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ORIGINAL ARTICLE

Association between urinary symptoms, quality of life, and pelvic floor function in females diagnosed with multiple sclerosis

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ABSTRACT

Objectives: The study aimed to evaluate the correlation between urinary symptoms, quality of life, and pelvic floor functions in female patients with multiple sclerosis (MS).

Patients and methods: In this descriptive cross-sectional study, 15 females (mean age: 39.6±8.3 years; range, 27 to 56 years) with relapsing-remitting MS were involved between May 2022 and January 2023. The physical and clinical characteristics of the participants were recorded. Information was obtained with the Global Pelvic Floor Distress Inventory (GPFDI), the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) Index, the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), the Overactive Bladder-Validated 8-question Screener (OAB-V8), the Urogenital Distress Inventory-6 (UDI-6), the Incontinence Impact Questionnaire-7 (IIQ-7), the King's Health Questionnaire (KHQ), and the Visual Analog Scale (VAS). Pelvic floor function was evaluated using the PERFECT scheme.

Results: Significant correlations were found between urinary symptom severity scores (GPFDI, BFLUTS, ICIQ-SF, UDI-6, IIQ-7, and OAB-V8) and various subdomains of the KHQ, particularly incontinence impact, physical/social limitations, emotional well-being, and sleep/energy. Discomfort levels measured by VAS positively correlated with UDI-6, ICIQ-SF, GPFDI, and KHQ subscores. Higher body mass index, longer disease duration, and higher EDSS scores were associated with greater lower urinary tract symptom severity. Additionally, pelvic floor muscle strength and endurance showed a negative correlation with EDSS scores, as well as several urinary symptoms and quality of life measures.

Conclusion: Urinary symptoms were associated with decreased pelvic floor function, greater physical disability, and reduced quality of life in females with MS.

Keywords: Multiple sclerosis, pelvic floor, quality of life, urinary symptoms.

Multiple sclerosis (MS) is autoimmune disease that causes demyelination in the central nervous system.[1] During the course of the illness, a sizable percentage of patients with MS describe different lower urinary tract symptoms (LUTS).[2,3] Symptoms vary depending on the location, size, and progression of the lesion. The most common LUTS in people with MS are urgency, frequency, and neurogenic detrusor overactivity.[2]

The pelvic floor muscles contribute to the mechanism of continence by increasing their tone during bladder filling and increased intra-abdominal pressure. Moreover, they inhibit involuntary detrusor contractions and help prevent incontinence. In MS, both brainstem and spinal cord neuronal demyelination may be associated with LUTS due to pelvic floor muscle weakness.[4]

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Lower urinary tract symptoms are common in people with MS, yet diagnosis and treatment are largely neglected. It can result in a decrease in QoL if untreated.[4,5] In MS, patient-reported outcomes related to sphincter function may be useful in determining the presence of pelvic floor dysfunctions and their effect on patients' life.[5]

This study aimed to examine the relationship between lower urinary tract dysfunctions and the levels of discomfort and QoL in female patients with MS.

PATIENTS AND METHODS

The descriptive cross-sectional study included 15 female patients (mean age: 39.6±8.3 years; range, 27 to 56 years) with relapsing-remitting MS (RRMS) who visited the Neurology Department of the Ondokuz Mayıs University Faculty of Medicine between May 2022 and January 2023. Patients with LUTS between the ages of 18 and 65, Expanded Disability Status Scale (EDSS) scores ≤5, and stable disease who volunteered to participate in the study were recruited. The exclusion criteria were pregnancy, having undergone surgery, medicine, or physiotherapy for lower urinary tract issues within the preceding six months, and having any major medical condition other than MS that significantly affected QoL. Written informed consent was obtained from all participants. The study protocol was approved by the Ondokuz Mayıs University Clinical Research Ethics Committee (Date: 08.12.2021, No: 2021/576). The study was conducted in accordance with the principles of the Declaration of Helsinki.

The introduction form recorded the participants' physical and demographic characteristics. Their age and body mass index (BMI) were recorded. Medical history included EDSS score, year of diagnosis, medications used, history and frequency of attacks, presence of chronic diseases other than MS, history of urologic/gynecologic surgery, number of pregnancies and births, menopausal status, and smoking habits.

