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Effectiveness of Physiotherapy in Patients with Multiple Sclerosis

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Abstract - Chronic inflammation, demyelination, gliosis, or neuronal death are hallmarks of multiple sclerosis (MS), an inflammatory disease of CNS. Improvements in motor efficiency on EDSS, functional assessment on IADL Scale, and also the impact of MS on patients' daily lives on MSIS-29 were statistically significant after physiotherapy, suggesting a positive change in the patients' functional status. The study's overarching objective is to evaluate physiotherapy's efficacy in multiple sclerosis.

Keywords - physiotherapy, treatment, multiple sclerosis

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INTRODUCTION

Neither the cause nor the progression of multiple sclerosis are entirely known at this time. It is a chronic inflammatory demyelinating disorder of CNS. In 1868, the first description of the disease's pathophysiology and symptoms was published by French physician Jean-Martin Charcot. Some researchers think that autoimmune mechanisms, in addition to environmental and genetic variables, play a crucial role in the development of demyelinating lesions. According to studies of MS's pathophysiology, demyelinating alterations impact the brain's gray matter, namely the cerebral cortex, basal nuclei, and cerebellar cortex. Neuronal dysfunction and edema are linked to inflammation, which is connected with the presence of pro-inflammatory cytokines, T-lymphocytes, and macrophages, and may lead to a recurrence of the illness. [1]

According to pathologists, the immunological response may originate from oligodendrocytes, the cells responsible for constructing the myelin coating surrounding the axon. A loss of nerve cells occurs as a result of damage to the myelin sheath or neurodegenerative processes, which in turn reduces the number of synapses and axons. There are several potential triggers for this illness, including viral infections, vitamin D insufficiency, and the influence of sex hormones. Viruses and genetic predispositions may spark an autoimmune response. Reduced access to the sun's rays has been linked to an increase in multiple sclerosis cases. Vitamin D insufficiency, caused by inadequate sun exposure, displays an immunoregulatory function protecting against autoimmune inflammation of a brain and spinal cord. The rise in the incidence of MS in women is consistent with a role for sex hormones in the disease's pathogenesis. Multiple sclerosis is more severe in women whose estradiol levels are high and whose progesterone levels are low, according to studies.[2]

Many young individuals suffer from multiple sclerosis. Aassociation between multiple sclerosis and sun exposure is supported by the fact that the disease's global prevalence fluctuates with latitude: the number of cases rises with increasing latitude and reduces close to the equator. The number of persons living with multiple sclerosis (MS) is estimated to be approximately 2.5 million worldwide at the present time and rising. Poland has a significant risk of multiple sclerosis since its incidence is 55-57 per 100,000 people, compared to 40-150 in Europe or north America. The Caucasian population is particularly at risk. People of working age are particularly vulnerable to the condition, which may render them disabled. The peak incidence rate occurs between the ages of 20 and 40. The pediatric type of MS is diagnosed

in young people. The late-onset variant of MS is more likely to affect those over the age of50.[3-5]

Those living with multiple sclerosis (MS) and their loved ones are impacted in almost every facet of daily life. Due to the vast variety of symptoms and the complexity of the condition, a combined pharmacological and neurorehabilitative strategy is required to effectively treat the patient. Kinesiology, physical therapy, massage, and hydrotherapy are all forms of physiotherapy used in the recovery process. Physiotherapy for MS patients focuses on compensatory processes that activate effector capacities and behavioral changes to help patients recover functional independence, but not physical mobility. It is important to prescribe physiotherapy treatments that address as many motor impairments as feasible. No matter how severe the sickness, getting moving will mitigate the symptoms of akinesia and improve the efficiency of every bodily system.[6]

Patients should be encouraged to move about as much as possible to combat the effects of akinesia during periods of severe sickness. Frequent body position adjustments, passive exercises to avoid contractures, and the implementation of breathing exercises to prevent respiratory system issues are all part of the physiotherapy of these patients. Urinary tract infection prevention and aid in ADLs are cornerstones of patient care.[7]

Disease progression, level of impairment, and neurological abnormalities should all be included into the rehabilitation plan. Therefore, treatment during remission depends on the extent of impairment and the desired outcomes. In this stage of the condition, rehabilitation may take place in a variety of settings, including inpatient facilities, outpatient clinics, and the patient's own home. A thorough diagnostic evaluation of the patient's functional condition and prognosis should precede the start of any physiotherapy treatment. Mood, neurological health, and cognitive function should all be included into a prognosis. [8-9]

