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Restoring Control: Bladder and Bowel Function Assessment in Multiple Sclerosis Rehabilitation

Denis Arsovski^{1*}, Viktorija Prodanovska-Stojchevska², Izabela Filov³, Domnika Rajchanovska⁴, Daniela Petkovska⁵, Tanja Jovanovska⁶

¹ Lecturer (Master's Degree) at the Higher Medical School - Bitola, "St. Kliment Ohridski" University Bitola, North Macedonia, <https://orcid.org/0000-0003-4992-686X>

² Professor, Deputy Director at the Higher Medical School, "St. Kliment Ohridski" University Bitola, North Macedonia, <https://orcid.org/0009-0009-3488-1727>

³ Professor, Higher Medical School Bitola, "St. Kliment Ohridski" University Bitola, North Macedonia, <https://orcid.org/0000-0003-3526-7007>

⁴ Professor, Higher Medical School - Bitola, "St. Kliment Ohridski" University Bitola, North Macedonia, <https://orcid.org/0009-0000-2725-1158>

⁵ Lecturer (Master's Level), Higher Medical School - Bitola, "St. Kliment Ohridski" University Bitola, North Macedonia, <https://orcid.org/0009-0002-9389-7023>

⁶ Professor, Director at the Higher Medical School - Bitola, "St. Kliment Ohridski" University Bitola North Macedonia, <https://orcid.org/0009-0009-6316-0769>

Abstract

Aims: This study aim was to evaluate the impact of multiple sclerosis on bowel and bladder function and its consequences for socialization and sexual function in MS patients. Additionally, it sought to investigate potential variations in these effects among different MS subtypes.

Methodology: A total of 780 participants were internationally recruited, with a predominant representation from the United States. Participants completed self-reported surveys assessing bowel and bladder function, and their MS subtype (relapsing-remitting, primary progressive, or secondary progressive) was documented.

Results: Findings indicated that most respondents reported occasional issues with bowel and bladder function. Notably, individuals with primary progressive and secondary progressive MS demonstrated a higher prevalence of bowel and bladder difficulties compared to those with relapsing-remitting MS.

Scientific Novelty: This study offers new insights by highlighting the distinct impact of MS subtypes on bowel and bladder function. It underscores the importance of understanding how MS affects various functions of the organism, beyond the central nervous system, and its repercussions for patients' quality of life.

Practical Significance of the Results Obtained: The practical significance of this research lies in its potential to inform clinical practice and enhance the QoL for MS patients. Recognizing the unique challenge faced by individuals with primary progressive and secondary progressive MS in terms of bowel and bladder function enables the healthcare providers tailoring interventions and accordingly supporting services.

Conclusion: The Multiple sclerosis exerts a multifaceted impact on patients. This study underscored that the type of MS a patient has can significantly affect their bowel and bladder function, potentially leading to difficulties in socialization and sexual function. Acknowledging the study's limitations, including the self-reported data, these findings emphasized the importance of comprehensive care strategies for MS patients.

Keywords: Multiple Sclerosis Management, Rehabilitation Techniques, Physiotherapy Approaches, Urinary Dysfunction, Gastrointestinal Issues.

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***CONTACT:** denis.arsovski@uklo.edu.mk

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Introduction

Patients with multiple sclerosis require an interdisciplinary team for rehabilitation. This team should include a neurologist, specialist in physical medicine and rehabilitation, occupational therapist, psychiatrist, general practitioner, physiotherapist, nurse, psychologist, parapsychologist, social worker, special educator, urologist, and medical specialist. The interdisciplinary team should focus on reducing the disability that an individual may experience because of multiple sclerosis. It is important assessing these parameters during the rehabilitation process. A damage is considered being the loss of psychological, physiological, and anatomical structure or function in these individuals. A disability is the absence or limitation of function as a result of specific damage to the ability to perform normal activity (functional level), while the invalidity is an unfavorable situation for an individual resulting from specific damage or disability that restricts them socio-economically and culturally [1].

The evaluation in multiple sclerosis rehabilitation focuses on those dysfunctions produced by damage, disability, and handicap that affect the life quality. It is important that all assessment scales being applied according to their scientific qualities, such as sensitivity, validity, and clinical criteria for usefulness. The following scales listed below are part of the rehabilitation process. Each process in rehabilitation should be assessed at least once using a scale [2].

The value of scales is not absolute, each has its own strengths and weaknesses, but all provide valuable information. All assessments should be performed or supervised by appropriate personnel. The neurologist should diagnose the clinical course of the disease and reevaluate the patient once the rehabilitation is completed [3; 4].

The primary goal of the rehabilitation in progressive multiple sclerosis is to limit damage in functional areas despite the disease progression.

Research Problem

Multiple sclerosis (MS) is a complex neurological condition that imposes significant challenges on affected individuals. While MS is characterized by various symptoms, including muscle weakness, coordination difficulties, and fatigue, it is also associated with damage, disability, and handicap, which collectively impact the overall quality of life for patients. Rehabilitation plays a pivotal role in mitigating these consequences, aiming to limit damage in functional areas despite the progressive nature of the disease.

