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RESEARCH ARTICLE

What is the Relationship Between Disability Level, Hip Adductor Spasticity, and Incontinence in People with Multiple Sclerosis? - A Pilot Study

Arzucan Toksal Ucar[1], Gungor Beyza Ozvar Senoz[2], Mustafa Acikgoz[3]

[1]Zonguldak Bulent Ecevit University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Zonguldak, Turkey
[2]Yuksek Ihtisas University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, Turkey
[3]Zonguldak Bulent Ecevit University Faculty of Medicine, Department of Medical Sciences, Clinic of Neurology, Zonguldak, Turkey

Abstract

Objective: This study aimed to examine the relationship between disability level, hip adductor spasticity, incontinence, pelvic floor dysfunction, and quality of life in patients with multiple sclerosis (pwMS).

Materials and Methods: Nineteen participants (11 females, 8 males) were included. Disability levels were assessed using the Expanded Disability Status Scale (EDSS). Spasticity was evaluated with the modified ashworth scale (MAS). Incontinence and pelvic floor dysfunction were assessed using the pelvic floor distress inventory-20 and its subscales [colorectal-anal distress inventory-8 (CRADI-8), urogenital distress inventory-6 (UDI-6)]. The impact on quality of life was measured with the international consultation on incontinence questionnaire-short form (ICIQ-SF), while overall health status was assessed using the king's health questionnaire (KHQ).

Results: The mean EDSS score was 2.23±1.67. No significant differences were observed between male and female participants for MAS-right, MAS-left, CRADI-8, UDI-6, ICIQ-SF, or the total KHQ score ($p>0.05$). A significant positive correlation was identified between disability levels and hip adductor spasticity, incontinence, pelvic floor dysfunction, and quality of life ($p<0.05$).

Conclusion: Routine evaluation of hip adductor spasticity, incontinence, pelvic floor dysfunction, and quality of life is recommended for pwMS, regardless of disability level or gender.

Keywords: Multiple sclerosis, hip adductor spasticity, incontinence, pelvic floor dysfunction, quality of life

Introduction

Multiple sclerosis (MS) is a neurodegenerative and inflammatory disease characterised by demyelination and secondary axon degeneration in the central nervous system (CNS), which usually occurs in young adults and is thought to be autoimmune (1). In the 2022 study, it is estimated that approximately 2.8 million people worldwide have MS and this number will increase over time (2). MS plaques/lesions are focal areas of demyelination with axonal loss and inflammation, commonly affecting the white matter and spinal cord, and may also involve the cerebral cortex. There are specific areas of MS in the CNS and the diagnosis is based on localisation (3,4).

MS, a chronic inflammatory disease, can manifest with symptoms such as reduced muscle strength, muscle tone, balance, coordination, and vision, along with severe fatigue, pain, bladder dysfunction, cognitive impairment, sensory disturbances, and emotional changes. The type and severity of symptoms vary between individuals (5). Spasticity, a velocity-dependent increase in muscle tone, is a significant feature of MS (6). It can affect both upper and lower limbs, impacting functionality and limiting daily activities (6,7). Spasticity often involves the muscles of the hip and lower extremities, including the hip flexors, hip adductors, and knee extensors. In cases of hip adductor spasticity, gait is markedly impaired, and mobility is restricted (8).

Address for Correspondence: Arzucan Toksal Ucar, Zonguldak Bulent Ecevit University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Zonguldak, Turkey
E-mail: arzucan.toksal@beun.edu.tr **ORCID-ID:** orcid.org/0000-0002-9320-7064
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In approximately 80% of patients with MS (pwMS), the most common MS plaques are located in the cervical spinal cord, particularly affecting the lateral corticospinal (pyramidal) and reticulospinal tracts. This involvement often leads to urinary system dysfunction (9). Urinary dysfunction is prevalent in MS because these tracts are responsible for the innervation of the bladder detrusor muscle and the external urethral sphincter (10). It is categorized into three types: storage, voiding, and postmicturition symptoms. Nearly 60% of pwMS experience moderate to severe urinary problems related to the disease. These symptoms can result in considerable morbidity and significantly impact quality of life, comparable to the effects of physical or cognitive impairments (10, 11).