Disease-related weariness is a common obstacle in the way of a successful rehabilitation program, reducing not only the patient's physical mobility but also their cognitive abilities. The goal of strengthening MS patients' motor abilities is to increase muscular strength, normalize muscle tension, improve coordination and balance, avoid urine incontinence, increase or maintain joint range of motion, prevent muscle atrophy, and offset the effects of immobility. Exercises that counteract the disease's negative effects should be a constant part of the rehabilitation process. Balance and coordination exercises, as well as breathing, stretching, and relaxation drills, would make up a large portion of everyday therapy. Exercises to increase aerobic capacity, strengthen specific muscle areas, and enhance proprioception would also be included. Muscle tension may be exacerbated if the pace and load of a workout routine are too fast for the body's capacity to adapt.[10-11]

The cardio-respiratory system and overall health rely on regular physical exercise, which is why it is recommended by the World Health Organization. The World Health Organization (WHO) suggests engaging in moderate-intensity physical activity for 30 minutes per day, five days per week, or vigorous-intensity physical exercise for 20 minutes per day, three days per week. Engaging in regular physical exercise, whether for sport or enjoyment, has several positive effects on one's health. Up until recently, the inclusion of exercise into the physiotherapy regimen of MS patients was met with skepticism due to the widespread notion that such activity may precipitate a recurrence of the condition. This view has been challenged, however, by a number of recent research. Instead, they showed that MS patients who engaged in aerobic exercise had positive results. [12]

Maintaining stringent selection criteria for physical exertion is crucial for introducing fitness training for MS patients because it ensures an efficiency boost without putting patients at risk of disease progression. Training should last at least a few weeks and preferably longer. This kind of exercise often makes use of a treadmill or cycloergometer. Exercise helps MS sufferers in more ways than one; it boosts their physical strength, endurance, and flexibility, and it lifts their spirits. Improved cardiorespiratory efficiency has been shown to increase cerebrovascular function, suggesting that movement may also considerably benefit brain function in people with multiple sclerosis. Lower-body muscular strength is increased with aerobic exercise, and this translates to less spasticity and no increase in relapse or tiredness.[13]

Clinimetrics in multiple sclerosis

Patients' disability, illness progression, treatment success, and quality of life may all be measured using these tools. The EDSS is the most widely used numerical scale today. An American neurologist, created it in 1983. The severity of MS symptoms is measured on a scale from 0 to 10, with 0 representing no impairment and 10 representing death. MSIS is yet another instrument for measuring impairment in people with MS. A questionnaire with 29 questions is given to the patient. Motor function of the limbs, eyes, sensibility, coordination, and balance, as well as gait, sphincter, or sexual dysfunction are all topics covered by the questionnaire. A score of 1 indicates no disruptions in that function, whereas

a score of 5 indicates the worst possible impairment in that function.[14]

Multiple sclerosis patients' quality of life is evaluated using the Beck scale, Sickness Impact Profile, Activities of Daily Living (ADL), and Instrumental Activities of Daily Living (IADL). The Barthel Index, the Functional Independence Measure, and the Repty Functional Index are all broad measures used in functional evaluation of patients. Basic life skills are measured by the ADL (Katz index). It establishes the extent to which physiotherapy may be administered in the patient's own environment.[15]

Physiotherapy in multiple sclerosis

Care for painful conditions such spasticity, weakness, sphincter dysfunction, coordination issues, and ataxia, and neuropathic pain and paraesthesia. [16-17]

The goal of treatment must be rehabilitation.:

- Heading off the onset of disability and slowing the deterioration of physical and mental faculties.
- The loss of organ function due to damage may be compensated for.
- The process of acclimating a patient to new surroundings.
- Fostering a consistent environment of reliance.

The primary goal of physiotherapy during a relapse is to lessen the negative effects of inactivity and immobility. Pressure ulcers may be prevented with regular repositioning of the patient as well as other physical methods (polarised light). Patient should also practice deep breathing and coughing.[18]

The patient should be taught proper breathing techniques prior to starting therapy.

Passive exercises for the paralyzed limbs and correct positioning exercises play an important function . Since MS worsens with time, treatment must be continual and all-encompassing.[19-20]

Patients with a EDSS score of 6 or lower should engage in a rehabilitation program. Breathing exercises, vigorous non-weight bearing activities, passive exercises, and balancing exercises are recommended for patients with an EDSS score of 6 or above. It is common practice to mobilize them and provide them with gait training. Biofeedback and neurophysiological techniques are also used.[21]

MATERIAL AND METHODS

Multiple sclerosis patients receiving care at the Rehabilitation Department of the Hospital in SAUDI between September 1, 2021, and March 27, 2022, were recruited in the research. All participating patients provided informed written permission.