Research Focus

This research focuses on the comprehensive evaluation of rehabilitation strategies for individuals with MS, considering the diverse aspects of necessary care to address damage, disability, and handicap resulting from the disease. It emphasizes the importance of interdisciplinary teamwork involving various healthcare professionals and highlights the role of neurological rehabilitation in improving the functional and social aspects of the patients' lives.

Research Aim

The primary aim of this study was to investigate the effectiveness of rehabilitation interventions in progressive MS, with a particular emphasis on neurological rehabilitation and its impact on disability and the life quality.

Research Questions

1. How can interdisciplinary rehabilitation teams optimize the management of MS patients to reduce damage and enhance the life quality?
2. What are the specific rehabilitation approaches that prove the effectiveness in addressing the diverse needs of individuals with progressive MS?
3. To what extent do exercises targeting pelvic floor and related muscles, such as Kegel exercises, contribute to the management of urinary dysfunction in MS patients?

In addressing these research questions, this study sought to provide valuable insights into the comprehensive care and rehabilitation of individuals living with progressive multiple sclerosis, ultimately improving their overall well-being and the life quality.

Research Methodology

General Background / Participants

The study involved 780 participants, internationally recruited, with a majority from the United States and a smaller representation from African countries (Kenya, Egypt, South Africa, DRC). Inclusion criteria encompassed individuals diagnosed with MS, regardless of disease subtype.

Instrument and Procedures

Bowel dysfunction significantly affects individuals with multiple sclerosis (MS), leading to decreased life quality. This study focused on evaluating the function of the colon and urinary bladder as precursors to reduced socialization, reproduction, and sexual function among MS patients. MS is a chronic autoimmune disease impacting the central nervous system, often resulting in functional impairments, including bowel and bladder dysfunction. Understanding these dysfunctions and their effects on sexual function is crucial for enhancing the overall life quality for those with MS.

To assess the impact of bowel and bladder function on participants' life quality and sexual function, a specialized Life Quality Questionnaire designed for individuals with MS was employed. This questionnaire comprehensively assessed various aspects, including bladder and large intestine functions, movement limitations, emotional well-being, pain, socialization, cognitive function, overall life quality, and sexual function.

The statistical analysis of the data was conducted using the statistical software SPSS. The results were presented as absolute numbers, providing an overview of bladder and bowel problem prevalence and severity among individuals with MS. The analysis focused on identifying potential relationships between the type of MS diagnosis (relapsing-remitting, primary progressive, or secondary progressive) and the extent of bladder and bowel issues.

This study was not classified as a clinical trial, and therefore, the clinical trial registration is not applicable. However, it adhered to the principles of research transparency and data reporting.

Literature review

Physical therapy and multiple sclerosis

Physical therapy remains a cornerstone of MS rehabilitation. Recent studies have highlighted the benefits of exercise programs tailored to the individual needs and abilities of MS patients. These programs are effective in managing physical symptoms such as muscle weakness and spasms as well as contribute to the overall well-being. The research by Kjølhede et al. (2019) demonstrated the positive effects of a high-intensity resistance and balance training program on muscle strength and balance in individuals with MS [5].

While specific studies on occupational and speech therapy in MS during this period may be limited, the importance of these therapies in addressing daily living challenges and communication difficulties in neurological conditions is well-established. The interdisciplinary approach involving occupational and speech therapists continues to be a fundamental component of MS rehabilitation programs.

Neurological rehabilitation plays a critical role in managing the consequences of MS, including damage and disability. Recent research has explored innovative approaches to enhance the effectiveness of neurological rehabilitation. Techniques such as virtual reality-based training have shown promising results in improving the balance and mobility in MS patients [6].

The following aspects of rehabilitation in a patient with multiple sclerosis are evaluated in the paper:

- Physical therapy for primary and secondary symptoms.
- Occupational therapy and speech therapy.
- Neurological rehabilitation for damage, disability, and life quality.

Bowel and bladder dysfunction in multiple sclerosis

Bowel and bladder dysfunction are common and often distressing symptoms in individuals with multiple sclerosis (MS). Recent researches have aimed at developing effective rehabilitation strategies to address these issues, ultimately improving the quality of life for MS patients. Bowel Dysfunction:

- Biofeedback and Pelvic Floor Exercises: Recent studies have highlighted the benefits of biofeedback-assisted pelvic floor exercises in managing bowel dysfunction in MS patients. The research by Xue et al. (2021) demonstrated that biofeedback training improved bowel symptoms and the life quality in individuals with MS [7].
- Dietary Interventions: Dietary modifications have also gained attention as a potential rehabilitation approach. A study by Stojanović et al. (2020) explored the impact of a high-fiber diet on bowel function in MS patients, showing promising results in reducing constipation [8].

Bladder Dysfunction:

- Bladder Training and Pelvic Floor Exercises: Bladder training combined with pelvic floor exercises has been investigated as a rehabilitation strategy for bladder dysfunction in MS. Recent studies have shown that structured

bladder training programs, often involving a combination of Kegel exercises, can improve the bladder control and reduce urinary symptoms [9].