To assess the QoL and symptoms of the lower urinary tract in participants, the Global Pelvic Floor Distress Inventory (GPFDI), the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) index, the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), the Overactive Bladder-Validated 8-question Screener (OAB-V8), the Urogenital Distress Inventory-6 (UDI-6), the Incontinence Impact Questionnaire-7 (IIQ-7), and the King's Health Questionnaire (KHQ) were used. The level of discomfort experienced by the participants was self-rated on a Visual Analog Scale (VAS).

The validity and reliability study of the GPFDI was conducted by Peterson et al.,[6] and its Turkish cultural adaptation study was conducted by Doğan et al.[7] The GPFDI consists of nine questions. The pelvic floor dysfunction symptoms, such as stress urine incontinence, urge incontinence, frequent and urgent urination, trouble urinating, pelvic organ prolapse, obstructed defecation, fecal incontinence, and dyspareunia, are evaluated along with their severity. The mean total score, ranging from 0 to 45, is calculated and multiplied by 20 to give a score out of 100. A higher score indicates a higher number of symptoms.

The BFLUTS was created by Jackson et al.[8] The validity and reliability study of the Turkish version of the BFLUTS was conducted by Gökkaya et al.[9] The 19 questions that make up the BFLUTS are divided into five subdimensions: QoL, storage, voiding, incontinence, and sexual life. Higher scores indicate increased severity of LUTS and detrimental impacts on sexual life and QoL. The total score ranges from 0 to 71.

The ICIQ-SF was designed by Avery et al.[10] to evaluate the impact of urine incontinence on QoL. Its Turkish validity and reliability were established by Çetinel et al.[11] There are four sections in the ICIQ-SF: frequency, amount, impact on daily life, and circumstances leading to incontinence. The total score obtained from the first three sections ranges from 0 to 21. A higher score indicates a greater negative impact of urinary incontinence on QoL.

Shumaker et al.[12] developed the UDI-6 and the IIQ-7, which Uebersax et al.[13] later condensed into abbreviated versions in 1995. In 2004, its validity and reliability were established in Turkish by Çam et al.[14] Forms measuring the effect of incontinence on QoL have a score ranging from 0 to 100. An increase in the score indicates a deterioration in QoL.

The KHQ, developed by Kelleher et al.[15] in 1997, evaluates the general health state of patients, as well as the impact of incontinence, levels of limitation (physical, role, and social), emotional status, sleep-energy levels, and severity of symptoms. Turkish validity and reliability studies for patients with urinary disorders, including MS, were conducted by Akkoç et al.[16] in 2011. A high

TABLE 1
The physical and clinical characteristics of the participants

	n	Mean±SD	Min-Max
Age (year)	15	39.7±2.3	27.0-56.0
Body mass index (kg/m²)	15	26.9±4.7	20.9-39.2
Time since the diagnosis was made (year)	15	9.7±1.4	1.0-22.0
Expanded Disability Status Scale	15	1.3±1.5	0.5-5.0
Parity (n)	15	2.1±0.3	0.0-4.0

SD: Standard deviation.

total score indicates that the patient's QoL has deteriorated.

Pelvic floor muscle functions of the participants were evaluated by vaginal palpation. In vaginal palpation, the clinician placed two fingers intravaginally, and the patient was asked to contract the pelvic floor muscles. The PERFECT scheme, developed by Laycock and Jerwood[17] in 2001, was used in vaginal palpation evaluation. In this scheme, "P" stands for power, "E" for endurance, "R" for repetition, "F" for fast contractions, and "ECT" for every contraction timed. Power assessment included perineal elevation during a maximal voluntary contraction using digital palpation according to the Oxford Scale. According to the Oxford Scale, muscle strength was divided into five degrees: 0/5 indicated no contraction, 1/5 indicated slight contraction, 2/5 indicated weak contraction, 3/5 indicated moderate contraction, 4/5 indicated strong contraction, and 5/5 indicated absolutely strong contraction. Endurance was recorded as the duration for which the participant could sustain a maximum voluntary contraction. It was defined as the ability to sustain the maximum voluntary contraction before a decrease of 35% or more in strength occurs (up to 10 sec). Repetition was assessed with maximum number of voluntary contractions that the participant could perform (up to a maximum of 10). Fast contractions were defined as the number of consecutive maximum voluntary contractions performed within 1 min (up to 10). Finally, every contraction timed indicated that the participant was reminded of the timing of each contraction.