Studies in the literature have documented urinary symptoms in pwMS (12-14). While it is known that the occurrence of urinary symptoms varies based on the location of CNS lesions, their relationship with disability levels and, specifically, hip adductor spasticity has not been explored. This study aimed was to examine the relationship between disability levels, hip adductor spasticity, incontinence, pelvic floor dysfunction, and quality of life in pwMS. The primary hypothesis was to assess the association between disability levels and incontinence, pelvic floor dysfunction, and quality of life. The secondary hypothesis was to assess the relationship between hip adductor spasticity and incontinence, pelvic floor dysfunction, and quality of life in pwMS.

Materials and Methods

This study was conducted as a cross-sectional observational study. It was completed in accordance with the principles of the Declaration of Helsinki at Zonguldak Bulent Ecevit University, Department of Neurology. All protocols and methods were approved by Zonguldak Bulent Ecevit University Ethics Committee (protocol no: 2024/22) and written consent was obtained from all patients.

Participants

Individuals aged 18-65 years with a confirmed diagnosis of MS by an experienced neurologist were included. Exclusion criteria included the presence of additional orthopedic or sensory issues in the lower extremities, any interventional procedures (such as botulinum toxin administration) within the past 6 months, lumbar disc herniation, or a neurogenic bladder.

Assessments

Demographic and clinical data of the participants were recorded. Disability levels were evaluated using the expanded disability status scale (EDSS), while hip adductor spasticity was assessed with the modified ashworth scale (MAS). Pelvic floor dysfunction and incontinence were assessed using the pelvic floor distress inventory-20 (PFDI-20), and the impact of incontinence on quality of life was measured with the international consultation on incontinence questionnaire-short form (ICIQ-SF). General health status was evaluated using the king's health questionnaire (KHQ). All assessments were conducted once and lasted 20-30 minutes.

Expanded Disability Status Scale (EDSS)

EDSS was used to determine the patients' level of disability. EDSS is most commonly used to assess the level of disability in pwMS. In this scale pyramidal, cerebral, cerebellar, brainstem, visual and sensory subparameters are evaluated. The EDSS is an ordinal rating system ranging from 0 (normal neurological status) to 10 (death due to MS). The EDSS scores the level of disability of patients after a detailed neurological examination. The determination of EDSS 4-6 is largely dependent on the characteristics of walking ability (15).

Assessment of Hip Adductor Spasticity

The MAS is the most widely used method for evaluating spasticity and is commonly applied in clinical settings. The patient is assessed while lying supine and relaxed. The joint is moved passively, repeatedly, and rapidly, with resistance being staged based on the examination findings (16). MAS is often used to assess spasticity in the hip adductors, knee extensors, and ankle plantar flexors, with scores ranging from 0 to 4. In this study, passive movement of the hip was performed with the patient in a supine position, and the increase in adductor muscle tone was evaluated for each leg. Patients were classified based on their MAS scores: no spasticity (0), mild spasticity (1 or 1+), moderate spasticity (2 or 3), and severe spasticity (4) (17).

PFDI-20

The PFDI-20 consists of 3 subscales and 20 questions that assess pelvic floor dysfunction related to the lower urinary system, colorectal-anal region, and pelvic organ prolapse (18). The overall score for pelvic floor dysfunction is calculated by summing the subscale scores, with higher scores indicating greater severity. This scale is used to evaluate pelvic organ prolapse, urinary and colorectal-anal symptoms resulting from pelvic floor dysfunction, as well as the level of discomfort associated with these symptoms. The scale includes the pelvic organ prolapse distress inventory-6 (POPDI-6), Colorectal-Anal Distress Inventory-8 (CRADI-8), and urinary distress inventory-6 (UDI-6), with a total of 20 items. Each subscale score ranges from 0 to 100, and the total score ranges from 0 to 300, where higher scores reflect increased discomfort related to pelvic floor symptoms (18). The scale was adapted into Turkish in 2010 (19). In this study, POPDI-6 was not used because it was not relevant for the male participants, and scores were obtained using the CRADI-8 and UDI-6.