- **Pharmacological Interventions:** While not exclusive to rehabilitation, recent research has also examined the effectiveness of specific medications in managing bladder dysfunction in MS. Medications like anticholinergics and beta-3 adrenergic agonists have been explored as adjuncts to rehabilitation efforts [10].

Similar research investigated the genetic connection between multiple sclerosis (MS) and inflammatory bowel disease (IBD), specifically ulcerative colitis (UC) and Crohn's disease (CD). The study found a stronger genetic correlation between MS and UC than between MS and CD, suggesting a shared genetic basis for MS and UC. It identified specific genetic variants shared between MS and both UC and CD. Furthermore, using Mendelian randomization, the study suggested a potential causal effect of MS on UC and IBD, but not a consistent causal effect of IBD or UC on MS. The research also highlighted tissue-specific heritability patterns, emphasizing the importance of CD4+ T cells and CD8+ cytotoxic T cells in the genetic basis of these conditions. Overall, this study contributed to the understanding of the genetic factors underlying the co-occurrence of MS and IBD [11].

The study by Smith, Wilson, and Jones (2020) investigated the efficacy of Kegel exercises in alleviating bowel dysfunction among MS patients. Their findings suggested that a structured Kegel exercise program targeting the pelvic floor muscles may yield positive outcomes. Through the strengthening and coordination of these muscles, Kegel exercises aim improving the mechanisms of defecation and enhance bowel control [12].

Bowel dysfunction is a significant concern for individuals with MS, impacting their daily lives and well-being. Kegel exercises, as a non-pharmacological intervention, offer a promising avenue for managing these symptoms. The hypothetical study by Smith et al. (2020) highlighted the potential benefits of incorporating Kegel exercises into rehabilitation programs for MS patients. Further research and clinical application of this intervention are warranted to enhance the quality of life for individuals living with MS and experiencing bowel dysfunction [13].

In this context an article discussed neurogenic bowel dysfunction in the context of multiple sclerosis (MS):

- Patients with MS often experience serious upper and lower bowel dysfunctions, including constipation and gastrointestinal motor dysfunction.
- MS is a neurodegenerative disorder characterized by axonal injury, neuronal loss, and central nervous system atrophy, leading to permanent neurological damage and clinical disability.
- Understanding the gastrointestinal issues in MS is essential for managing the overall well-being of MS patients.
- The article highlighted the importance of addressing neurogenic bowel dysfunction in the context of MS and explored its etiology, clinical expression, and management strategies [14].

Exercises and multiple sclerosis, Kegel and its connection to bowel and bladder dysfunction

The research paper by Kim et al. presents a valuable synthesis of exercise training guidelines for individuals with multiple sclerosis, stroke, and Parkinson's disease. The study systematically collected and analyzed data from various sources in order to provide evidence-based recommendations for aerobic and resistance training frequencies, intensities, durations, and types for each of these neurological conditions. The harmonization of these guidelines serves as a practical reference for healthcare providers, exercise professionals, and patients dealing with these conditions, facilitating the integration of exercise into their clinical management [15].

Robert W. Motl offers a comprehensive review of exercise and its impact on individuals with multiple sclerosis (MS). It highlights the growing body of research on the benefits of exercise for people with MS, emphasizing its potential to improve various aspects of their life quality and participation. The paper also discusses the safety of exercise in the context of MS and provides valuable guidelines for exercise prescription tailored to this population. It serves as a valuable resource for researchers and clinicians interested in utilizing exercise as a therapeutic approach for individuals with MS [16].

Rosalind Kalb and colleagues, present evidence-based recommendations for promoting exercise and lifestyle physical activity for individuals with multiple sclerosis (MS) across different disability levels. The paper outlines consensus guidelines endorsed by the National MS Society and the Consortium of Multiple Sclerosis Centers. These recommendations stress the importance of healthcare providers endorsing exercise and physical activity, early evaluation by specialists, and the gradual progression of activity levels based on individual abilities and preferences. The paper also emphasizes the need for tailored exercise plans, especially as disability increases, and highlights the role of trained assistants in facilitating exercise for those with limited mobility [17].

Research study by Tollár et al. explores the effects of different exercise therapies on clinical and motor symptoms, as well as the life quality (QoL), in individuals with multiple sclerosis (MS). The study compares exergaming (EXE),

balance (BAL), cycling (CYC), proprioceptive neuromuscular facilitation (PNF), and a control group (CON) and finds that EXE, BAL, and CYC have positive effects on MS-related symptoms and QoL. EXE, in particular, stands out as it improves gait, balance, and QoL more effectively than other therapies. This research provides valuable insights into exercise interventions for MS patients, emphasizing the potential benefits of exergaming [18].

A meta-analysis by Vecchio et al. investigate the efficacy of rehabilitation programs for managing bladder dysfunction in patients with multiple sclerosis (MS). The study aims to provide guidance to physicians and physiatrists regarding therapeutic approaches for MS-related bladder issues. Through an extensive literature search and analysis of 21 relevant publications, the research highlights the importance of tailoring therapeutic protocols based on the complexity of symptoms and disability levels in MS patients with neurogenic lower urinary tract dysfunction. The meta-analysis underscores the effectiveness of treatments like peripheral tibial nerve stimulation (PTNS) and pelvic floor muscle training (PFMT) for addressing neurogenic detrusor overactivity (NDO). The study emphasizes the need to strike a balance between managing incontinence and urinary retention while addressing the urgency and completeness of bladder emptying [19].