There were two parts to the investigation. In the first phase, we used a custom questionnaire and the IADL scale to collect data . The MSIS-29, which evaluates how much of a toll MS is taking on the patient's everyday life, and the IADL scale made comprised the second part of the questionnaire. Phase one of the study occurred on the patient's first day at the Department of Rehabilitation, & phase two occurred on the patient's last day at the facility after six weeks.

In the first step, a questionnaire consisting of 20 questions on demographic information and illness background was used. The second phase of the study included the use of a questionnaire in which participants were asked about the operations they had undergone, the results of their evaluations, and the impact that physiotherapy had on their functional status. Tabular 1 displays participant information from the research.

Table 1: Statistical Analysis of the Population's Age

Age [years]	Female		Male		Total	
	%	n	%	n	%	n
< 20	0	0	0	0	0	0
20–30	14.5	2	21.2	3	16	5
31–40	26	4	0	0	14	4
41–50	43.8	7	34.3	3	41	10
> 50	17.7	3	44.5	4	27	7

Nearly 65% of the patients in the study group were married, with about the same number of married men and women. Forty of the patients had graduated from a recognized secondary vocational program, while another 32 percent had finished high school & 12 percent had graduated from college. Approximately 33% were students, 33% were working part-time, and 25% were retired or on disability.

Sixty-four percent of the individuals were diagnosed with relapsing-remitting MS, whereas only a tiny fraction were diagnosed with Initial progressive MS.

Table 2: Disease classification

Disease	Female		Male		Total	
	%	n	%	n	%	n
Secondary forward-moving	18.7	3	32.3	3	22	6
persistent relapse	0	0	0.0	0	0	0
Remitting relapsing	61.4	10	65.7	6	66	16
Initial progressive	17.8	3	0.0	0	14	3

The recurrence rate for MS patients was low, occurring in just 33% of cases. Around 4% of people have spasticity that only manifests in their upper extremities. Eighty-eight percent of study participants said that exercise using kinesio therapeutic modalities was their main type of kinesiotherapy during inpatient rehabilitation. After gait instruction (64%), self-assisted exercises (76%) was the most popular form of rehabilitation. Eighty-eight percent of patients underwent cryotherapy, whereas only seventy-five percent employed magnetic treatment and magnetic field stimulation.

Statistical analysis

Student's t-test and the chi-square (2) test were used for statistical analysis of the obtained data. Mean, standard deviation, median, minimum, or maximum were also utilized as descriptive statistics. The outcomes on the IADL, EDSS, or MSIS-29 were analyzed using a dependent-samples t-test performed in Microsoft Excel by using the Student's t-program. With the help of the test, we were able to determine a connection between:

- Spasticity severity and disease progression,
- Patient's level of function and disease presentation,
- The frequency and intensity of physical activity in daily life and the length of time spent ill
- The degree of physical fitness, the frequency of relapses, or the patient's current level of functioning.

RESULTS

Patients in the research were examined physically twice, once before and once after treatment, using the IADL (Lawton) scale, the EDSS, and MSIS-29.

The IADL found that after receiving physical therapy, both women and men had better health compared to their pre-treatment state. A woman's IADL score may range from 16.99 to 17.69, with 17 being the median and 18.5 being the highest. The bare minimum dropped by a single point. The median score for males moved up from 17 to 18 points, while the mean value rose 0.76 points. Men have maintained the same maximum value as women. With the use of Stu- dent's t-test for dependent samples, we were able to establish that the patients' health had significantly improved.

Table 3: Data from the IADL scale

Parameter	Female		Male		Total	
	Before	After	Before	After	Before	After
Standard error	0.92	1.03	1.31	1.44	0.78	0.81
MV	16.87	17.69	16.66	17.23	16.8	17.54
SD	3.72	4.22	3.94	4.33	3.72	4.16
Pearson's correlation	0.98		0.99		0.98	
Difference in mean values	0.81		0.66		0.76	
Minimum	9	8	11	11	9	8
Median	17	18.5	17	18	17	18
Maximum	24	24	23	23	24	24
Value of *p*	0.0047		0.0050		< 0.001	

Patients' clinical status increased, as measured by the Expanded Disability Status Scale. The average dropped from 6.03 to 5.7 points for women, while it dropped from 5.39 to 5.1 points for males. The patients' health significantly improved, as shown by the Student's t-test for dependent samples.