ICIQ-SF

International incontinence survey modules are designed as universally applicable scales. The ICIQ-SF assesses the quality of life related to incontinence (20). It consists of six questions: "Date

of birth", "Gender", "How often do you experience incontinence?", "How much do you experience incontinence?", "How much does incontinence affect your daily life?", and "In which situations do you experience incontinence?". The total score ranges from 0 to 21, with higher scores indicating a greater negative impact on quality of life. The Turkish version of the questionnaire, which underwent validity and reliability testing in Turkish, was used to evaluate quality of life in this study (21).

KHQ

The KHQ is a tool recommended by international guidelines for assessing quality of life (22). The questionnaire consists of 10 main sections that evaluate general health status, the impact of incontinence, limitations in roles (physical and social limitations), personal relationships, emotional health, sleep energy levels, and symptom severity. In addition, there is a section called the symptom severity scale, which assesses the symptoms related to bladder issues. This section includes a key question: "How much do you think problems with your bladder affect your life?" It evaluates the impact and severity of bladder problems under various subheadings, such as pollakiuria, nocturia, sudden urge incontinence, stress incontinence, nocturnal enuresis, incontinence during sexual intercourse, frequent urinary tract infections, and bladder pain. The symptom severity scale is scored from 0 (best) to 30 (worst), while the scores for all other subscales range from 0 (best health) to 100 (worst health). The total for the entire questionnaire ranges from 0 (best) to 930 (worst). The Turkish version of the questionnaire has been validated and tested for reliability (23).

Statistical Analysis

Statistical analysis was conducted using the SPSS 22.0 software. The normality of the numerical variables was assessed with the Shapiro-Wilk test. Descriptive statistics were reported as the mean ± standard deviation and median (min-max) for numerical variables and as frequency and percentage for categorical data. Differences between groups for categorical variables were tested using the Spearman chi-squared test. For comparisons between two groups for numerical variables, the independent t-test was used when parametric test assumptions were met, and the Mann-Whitney U test was used when they were not. For comparisons among multiple groups for numerical variables, one-way ANOVA was applied when parametric assumptions were met, and Kruskal-Wallis ANOVA was used when they were not. The linear relationship between two numerical variables was evaluated using Pearson correlation analysis when parametric assumptions were met and Spearman correlation analysis when they were not. A p-value of <0.05 was considered statistically significant for all analyses.

Results

A total of 19 patients (11 females, 8 males) with a mean age of 39.31±12.80 years were included in the study. The mean EDSS score for the patients was 2.23±1.67. Of the patients, 15 (79%) were diagnosed with relapsing-remitting MS (RRMS), 3 (16%) with primary progressive MS (PPMS), and 1 (5%) with secondary progressive MS (SPMS). The demographic and clinical characteristics of the participants are provided in Table 1.

The hip adductor spasticity scores based on the MAS are shown in Table 2. Patients were distributed among MAS values of 0, 1, and 1+, with no patients exhibiting MAS values of 2, 3, and 4.

The scores for CRADI-8, UDI-6, ICIQ-SF, and the total KHQ score are displayed in Table 3.

No significant differences were found between men and women in terms of MAS-right, MAS-left, CRADI-8, UDI-6, ICIQ-SF, and the total KHQ score (p=0.642, p=0.924, p=0.298, p=0.177, p=0.310, and p=0.109, respectively).

The correlation analysis results are presented in Table 4. Higher disability levels were associated with increased MAS-left, CRADI-8, UDI-6, ICIQ-SF, and total KHQ scores (p=0.017,

Table 1. Descriptive characteristics of patients

	Minimum - maximum (n=19)	Mean ± SD (n=19)
Age (years)	20-62	39.31±12.80
Height (cm)	150-187	165.31±11.05
Weight (kg)	50-107	72.05 ±16.27
EDSS score	1-6	2.23±1.67
Duration of MS (year)	1-20	6.05±5.54

Table 2. Modified ashworth scale scores

MAS	Right n (%)	Left n (%)
0	15 (78.9%)	11 (57.9%)
1	1 (5.3%)	7 (36.8%)
1+	3 (15.8%)	1 (5.3%)