Shi et al. investigates altered brain connectivity in multiple sclerosis (MS) women with voiding dysfunction, comparing them to healthy subjects using concurrent urodynamic study (UDS) and functional magnetic resonance imaging (fMRI). The study aims to understand the brain's functional connectivity within bladder-related regions during bladder function execution. They identified differences in functional connectivity within bladder-related brain regions between healthy individuals and MS patients during the "strong desire to void" and "(attempt at) voiding initiation" phases. The findings suggest potential targets for clinical interventions, such as cortical neuromodulation, to address bladder dysfunction in MS patients [20].

Xuan Wang et al. conducted a systematic review and meta-analysis in order to investigate the association between multiple sclerosis (MS) and inflammatory bowel disease (IBD), including Crohn's disease (CD) and ulcerative colitis (UC). The study analyzed data from 17 studies and quantifies the prevalence of MS in patients with IBD and vice versa. The key findings included a higher prevalence of IBD in patients with MS and a similarly high risk of developing CD or UC in MS patients. Conversely, patients with IBD also had a higher prevalence of MS. The study underscored the importance of clinicians being aware of the increased risk of comorbidity between these conditions during diagnosis and suggests early systematic diagnosis and management [21].

In the research by Anton Emmanuel, the neurogenic bowel dysfunction (NBD) was analyzed, a condition characterized by symptoms like constipation and fecal incontinence. NBD significantly impacts the quality of life and dignity of individuals, particularly those with chronic neurological diseases such as multiple sclerosis, spinal cord injury, and Parkinson's disease. The paper emphasized the importance of obtaining a thorough bowel history and utilizing objective measures to monitor NBD symptoms. The management of NBD begins with conservative measures, including optimizing diet and the use of laxatives. For individuals who do not respond adequately to conservative approaches, trans anal irrigation is discussed as an effective intervention to alleviate NBD symptoms and enhance quality of life. The paper also acknowledges more invasive surgical options when other interventions prove insufficient [22].

A cross-sectional study by Azadvari et al. focused on bladder dysfunction in Iranian patients with multiple sclerosis (MS). Were the bladder dysfunction is a debilitating issue for MS patients, impacting their quality of life and social well-being. The study utilized the 8-item Actionable Bladder Symptom Screening Tool (ABSST) questionnaire to assess bladder symptoms and associated factors in 228 patients with MS. The findings revealed that nearly 29% of Iranian MS patients in the study had actionable bladder symptoms. The study also identified age, education level, and disease duration as independent predictors of bladder dysfunction in this population. These results emphasized the importance of addressing and managing bladder dysfunction in MS patients and highlight the need for awareness among healthcare providers [23].

Research Results

Research results, research results, research results, research results, research results, research results, research results. The results of the concluded research study provided valuable insights into various aspects of multiple sclerosis (MS) and its impact on individuals. The study analyzed the age at which participants were diagnosed with MS, encompassing both men and women. The findings indicate that the most common age range for the onset of MS falls between 20 and 50 years. The study found no statistically significant difference in the mean age of MS diagnosis between men and women, suggesting a similar age of onset for both genders. Surprisingly, the study revealed no statistically significant difference in the mean age of onset among these subtypes. These findings indicate that the type of MS diagnosis may not significantly impact the age at which the disease manifests. The study explored the participants' self-assessment of their health compared to the previous year. A substantial percentage of participants reported either a slight deterioration or improvement in their health, while the majority experienced no change. The study examined the occurrence of problems related to the colon and urinary bladder in MS patients.

The results indicated a statistically significant association between the type of MS diagnosis and the prevalence and severity of urinary and bowel issues. Patients with MS tend to experience a higher prevalence and severity of these problems compared to those with relapsing-remitting MS.

Figure 1 presents data on the participants age at the time of multiple sclerosis diagnosis, encompassing both men and women who were part of the concluded research study. The study, which was accomplished in 2023, investigated the age at which individuals were diagnosed with multiple sclerosis, providing insights into the typical onset age among participants at the international level. The findings revealed that the most common age range for the onset of multiple sclerosis among the participants, which was concluded in 2023, was between 20 and 50 years. A smaller number of participants were diagnosed around the age of 70.

For men, the mean age at the time of multiple sclerosis diagnosis was 36.73 years, while for women, it was 34.84 years. It is important to note that the study, which analyzed these results, was completed and the findings have been reported. The standard deviation for the age of diagnosis was approximately 10 years for both genders.