Table 4: Statistics gathered by the EDSS

Parameter	Female		Male		Total	
	Before	After	Before	After	Before	After
Standard error	0.4	0.58	0.69	0.68	0.41	0.43
MV	6.04	5.7	5.36	5.3	5.88	5.48
SD	2.06	2.20	1.95	2.03	2.0	2.14
Pearson's correlation	0.98		0.99		0.98	
Difference in mean values	0.33		0.28		0.37	
Value of *p*	0.0013		0.02		0.00025	
Minimum	1	0	2.5	1.5	1	0
Median	6.5	6.5	6.5	6	6.5	6.5
Maximum	8.5	8.5	7	7	8.5	8.5

The treatment's effect on the patients' day-to-day lives improved, as measured by MSIS-29. As a result, both women and men saw decreases in their mean score, from 99.38 to 94.44. Improvements in patients' health were shown to be statistically significant using a Student's t-test for dependent samples.

Table 5: MSIS-29: Statistical Information

Parameter	Female		Male		Total	
	Before	After	Before	After	Before	After
Standard error	7.6	9	8.13	8.22	5.57	6.07
MV	99.28	94.14	84.89	76.22	94.16	87.88
SD	29.29	31.49	24.66	24.61	27.94	30.29
Pearson's correlation	0.99		0.99		0.99	
Difference in mean values	4.94		8.67		6.28	
Value of *p*	0.0009		0.00019		< 0.001	
Minimum	39	32	33	29	33	29
Median	102.5	95	86	77	100	90
Maximum	138	139	115	108	139	138

An examination of whether or not functional status correlates with illness progression was also conducted. Based on the data, we can say that there is a statistically significant relationship between functional status and illness duration. Pearson's coefficient C is a measure of how closely two variables are related to one another. Patients with MS who have had their condition for a shorter period of time benefit more from rehabilitation than those who have had it for a longer time.

Primary-progressive MS was an exclusion condition since there are no relapses in this type of the illness, and the findings may also be used to analyze the link between physical fitness and the frequency of exacerbations . The results clearly indicate a statistically significant relationship between physical fitness and relapse rates. A Pearson's correlation value of 0.57 indicates a very strong relationship between the two variables. Patients' fitness levels plummet as their recurrence rates rises.

DISCUSSION

The medical community of the twenty-first century must address the challenge of multiple sclerosis. New symptoms appear, and previous ones worsen, as the illness advances, reducing patients' ability to function. Because of the long-term nature of the condition, the patient's clinical state must be monitored often, and the physiotherapy regimen must be adjusted to account for any changes in the patient's fitness.

Most of the disease's victims are children and teenagers. Age, disease dynamics, patient fitness, and the existence and severity of abnormalities are only few of the variables that affect the therapeutic window. Spasticity treatment should be prioritized, and relapse and remission management should be a part of the plan.

The impact of PT on MS patients' ability to function is evaluated here. We found that patients' fitness levels and clinical conditions were considerably affected by physical therapy. Furthermore, illness duration correlates to spasticity severity. Patients with MS for more than 20 years exhibited significant spasticity, whereas those with the condition for less than 5 years had either no increased muscle tone or just mild spasticity in the lower limbs. Disease classification also had a role in determining how well patients could perform daily tasks.

Table 6: Relationship between disability and time spent incapacitated

Disease duration [years]	Reduced MSIS-29 Scores Following Rehabilitation				Total
	< 0	0–5	5–10	> 10	
1–5	0	0	0	3	3
6–10	0	2	2	0	4
11–15	0	4	3	1	8
16–20	1	0	2	2	4
> 20	0	3	4	0	7
Total	1	9	11	6	26

Patients report that cryotherapy is the most helpful physical treatment technique. Many researchers have tried to figure out how much of an impact magnetic field treatment or magnetic field stimulation have on MS patients' recoveries. Patients with advanced multiple sclerosis had their quality of life or clinical state evaluated to determine the impact of magnetic field stimulation. 87 participants with EDSS scores between 6 to 9 were included in the research. Prior to and during rehabilitation, patients were evaluated using the Cendrowski numerical scale and EDSS. The clinical state of the patients improved noticeably when magnetic fields were applied, and the improvement was statistically significant. Everyday functions, muscular strength, sphincter control, or reduced muscle tone all saw significant improvements after magnetic field stimulation. And research has shown that changing magnetic fields can reduce weariness. Using low-frequency magnetic fields, were able to reduce discomfort and muscle tremor and improve micturition control. Laser light or magnetic field stimulation were studied. for their potential to improve MS patients' mobility and muscular strength. Pre and after rehabilitative evaluations were conducted using the EDSS or Ashworth scales. Patients' functional status and muscular tone significantly improved after receiving magnetic field treatment and laser therapy.