Table 3. Scores of pelvic floor dysfunction, incontinence and quality of life

	Minimum - maximum (n=19)	Mean ± SD (n=19)
CRADE-8	0-28	11.63±10.25
UDI-6	0-37	15.15±11.52
ICIQ-SF	0-19	5.15±6.17
Total score of KHQ	0-878	205.68±235.72

Table 4. Analysis of demographic data and tests' and scales' scores

		MAS-R	MAS-L	CRADE-8	UDI-6	ICIQ_SF	KHQ-Total
EDSS	r	0.429	0.541	0.629	0.496	0.564	0.580
	p	0.067	**0.017***	**0.004***	**0.031***	**0.012***	**0.009***
		CRADE-8	UDI-6		ICIQ_SF	KHQ-Total	
MAS-R	r	0.448	0.421		0.555	0.336	
	p	0.054	0.073		**0.014***	0.159	
MAS-L	r	0.331	0.330		0.627	0.474	
	p	0.166	0.167		**0.004***	**0.040***	
		ICIQ_SF			KHQ-Total		
CRADE-8	r	0.739			0.684		
	p	**<0.000***			**0.001***		
UDI-6	r	0.829			0.725		
	p	**<0.000***			**<0.000***		

EDSS: Expanded disability status scale, MAS-R: Modified ashworth scale-right, MAS-L: Modified ashworth scale-left, CRADE-8: Colorectal-anal distress inventory-8, UDI-6: Urinary distress inventory-6, ICIQ-SF: International consultation on incontinence questionnaire short form, KHQ: King's health questionnaire, *p-value <0.05

p=0.004, p=0.031, p=0.012, and p=0.009, respectively). Higher MAS-right scores were correlated with higher ICIQ-SF scores (p=0.014). Additionally, higher MAS-left scores were associated with higher ICIQ-SF (p=0.004) and total KHQ scores (p=0.040). Furthermore, higher CRADI-8 scores were linked to higher UDI-6, ICIQ-SF, and total KHQ scores (p<0.001, p<0.001, and p=0.001, respectively).

The correlation analyses between KHQ and EDSS, CRADI-8, and UDI-6 are presented in Table 5. A positive correlation was observed between disability status and the incontinence impact and emotions subscale scores (r=0.754, p<0.001; r=0.478, p=0.038, respectively). CRADI-8 scores showed a positive correlation with the incontinence impact, physical limitations, emotions, severity levels, and symptom severity scale (r=0.731, p<0.001; r=0.596, p=0.007; r=0.608, p=0.006; r=0.612, p=0.005; and r=0.481, p=0.037, respectively). Additionally, UDI-6 scores were positively correlated with general health status, incontinence impact, physical limitations, emotions, severity levels, and symptom severity scale (r=0.512, p=0.025; r=0.691, p=0.001; r=0.572, p=0.011; r=0.589, p=0.008; r=0.635, p=0.003; and r=0.563, p=0.012, respectively).

Discussion

This study investigated the disability level, hip adductor spasticity, incontinence, pelvic floor dysfunction, and quality of life in pwMS. In this pilot study, a correlation was identified between the disability level, hip adductor spasticity, incontinence, and incontinence-related quality of life in 19 patients with various types of MS. These findings suggest that patients with different MS types, varying levels of spasticity, genders, and particularly those with low EDSS scores, should be evaluated for incontinence and pelvic floor dysfunction.

MS is a condition with various clinical forms, and it has been reported that disease progression differs depending on the type. The disease typically begins with clinically isolated syndrome and progresses to RRMS, with studies indicating that a considerable number of RRMS patients eventually transition to SPMS (24). The sample in our study predominantly included individuals with RRMS, PPMS, and SPMS, reflecting the general MS population. Disability level was assessed using the EDSS score and disease duration, revealing that our population comprised mostly patients with low disability levels. Therefore, this study offers a novel perspective in the literature by examining incontinence, pelvic floor dysfunction, and quality of life in patients with low disability levels in MS.