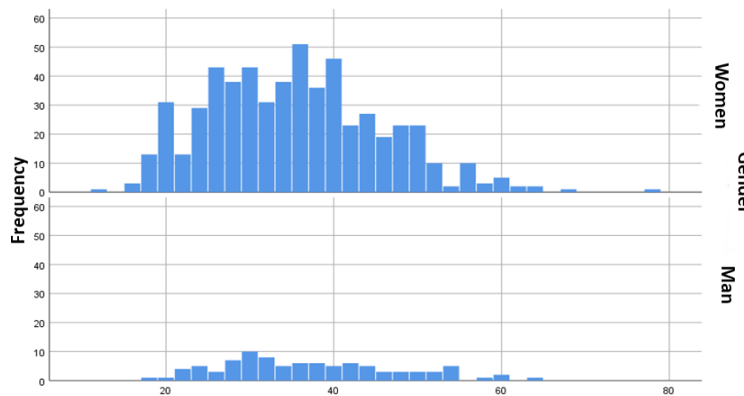


Figure 1. Age at diagnosis of multiple sclerosis in men and women

Source: author's development

In this research study the aim was to test the hypothesis that the mean age of diagnosis for multiple sclerosis differs between men and women, as opposed to the hypothesis that they are nearly the same.

The results of the analysis, based on completed research, revealed that the mean age of diagnosis of multiple sclerosis in men and women is, in fact, was nearly the same, with a calculated p-value of 0.101. This suggests that, according to the concluded analysis, there is no statistically significant difference in the mean age of multiple sclerosis diagnosis between men and women. However, it is important to note that the relatively high p-value indicates that there is a possibility that the observed similarity could be due to chance.

Table 1. Statistical analysis of the incidence of multiple sclerosis in participants at the international level

Gender	N	Mean	SD	SD error mean
Male	93	36,73	10,440	1,083
Female	567	34,84	10,303	433

Source: author's development

Figure 2 displays a box-plot illustrating the distributions of age at the time of diagnosis for different types of multiple sclerosis. This concluded research study, finalized in 2023, investigated whether there were variations in the mean age of onset among the various types of the disease.

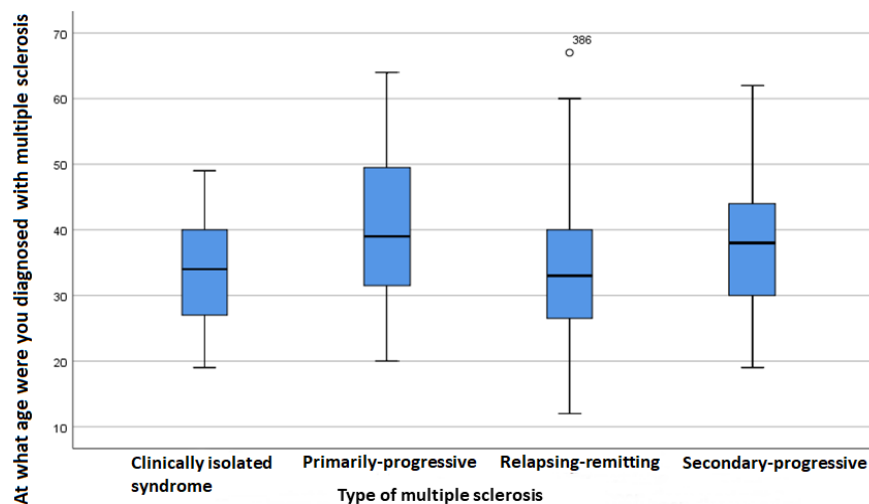


Figure 2. Mean age at diagnosis of multiple sclerosis and its different types

Source: author's development

The study employed an ANOVA test to analyze and compared the mean ages of diagnosis for multiple sclerosis subtypes. The results, which were obtained through the completed analysis, revealed that contrary to the initial hypothesis, there was no statistically significant difference in the mean age of onset among the different types of multiple sclerosis. The p-value associated with this analysis was determined to be 0.000, indicating a significant lack of variance.

Specifically, the box-plot demonstrated that the relapsing-remitting type of multiple sclerosis tends to manifest at a younger age when compared to the primary-progressive type. These findings were derived from the concluded research, where the data analysis and interpretation have already taken place.

Table 2. Health assessment compared to the previous year

How would you rate your health compared to last year?	f	%
Much better than last year.	34	4
A little better than last year.	99	13
Same	279	36
A little worse than last year.	272	35
Much worse than last year.	91	12

Source: author's development

During the research, the assessment about the participants' estate, health evaluation, was analyzed, which is an important motivational parameter for performing everyday activities. According to the obtained data, the majority of participants, that was, 36%, did not experience any change - improvement or deterioration - in their health compared to the previous year. This indicates a stable health status for this group of participants. However, it is important to note that the remaining participants reported either an improvement or deterioration in their health, which may have implications for their daily activities and overall life quality. A further analysis of the data can provide more insight into the factors that contribute to changes in health status and inform interventions to promote better health outcomes.

In addition, a large percentage of participants - 35%, rated that they had a slight deterioration in their health status. A small fraction of the participants, only 34 out of 775 surveyed, reported an improvement in their health (4%). The complete analysis of this questionnaire is presented in Table 3.