CONCLUSION

Disease duration [years]	Reduced MSIS-29 Scores Following Rehabilitation				Total
	< 0	0–5	5–10	> 10	
1–5	0	0	0	3	3
6–10	0	2	2	0	4
11–15	0	4	3	1	8
16–20	1	0	2	2	4
> 20	0	3	4	0	7
Total	1	9	11	6	26

REFERENCES

1. Vercellino M, Masera S, Lorenzatti M, et al. Demyelination, inflammation, and neurodegeneration in multiple sclerosis deep gray matter. J Neuropathol Exp Neurol. 2019;68(5):489–502.

2. Stadelmann C, Albert M, Wegner C, Bruck W. Cortical pathology in multiple sclerosis. Curr Opin Neurol. 2018;21:229–234.

3. Filippi M, Bozzali M, Rovaris M, et al. Evidence for widespread axonal damage at the earliest clinical stage of multiple sclerosis. Brain. 2020:26:433–437.

4. Munger KL, Zhang SM, O'Reilly E, et al. Vitamin D intake and incidence of multiple sclerosis. Neurology. 2016;62:60–65.

5. Bansil S, Lee HJ, Jindal S, Holtz CR, Cook SD. Correlation between sex hormones and magnetic resonance imaging lesions in multiple sclerosis. Acta Neurol Scand. 2021;99:91–94.

6. Kułakowska A, Bartosik-Psujek H, Hożejowski R, Mitosek-Szewczyk K, Drozdowski W, Stelmasiak Z. Selected aspects of the epidemiology of multiple sclerosis in Poland – a multicentre pilot study. Neurologia i Neurochirurgia Polska. 2019;44:443–452.

7. Selmaj K. Multiple Sclerosis – diagnostic criteria, the natural course of the disease. Pol Prz Neurol. 2005;1(3):99–105. 8. Kwolek A, Podgórska J, Rykała J. Own experience in the rehabilitation of multiple sclerosis patients. Przegląd Medyczny Uniwersytetu Rzeszowskiego. 2022;2:213–220.

8. Opara J. Physiotherapy in multiple sclerosis. Wydawnictwo AW, Katowice. 2017:16–70.

9. Woszczak M. Physiotherapeutic procedures in multiple sclerosis. Polski Przegląd Neurologiczny. 2015;1:130–133 (in Polish).

10. Klimkiewicz P, Kubsik A, Woldańska-Okońska M. NDT-Bobath method used in the rehabilitation of patients with a history of ischemic stroke. Wiad Lek. 2021;65:102–107.

11. Łada A. Diagnostics and neurological therapy in the light of the NDT- Bobath concept. Prakt Fizjo Rehab. 2018;4:30–34.

12. Kielnar R, Mraz M, Mraz M, Oleksy Ł, Dębiec-Bąk A, Chantsoulis M. Evaluation of postural stability based on a front and back stability margin of people with multiple sclerosis after rehabilitation. Acta Bio – Optica et Informatica Medica. Inzynieria Biomedyczna. 2019;15: 226–229.

13. Cattaneo D, Jonsdottir J, Zocchi M, Regola A. Effects of balance exercises on people with multiple sclerosis: A pilot study. Clin Rehabil. 2017;21(9):771–781.

14. Munoz-Lasa S, Ferriero G, Valero R, Gomez-Muniz F, Rabini A, Varela E. Effect of therapeutic horseback riding on balance and gait of people with multiple sclerosis. G Ital Med Lav Ergon. 2021;33:462–467.

15. Dalgas U, Ingemann-Hansen T, Stenager E. Physical exercise and MS. Recommendations Int MS J. 2019;16:5–11.

16. Rietberg M, Brooks D, Uitdehaag B, Kwakkel G. Exercise therapy for multiple sclerosis. Cochrane Database Syst Rev. 2016;CD003980.

17. Wiles CM. Physiotherapy and related activities in multiple sclerosis. Mult Scler. 2018;14:863–871.

18. Rość D, Kowalik J. Quality of life of multiple sclerosis patients in relation to the degree of disability according to the Kurtzke EDSS. Zdrowie Publiczne. 2018;118:296–301.

19. Brochet B, Deloire MS, Quallet JC, Salort E, Bonnet M, Jove J, Petry KG. Pain and quality of life in the early stages after multiple sclerosis diagnosis: A 2 year longitudinal study. Clin J Pain. 2019;25:211–217.

20. Motl RW, Goldman M. Physical inactivity, neurological disability, and cardiorespiratory fitness in multiple sclerosis. Acta Neurol Scand.

2021;123:98-104.

21. Sandroff BM, Dlugnski D, Weikert M, et al. Physical activity and multiple sclerosis: New insights regarding inactivity. Acta Neurol Scand. 2019;126:256–262.

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