Bladder dysfunction or incontinence, which is common in pwMS and impacts their quality of life, has been reported to affect nearly all patients 10 years after diagnosis (25). Studies have indicated that incontinence and quality of life are more significantly affected in patients with moderate disability and/or longer disease duration (26-28). In addition, some studies have focused primarily on women. Tekin et al. (12) reported a high incontinence rate in women with MS, which negatively affected their quality of life. Zecca et al. (27) included both men and women in their study, but only 28% of the participants were male. In our study, we identified a correlation between the EDSS score and incontinence, pelvic floor dysfunction, and quality of life in a population of both genders with low disability. The absence of significant gender differences in these parameters is an important finding. As we anticipated, we conclude that studies on pelvic floor dysfunction in the MS population should include both genders.

One of our hypotheses was that hip adductor spasticity could be linked to pelvic floor dysfunction and quality of life. In our

Table 5. The correlations between KHQ subparameters and EDSS, CRADE-8, UDI-6				
		EDSS	CRADE-8	UDI-6
General health status	r	0.415	0.342	0.512
	p	0.077	0.152	0.025*
Incontinence impact	r	0.754	0.731	0.691
	p	**0.000***	**0.000***	**0.001***
Role limitation	r	0.431	0.450	0.442
	p	0.066	0.053	0.058
Physical limitatitons	r	0.444	0.596	0.572
	p	0.057	**0.007***	**0.011***
Social limitations	r	0.359	0.431	0.429
	p	0.132	0.065	0.067
Personal relationships	r	0.277	0.129	0.045
	p	0.251	0.599	0.856
Emotions	r	0.470	0.608	0.589
	p	**0.038***	**0.006***	**0.008***
Sleep energy levels	r	0.358	0.345	0.344
	p	0.133	0.148	0.149
Severity measures	r	0.436	0.612	0.635
	p	0.062	**0.005***	**0.003***
Symptom severity scale	r	0.316	0.481	0.563
	p	0.187	**0.037***	**0.012***
Total KHQ score	r	0.580	0.684	0.725
	p	**0.009***	**0.001***	**0.000***

EDSS: Expanded disability status scale, CRADE-8: Colorectal-anal distress inventory-8, UDI-6: Urinary distress inventory-6, KHQ: King's health questionnaire, *: p-value <0.05

population, patients had low disability and minimal spasticity, and only hip adductor spasticity was found to be associated with quality of life. Marques et al. (29) demonstrated that the hip adductor muscles and pelvic floor muscles work synergistically and that training both is crucial for incontinence rehabilitation in healthy women. Although we anticipated that adductor muscle spasticity might be associated with incontinence and pelvic floor dysfunction in pwMS, we believe that the limited sample size prevented as from establishing this relationship. Furthermore, as seen in other studies (8), hip adductor spasticity may have impacted quality of life by hindering activities of daily living in our study.

Another finding of our study is that incontinence and pelvic floor dysfunction are linked to quality of life. While various factors influence quality of life in MS (30), our results showed that incontinence and pelvic floor dysfunction impact general health, emotions, social participation, and even sleep and energy levels, consistent with the literature (31). Early assessment and management of incontinence and pelvic floor dysfunction can enhance patients' participation in daily activities and improve quality of life.

Study Limitations

This is a pilot study, and to generalize the findings to the MS population, the sample size should be expanded to include patients with different MS types, varying disability levels, and hip adductor spasticity.

Conclusion

This pilot study demonstrated a correlation between disability level, hip adductor spasticity, incontinence, pelvic floor dysfunction, and quality of life. In pwMS, routine clinical assessments should address incontinence, pelvic floor function, and quality of life, regardless of disability level or gender, with potential effects identified earlier.

Ethics

Ethics Committee Approval: This study was approved by the Zonguldak Bulent Ecevit University Ethics Committee (protocol no: 2024/2).

Informed Consent: Each participant provided written informed consent.

Footnotes

Authorship Contributions

Concept: A.T.U., G.B.O.S., Design: A.T.U., G.B.O.S., Data Collection or Processing: A.T.U., M.A., Analysis or Interpretation: G.B.O.S., M.A., Literature Search: A.T.U., G.B.O.S., Writing: A.T.U., G.B.O.S., M.A.

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