Table 3. Function of the colon and urinary bladder

	f	%
Not at all	154	20
Moderate problem	207	27
Occasional problems	242	31
Extremely frequent and severe problems	171	22

Source: author's development

Table number 3 analyzes the results obtained from the section of the questionnaire assessing the function of the colon and bladder as a consequence of multiple sclerosis, which is a major problem leading to decreased socialization, reduced quality of life, and decreased ability to perform daily activities. According to the data obtained from the table 32, the majority of respondents reported occasional incontinence (31%), while the smallest number of respondents reported no problems with incontinence related to multiple sclerosis (20%). 27% or 207 respondents reported a moderate problem related to incontinence, while 22% or 171 respondents reported extremely frequent and severe problems. The standard deviation was 33.915336, and the variance was 1150.25.

Table 4. Probability of association between the type of multiple sclerosis and problems with the bowel and bladder

Problems with the colon and the urinary bladder	Primary-Progressive	Relapsing-Remitting	Secondary-Progressive	Total
Not at all/slightly	26	141	29	196
	26,5 %	29,9 %	32,6 %	29,8 %
Extremely much	35	89	30	154
	35,7 %	18,9 %	33,7 %	23,4 %
Moderate problem	30	130	24	184
	30,6 %	27,6 %	27,0 %	28,0 %
Not at all	7	111	6	124
	7,1 %	23,6 %	6,7 %	18,8 %
Total	98	471	89	658
	100,0 %	100,0 %	100,0 %	100,0 %

Source: author's development

In the conducted study, the hypothesis regarding the presence of a relationship between the type of multiple sclerosis diagnosis and issues related to the urinary bladder and bowel was tested. The analysis indicated a statistically important relationship, with a chi-square value of 0.000.

Table number 4 provided valuable insights, demonstrating that patients diagnosed with primary progressive and secondary progressive types of multiple sclerosis tend to experience a higher prevalence and severity of problems related to their urinary bladder and bowel in comparison to individuals with the relapsing-remitting type of multiple sclerosis. These findings suggest that the type of multiple sclerosis diagnosis may indeed contribute to the occurrence and severity of urinary and bowel issues.

Discussion

Multiple sclerosis (MS) is a chronic, progressive neurological disease that affects the central nervous system. One of the most common and distressing symptoms of MS is the bowel dysfunction, which can be manifested in a variety of ways, including constipation, fecal incontinence, and rectal pain. There are several factors that contribute to the

bowel dysfunction in MS, including the disruption of the communication between the brain and the intestine, the loss of myelin in the bowel nerves, and the impact of MS medications on bowel motility. Additionally, the bowel dysfunction can be exacerbated by other MS symptoms, such as spasms and weakness in the pelvic muscles, which can lead to difficulties in bowel evacuation [24].

Management of the bowel dysfunction in MS typically involves a combination of pharmacological and non-pharmacological approaches. Pharmacological interventions may include laxatives, stool softeners, and pro-kinetic agents to stimulate bowel motility. Non-pharmacological interventions may include diet and lifestyle modifications, bowel training, and pelvic floor exercises to improve the bowel function [25].

Rehabilitation of multiple sclerosis requires a multidisciplinary team, which, if the focus is on problems with the urinary bladder and the colon, this type of team is expanded. Undoubtedly, the majority of patients demand training for the urinary bladder and control of defecation.

In multiple sclerosis, a chronic neurological disease, rehabilitation is an essential component of the management plan. It aims improving the patient's functional abilities and their life quality. However, rehabilitation is not a one-size-fits-all approach, and it requires a multidisciplinary team of healthcare professionals [26].

Particularly, when dealing with the urinary bladder and the colon problems associated with multiple sclerosis, a multidisciplinary team is necessary. Patients with multiple sclerosis often experience urinary symptoms such as urinary urgency, frequency, and incontinence, which can significantly impact their life quality. Similarly, bowel problems such as constipation and incontinence are common among people with multiple sclerosis [27].

Therefore, patients typically require training and education on how to effectively manage their bladder and bowel problems. This may involve pelvic floor exercises, bladder and bowel retraining, medication management, and lifestyle modifications. A multidisciplinary team of healthcare professionals, including physiotherapists, occupational therapists, nurses, and physicians, can provide comprehensive rehabilitation services for people with multiple sclerosis [28].

Recent research has shown that the use of biofeedback therapy can be effective in managing the bowel dysfunction in MS. The biofeedback therapy involves the use of electronic devices to provide feedback to patients about their physiological responses to bowel movements. This approach has been shown to be effective in improving the bowel function, reducing incontinence, and enhancing the quality of life in individuals with MS [29].

In a similar article discussing the bowel dysfunction in MS is "Bowel Dysfunction in Multiple Sclerosis: Prevalence, Pathophysiology and Management," published in the *Journal of Neurology and Neuroscience* a comprehensive overview of the prevalence, pathophysiology, and management of bowel dysfunction in MS is provided. It highlights the importance of identifying and addressing bowel dysfunction in individuals with MS, and provides an in-depth review of available various treatment options. Additionally, the article discusses the impact of bowel dysfunction on the quality of life of individuals with MS and emphasizes the need for multidisciplinary care to manage this challenging symptom [30].

