after the intervention, i.e. the intervention could enhance the patients' quality of life in all domains. Similar to our findings, Lucio et al. reported significantly different Qualiveen-30 scores (and thus quality of life) between patients who followed a pelvic floor muscle exercise routine and the controls[19].

In a study in Turkey, Khorshid and Sar concluded that although pelvic floor muscle exercises improved the quality of life in women with stress urinary incontinence, such exercises required practice, encouragement, and reminders[32]. Therefore, we tried to eliminate barriers to proper and regular practice of pelvic floor muscle exercises by following the patients up through phone calls, presence in the MS clinic, and provision of training pamphlets and self-report checklists.

Ghasemi et al. found significant improvements in physical and mental quality of life of MS patients with urinary incontinence after the use of Swiss balls and biofeedback. Moreover, exercising with a Swiss ball was more effective than biofeedback in improving the patients' physical quality of life. This can be justified by the required level of activity and the need for concentration, cognition, balance, and respiration during the exercises[16].

A study that examined the quality of life in MS patients with overactive bladder syndrome indicated significant correlations between urinary symptoms and all dimensions of quality of life including perceived general health and role, physical, and social limitations[33]. Apparently, urinary incontinence can negatively affect all dimensions of quality of life regardless of the patients' sex, type of disease, and other factors.

Previous studies have reported contradictory findings about the effects of pelvic floor muscle exercises on different dimensions of quality of life. While some studies have suggested the absence of any effects[34], others have highlighted the efficacy of exercises in some or all dimensions of quality of life. We detected significant improvements in all dimensions of quality of life after three months of pelvic floor muscle exercises. The administration of the Qualiveen-30, which is a quality of life questionnaire specifically designed for patients with urinary incontinence caused by neurological disorders such as spinal cord injuries and MS, might explain such a finding. Most studies have used time-consuming and expensive urodynamic test or neuromuscular stimulation test to assess the efficacy of pelvic floor exercises on urinary incontinence [6,16,18,30] but we used a non-invasive, simple and inexpensive method, that is, standard questionnaires, to assess a non-invasive intervention.

Generally, although there is strong evidence indicating the effectiveness of pelvic floor muscle exercise in the treatment of urinary incontinence, the effect of a favorable training protocol remains unclear. Different studies have shown the effectiveness of various training programs, but superiority of one method over another has not yet been reported[35]. Proper identification of pelvic floor muscles and performing effective contractions is the key to deciding benefits of the intervention, and if patients fail to properly identify these muscles, exercises will have no positive effect on urinary incontinence, and may even have adverse effects.

A limitation of the study was the self-administered nature of data collection. Furthermore, the limited number of patients restrained the use of a control group. It is recommended that similar studies be conducted with a control group, for longer follow-up periods and comparison of different results obtained at different time periods.

According to the present study results, health personnel, including nurses, are recommended to train patients with MS on pelvic floor muscle exercises as a non-pharmacological and non-invasive method to decrease the incidence of urinary disorders and promote the quality of life in MS patients with urinary incontinence.

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