Statistical analysis

Data were analyzed using the IBM SPSS version 25.0 software (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as numbers and percentages, and continuous variables were shown as mean ± standard deviation (SD). The Shapiro-Wilk test was used to assess normal distribution. The Pearson test was used for correlation analysis of parametric data. The Spearman test was used for nonparametric data. A p-value <0.05 was considered statistically significant.

The effect size was calculated for the correlation coefficient (r=0.764) between ICIQ-SF scores and KHQ (social limitation) scale scores. As a result of the post hoc power analysis performed at a 5% significance level for 15 people, the power of the study was calculated as 98.8%.

RESULTS

The characteristics of the participants are shown in Tables 1 and 2. Table 3 shows correlations between participants' GPFDI scores and the KHQ

TABLE 2
Demographic and clinical characteristics of participants (n=15)

	n	%
Educational status		
Primary school	1	20.0
Secondary school	3	6.7
High school	5	33.3
University and above	6	40.0
Working status		
Yes	4	26.7
No	11	73.3
Marital status		
Married	11	73.3
Single	2	13.3
Widowed	2	13.3
Medication use in MS treatment		
Yes	8	53.3
No	6	40.0
Menstrual status		
Regular menstruation	12	80.0
Menopause	3	20.0

MS: Multiple sclerosis.

TABLE 3
Correlations between VAS and KHQ scores and GPFDI, BFLUTS, ICIQ-SF, UDI-6, and IIQ-7, OAB-V8 scores

	GPFDI	BFLUTS	ICIQ-SF	UDI-6	IIQ-7	OAB-V8	VAS
VAS							
Correlation coefficient	0.795**	0.445	0.750**	0.552*	0.354	0.401	1.000
Sig. (2-tailed)	0.000	0.096	0.001	0.033	0.215	0.138	
n	15	15	15	15	15	15	15
KHQ (general health perception)							
Correlation coefficient	0.136	0.359	0.367	-0.008	0.136	-0.022	0.197
Sig. (2-tailed)	0.629	0.188	0.178	0.977	0.629	0.937	0.481
n	15	15	15	15	15	15	15
KHQ (Incontinence impact)							
Correlation coefficient	0.652**	0.419	0.750**	0.384	0.321	0.253	0.743**
Sig. (2-tailed)	0.008	0.120	0.001	0.158	0.244	0.363	0.001
n	15	15	15	15	15	15	15
KHQ (role limitation)							
Correlation coefficient	0.361	0.605*	0.440	0.549*	0.206	0.468	0.414
Sig. (2-tailed)	0.186	0.017	0.100	0.034	0.460	0.078	0.125
n	15	15	15	15	15	15	15
KHQ (physical limitation)							
Correlation coefficient	0.177	0.517*	0.697**	0.607*	0.212	0.483	0.385
Sig. (2-tailed)	0.527	0.048	0.004	0.016	0.448	0.068	0.156
n	15	15	15	15	15	15	15
KHQ (social limitation)							
Correlation coefficient	0.496	0.445	0.764**	0.604*	0.721**	0.327	0.755**
Sig. (2-tailed)	0.060	0.096	0.001	0.017	0.002	0.235	0.001
n	15	15	15	15	15	15	15
KHQ (personal relationship							
Correlation coefficient	0.430	0.533*	0.338	0.564*	0.489	0.503	0.345
Sig. (2-tailed)	0.110	0.041	0.218	0.028	0.065	0.056	0.208
n	15	15	15	15	15	15	15
KHQ (emotional)							
Correlation coefficient	0.248	0.380	0.784**	0.587*	0.610*	0.294	0.532*
Sig. (2-tailed)	0.372	0.163	0.001	0.021	0.016	0.288	0.041
n	15	15	15	15	15	15	15
KHQ (sleep/energy)							
Correlation coefficient	0.516*	0.551*	0.227	0.505	0.583*	0.733**	0.263
Sig. (2-tailed)	0.049	0.033	0.416	0.055	0.022	0.002	0.344
n	15	15	15	15	15	15	15
KHQ (severity of symptoms)							
Correlation coefficient	−0.059	0.453	0.411	0.561*	0.606*	0.269	0.230
Sig. (2-tailed)	0.835	0.090	0.128	0.030	0.017	0.332	0.409
n	15	15	15	15	15	15	15