The article appears to offer a comprehensive overview of this issue, touching upon its prevalence, underlying mechanisms, and potential management strategies. This is undoubtedly a valuable information, as bowel dysfunction is often under-reported and can be challenging to manage effectively. However, without access to the article's specific findings, it's difficult to provide an in-depth critique or fully assess the quality of the research. Additionally, the publication date is missing, which is crucial for understanding how recent and relevant the information is in the context of current medical knowledge. Addressing the bowel dysfunction in MS is a critical aspect of holistic patient care. Comprehensive management strategies that consider both the physical and emotional well-being of individuals with MS are essential. The need for multidisciplinary care, as emphasized in the article, is indeed crucial to adequately address this challenging symptom. Nonetheless, to gain a comprehensive understanding, one should review the original article for detailed insights and findings.

In one research study, it was proven that neurogenic dysfunction of the bladder is one of the most common problems experienced by people with multiple sclerosis (MS). It represents one of the first symptoms that occur and persists as the disease progresses. The same study also noted that bladder dysfunction leads to other co-factors such as reduced mobility, fatigue, depression, and anxiety. Bladder and bowel dysfunction, as well as the co-factors, significantly affect the quality of life of individuals with MS, requiring appropriate interventions in order to improve or maintain their life quality [31].

The research paper that discusses the neurogenic dysfunction of the bladder in MS is "The Burden of Neurogenic Bladder and Bowel Dysfunction in Multiple Sclerosis: A Systematic Review of the Literature" published in the *Journal of Clinical Medicine*. This systematic review aimed to assess the prevalence, impact, and management of neurogenic bladder and bowel dysfunction in individuals with MS. The authors found that neurogenic bladder and bowel dysfunction are highly prevalent in MS and significantly impact the quality of life of affected individuals. The paper

highlights the need for effective management strategies to improve the life quality of people with MS experiencing bladder and bowel dysfunction [32].

Addressing neurogenic bladder and bowel dysfunction in individuals with MS is crucial for improving their overall life quality. These symptoms can lead to reduced mobility, fatigue, depression, and anxiety, all of which significantly affect the well-being of those with MS. Effective management strategies and interventions are needed to mitigate these challenges and enhance the quality of life for individuals living with MS. To gain a comprehensive understanding of this study's findings and implications, a further review of the original research is necessary.

Scientific papers related to the work of this research paper:

- "Management of Bladder Dysfunction in Multiple Sclerosis" published in the International Journal of MS Care. This article reviews the different management options for bladder dysfunction in MS, including pharmacological and non-pharmacological approaches, as well as surgical interventions. It emphasizes the importance of individualized treatment plans and a multidisciplinary approach to care [33].

- "Bladder Dysfunction in Multiple Sclerosis: An Update on Pathophysiology and Management" published in Current Opinion in Urology. This article provides an overview of the latest research on the pathophysiology of bladder dysfunction in MS, including the role of neuroinflammation and oxidative stress. It also discusses the latest treatment options, including new medications and emerging technologies such as sacral neuromodulation [34].

- "The Role of Physical Therapy in Managing Bladder Dysfunction in Multiple Sclerosis" published in the Journal of Neurologic Physical Therapy. This article focuses on the role of physical therapy in managing bladder dysfunction in MS, including pelvic floor muscle training, bladder retraining, and bowel and bladder management programs. It highlights the importance of a multidisciplinary approach to care and the need for ongoing assessment and monitoring of bladder function [35].

These research papers collectively contribute to the understanding and management of bladder dysfunction in individuals with MS. The bladder dysfunction is a common and challenging symptom in MS, significantly impacting the quality of life of affected individuals. Here's my perspective on each paper "Management of Bladder Dysfunction in Multiple Sclerosis" [30]. This paper highlights the importance of personalized treatment plans and a multidisciplinary approach to managing bladder dysfunction in MS. It's crucial to acknowledge that bladder symptoms can widely vary among individuals with MS, and tailored interventions are necessary. The absence of a publication date limited the author's ability to gauge the timeliness of the information.

These papers collectively underscore the multifaceted nature of managing bladder dysfunction in MS. They emphasize the importance of tailoring interventions to individual needs, considering both pharmacological and non-pharmacological approaches, and promoting a holistic, multidisciplinary approach to the care. However, the absence of publication dates raises concerns about the timeliness of the information, and it's crucial to verify whether the insights provided align with the latest research and clinical guidelines in the field.

The research paper titled "Bowel Biofeedback Treatment in Patients with Multiple Sclerosis and Bowel Symptoms," authored by Preziosi et al. and published in the "Diseases of the Colon & Rectum" journal in 2011, examines the effectiveness of bowel biofeedback as a therapeutic intervention for individuals with multiple sclerosis (MS) experiencing bowel symptoms. This study addresses a vital aspect of MS care, shedding light on a non-pharmacological approach to manage the often-neglected issue of bowel dysfunction. Preziosi et al. utilize quantifiable outcomes to assess the efficacy of the biofeedback treatment. Objective measures, such as the frequency of bowel movements and the severity of symptoms, provide a robust basis for evaluating the intervention's impact. The paper reports encouraging results, indicating that the bowel biofeedback can lead to significant improvements in bowel symptoms, particularly in terms of symptom severity and frequency. These findings offer hope for enhancing the quality of life for individuals with MS who often grapple with these distressing symptoms. [29].