VAS: Visual Analog Scale; KHQ: King's Health Questionnaire; GPFDI: Global Pelvic Floor Distress Inventory; BFLUTS: Bristol Female Lower Urinary Tract Symptoms Index; ICIQ-SF: International Consultation on Incontinence Questionnaire-Short Form; UDI-6: Urogenital Distress Inventory-6, IIQ-7: Incontinence Impact Questionnaire-7; OAB-V8: Overactive Bladder-V8; * Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).

impact and sleep/energy subscores; BFLUTS scores and the physical limitation and personal relationship subscores; ICIQ-SF scores and the physical and social limitations, incontinence impact, sleep-energy, emotional, and seriousness subscores; UDI-6 scores and the role limitation, physical and social limitations, emotional, and seriousness subscores; IIQ-7 scores and the

TABLE 4
Correlations between the physical and clinical characteristics of the participants and GPFDI, BFLUTS, ICIQ-SF, UDI-6, IIQ-7, OAB-V8, and VAS scores

	GPFDI	BFLUTS	ICIQ-SF	UDI-6	IIQ-7	OAB-V8	VAS
Age (year)							
Correlation coefficient	−0.077	−0.109	−0.027	−0.273	0.276	−0.204	0.019
Sig. (2-tailed)	0.784	0.700	0.924	0.326	0.320	0.467	0.946
n	15	15	15	15	15	15	15
Body mass index (kg/m^2)							
Correlation coefficient	0.178	0.300	0.518*	0.546*	0.395	0.299	0.314
Sig. (2-tailed)	0.526	0.278	0.048	0.035	0.145	0.279	0.254
n	15	15	15	15	15	15	15
Time since the diagnosis was made (year)							
Correlation coefficient	0.492	0.166	0.278	0.392	0.520*	0.594*	0.390
Sig. (2-tailed)	0.063	0.555	0.316	0.148	0.047	0.020	0.151
n	15	15	15	15	15	15	15
EDSS							
Correlation coefficient	0.310	0.327	0.587*	0.453	0.152	0.292	0.428
Sig. (2-tailed)	0.261	0.234	0.022	0.090	0.588	0.290	0.111
n	15	15	15	15	15	15	15
Parity							
Correlation coefficient	−0.087	−0.019	−0.477	−0.301	−0.224	−0.240	−0.215
Sig. (2-tailed)	0.757	0.946	0.072	0.275	0.422	0.390	0.441
n	15	15	15	15	15	15	15

GPFDI: Global Pelvic Floor Distress Inventory; BFLUTS: Bristol Female Lower Urinary Tract Symptoms Index; ICIQ-SF: International Consultation on Incontinence Questionnaire-Short Form; UDI-6: Urogenital Distress Inventory-6, IIQ-7: Incontinence Impact Questionnaire-7; OAB-V8: Overactive Bladder-V8; VAS: Visual Analog Scale; EDSS: Expanded Disability Status Scale; * Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).

social limitations, sleep/energy, and emotional subscores; and OAB-V8 scores and the sleep/energy sub-scores. Furthermore, the level of discomfort participants felt as a result of LUTS (evaluated with VAS) was found to positively correlate with the UDI-6, ICIQ-SF, GPFDI, and the KHQ's incontinence impact and social limitation scores.

Table 4 shows correlations between the physical and clinical characteristics of the participants (age, BMI, time since MS diagnosis, EDSS, and parity) and LUTS scores (GPFDI, BFLUTS, ICIQ-SF,

TABLE 5
Correlations between pelvic floor functions and ICIQ-SF, EDSS, and KHQ subparameters

	Age (year)	BMI (kg/m^2)	Time since the diagnosis was made (year)	EDSS	Parity	ICIQ-SF	KHQ (Incontinence impact)
Power							
Correlation coefficient	−0.115	0.204	0.103	−0.687*	−0.011	−0.633*	−0.652*
Sig. (2-tailed)	0.736	0.548	0.763	0.019	0.975	0.037	0.030
n	11	11	11	11	11	11	11
Endurance							
Correlation coefficient	0.033	−0.172	0.517	−0.697*	0.177	−0.530	−0.598
Sig. (2-tailed)	0.928	0.635	0.126	0.025	0.624	0.115	0.068
n	10	10	10	10	10	10	10

ICIQ-SF: International Consultation on Incontinence Questionnaire-Short Form; EDSS: Expanded Disability Status Scale; KHQ: King's Health Questionnaire; BMI: Body mass index; * Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).

UDI-6, IIQ-7, OAB-V8, and VAS). There was a positive correlation between BMI, ICIQ-SF, and UDI-6 scores, time since the diagnosis was made and IIQ-7 and OAB-V8 scores, as well as EDSS and ICIQ-SF scores.

Pelvic floor strength (power parameters) had a negative correlation with EDSS, ICIQ-SF, and KHQ's incontinence impact scores (Table 5).

DISCUSSION

This study showed that lower urinary tract dysfunctions were associated with QoL, the level of discomfort caused by these dysfunctions, the physical and clinical characteristics, and pelvic floor functions in females with RRMS.

According to a review by Bientinesi et al.,[2] the majority of patients with MS experience moderate to severe effects on their QoL from lower urinary tract issues. The type and intensity of symptoms may negatively affect the QoL and general well-being of a patient with MS.[2,18] In this study, lower QoL scores were associated with more severe urinary tract symptoms. Furthermore, there was a relationship between pelvic floor discomfort and its effect on QoL and sleep/energy status due to incontinence. Additionally, urinary symptoms were demonstrated to effect QoL, physical and social limitations, role limitations, emotional status, and severity of urinary symptoms.

As the severity of LUTS increased among the participants in this study, the discomfort level they experienced due to these symptoms also increased. Additionally, discomfort due to urological symptoms was associated with QoL indicators, indicating the negative effect of incontinence on QoL and increased social limitation. Lower urinary tract symptoms may be perceived as less significant by patients with MS, considering the many other physical dysfunctions they experience. This may influence their participation in and adherence to treatment. For clinicians, assessing the level of discomfort patients experience due to LUTS, may provide valuable insight when designing rehabilitation programs aimed at improving patient well-being and QoL.

In MS, the severity of LUTS is associated with the level of disability.[19] In a study by Seddone et al.,[20] a high level of disability (EDSS >6.5) and having a progressive MS phenotype were reported to be associated with increased severity of urinary symptoms. In the current study, the EDSS scores of the participants did not exceed 5.0. However, the findings showed that as EDSS scores and the number of years since MS diagnosis increased, the severity of LUTS also increased. This study highlighted the importance of early evaluation of LUTS in patients with MS, even when EDSS scores are still low.

There is no clear and consistent evidence of a direct link between BMI and LUTS in patients with MS. However, higher BMI may worsen LUTS indirectly through factors such as weak pelvic floor muscles, reduced mobility, and increased pressure on the bladder. Miget et al.[21] suggested that this link may be more evident in female patients with MS. In this study, BMI was found to be associated with certain urinary symptoms. Clinically, incorporating BMI assessment may support a more holistic approach to pelvic floor rehabilitation and symptom management.

Pelvic floor functions are linked to the onset and severity of LUTS in individuals with MS.[5] According to a study by Resstel et al.,[4] females with MS who experienced symptoms related to their lower urinary tract performed worse on all PERFECT scheme measures compared to those without such problems. Additionally, pelvic floor symptoms adversely affect activities of daily living, walking, and the physical dimension of QoL.[5] The present study demonstrated a connection between the degree of urinary incontinence and its effect on the strength and endurance of the pelvic floor muscles. In addition, we found an association between higher EDSS scores and reduced pelvic floor strength and endurance, suggesting that increased levels of disability may be a risk factor for pelvic floor dysfunction. Our results highlighted the significance of assessing the function of the pelvic floor muscles in females with MS experiencing LUTS and directing them to a physiotherapist for participation in training programs. This may contribute to the prevention, early detection, and treatment of pelvic floor dysfunctions.

This study had some limitations. It included only female volunteers diagnosed with RRMS who visited the Neurology Department of the Ondokuz University Faculty of Medicine. Consequently, the limited number of samples and the inability to generalize the findings were limitations of the study. This study did not focus on causality; therefore, the physical and clinical characteristics of the individuals were limited to EDSS scores,

age, parity, and BMI. Other factors that describe physical condition, such as spasticity, may act as confounders, and it is recommended that such parameters be considered in the analyses of studies evaluating the pelvic floor.

In conclusion, this study highlighted a significant relationship between lower urinary tract dysfunctions and various aspects of well-being in females with MS. The findings underscored the impact of these dysfunctions on QoL, discomfort levels, physical and clinical characteristics, as well as pelvic floor function. These results emphasized the importance of comprehensive assessments and multidisciplinary approaches in the management of urinary symptoms in this population. Early identification and targeted interventions may contribute to improved functional outcomes and overall QoL for females diagnosed with MS.

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