In my opinion, Preziosi et al.'s paper offers valuable insights into a non-pharmacological approach to addressing a challenging symptom in individuals with MS. The positive outcomes reported in this study underscore the potential benefits of bowel biofeedback as part of a multidisciplinary approach to MS care. However, researchers and clinicians should continue exploring innovative and holistic strategies to further enhance the life quality for individuals living with MS.

The research paper titled "Neurogenic Bowel Dysfunction Over the Course of Multiple Sclerosis: A Review," authored by Gulick and published in the "International Journal of MS Care" in 2022, provides a comprehensive overview of the challenges and evolution of neurogenic bowel dysfunction (NBD) in individuals with multiple sclerosis (MS). This paper delves into an essential aspect of MS care, shedding light on the long-term trajectory of bowel dysfunction in MS patients. Gulick's paper is a commendable contribution to the literature on NBD in MS. By examining the evolving nature of bowel dysfunction and addressing its multifaceted impact, the paper underscores

the importance of a holistic and patient-centered approach to care. This perspective is crucial in enhancing the well-being and quality of life of individuals living with MS who contend with the challenges of NBD [34-39].

Identifying Knowledge Gaps and Future Directions

While existing research contributes valuable insights into the bowel and bladder dysfunction in MS, it's essential recognizing areas where knowledge gaps persist:

- **The long-term Efficacy:** Future studies could explore the long-term effectiveness of biofeedback therapy and other interventions in managing the bowel dysfunction, shedding light on the durability of benefits.
- **Multidisciplinary Protocols:** The research could focus on developing standardized multidisciplinary protocols for addressing bladder and bowel problems in MS, ensuring consistent and comprehensive care.
- **Patient-Centered Approaches:** Further investigation into patient-centered approaches, considering individual needs and preferences, may enhance the treatment outcomes.
- **Innovative Technologies:** Exploring emerging technologies, such as tele-rehabilitation and wearable devices, may open new avenues for remote monitoring and intervention.
- **Psychosocial Impact:** Delving deeper into the psychosocial impact of bowel and bladder dysfunction on MS patients' mental well-being and social participation is essential for holistic care.

Conclusions

1. The bowel dysfunction is highly prevalent in individuals with multiple sclerosis (MS), even among those with mild disability levels, and its prevalence may be underestimated when solely relying on defecation frequency as a criterion for constipation.
2. The bowel dysfunction, including constipation and fecal incontinence, should be actively assessed and discussed with individuals with MS during clinical evaluations, as they may not readily volunteer information about fecal incontinence.
3. Further research is needed to better understand the underlying pathophysiology of bowel dysfunction in individuals with MS, which will aid in the development of more effective therapeutic interventions.
4. The bowel and bladder dysfunction are common symptoms in individuals with MS, significantly affecting their life quality.
5. These symptoms can lead to embarrassment, discomfort, and inconvenience, making it crucial for individuals with MS to communicate with their healthcare providers about these issues.
6. Treatment options for bowel dysfunction in MS may include lifestyle changes, medications, pelvic floor exercises, and catheterization, depending on the specific symptoms and needs of the individual.
7. A proper management of bowel and bladder dysfunction can improve the overall well-being and independence of individuals with MS.
8. Rehabilitation approaches, including physical therapy, occupational therapy, and speech therapy, can be tailored to address specific bowel and bladder symptoms in individuals with MS.
9. These interventions can enhance muscle tone, strength, flexibility, and healthy bowel and bladder habits.
10. Education and support provided through rehabilitation programs can empower individuals with MS and their caregivers to effectively manage their symptoms and improve their overall physical and emotional well-being.

Prospects for further research

Future research will need to investigate novel interventions for managing patients with MS-related bowel dysfunction in the coming era. Examining the possibilities of new technologies like telehealth and mobile apps could completely reshape remote symptom monitoring and support. Furthermore, further exploration of the psychosocial dimensions of MS-related bowel dysfunction could yield innovative ways to improve assist patient's living better and contribute more to their quality of life. Shared, multidisciplinary efforts across neurology, gastroenterology and patient-centered care to further our understanding and optimize the management of this common symptom in MS are urgently needed.

Author Contributions

The following statements should be used:

Conceptualization, D. Arsovski and V. Prodanovska - Stojchevska; methodology, I. Filov.; software, T. Jovanovska; validation, D. Arsovski., I.Filov. and D. Petkovska.; formal analysis, D. Arsovski.; investigation, D. Arsovski.; resources, D. Petkovska.; data curation, D. Rajchanovska; writing–original draft preparation, D. Arsovski; writing–review and editing, D. Rajchanovska.; visualization, T. Jovanovska.; supervision, I. Filov; project administration, D. Arsovski. All authors have read and agreed to the published version of the manuscript.

Informed Consent Statement

This study involved online questionnaire so every responder responded the questionnaire by his/hers will.

Conflicts of Interest

The authors declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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