Effect of Model-Based Educational Intervention on Improving Treatment Satisfaction and Self-Efficacy for Patients with Multiple Sclerosis

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Abstract

Background: Demyelination of nerve cells and central nervous system damage are hallmarks of multiple sclerosis (MS), one of the most prevalent chronic illnesses of the central nervous system. This study **aimed to** evaluate the effect of model-based educational intervention on improving treatment satisfaction and self-efficacy for patients with multiple sclerosis. **Method:** A quasi-experimental design was used. **Setting:** The study was conducted at the neurology department and neurology outpatient clinics at Mansoura University Hospital. **Subjects:** A purposive sample of 90 patients was divided equally into two groups, and a study and control group (each one 45 patients) were included. **Tools for data collection: Tool I:** Structured Interview Questionnaire included **Part 1:** Demographic data of patients, and **Part 2:** Health History. **Tool (2):** Multiple Sclerosis Knowledge Questionnaire (MSKQ). **Tool III:** Treatment Satisfaction Questionnaire for Medication, and **Tool IV:** Multiple Sclerosis self-efficacy scale. **Results:** the study found that before model-based educational intervention (82.2%), patients had low knowledge, but afterward (75.6%) had good knowledge. In the control group, 80% of patients had low knowledge after routine care, while 2.2% had good knowledge. The study group had a global satisfaction score of 40.83 ± 24.01, while the control group had 39.58 ± 24.64. After the program, the study group had a score of 59.03 ± 18.49 and the control group had 40.28 ± 25.51. The study group had a mean self-efficacy score of 41.51 ± 11.20 before the program and 62.64 ± 10.99 after the program, while the control group had a mean score of 40.87 ± 10.89 before the study and 31.44 ± 11.33 following routine care. There was a substantial positive link between knowledge, global satisfaction, and self-efficacy in study groups before and after the training (p <0.001*). **Conclusion:** The study results concluded that implementing model-based educational intervention significantly enhanced knowledge, treatment satisfaction, and self-efficacy in patients with multiple sclerosis, suggesting its potential as a standard care model. **Recommendations:** Model-based educational intervention (cohesive nursing model) is recommended to be used by nurses to provide continuous care and interventions for MS patients. Future research should be implemented to study the effect of model-based educational intervention on MS patients in distinctive settings.

Keywords: Model-based educational intervention, Treatment Satisfaction, Self-efficacy, Multiple Sclerosis

Introduction

Multiple sclerosis (MS) is a prevalent cause of disability among young and middle-aged individuals in the developed world. It is a chronic, inflammatory disease of the central nervous system that is demyelinating **Dobson &Giovannoni, (2019)**. It is characterized by an unpredictable disease trajectory and can be categorized into various patterns with varying prevalence rates. **Amatya, et al., (2018) & Walton, et al., (2020)**. MS impacted approximately 2.8 million individuals worldwide. The incidence and prevalence rates of MS are on the rise as a result of the increased average age and extended life

expectancy, which are a result of medical advancements in the treatment of MS and the management of the superimposed comorbidities that are frequently diagnosed with an MS **Palmer, et al., (2020).**

In Egypt, there are 59,671 patients diagnosed with multiple sclerosis with an average diagnosis age of twenty-seven years. New cases incidence rate yearly is 9,244, with a female predominance of 75%. Each month, there are 770 diagnoses, with 90% attributed to relapsing-remitting multiple sclerosis **Afifi, et al., (2021)**. Multiple Sclerosis (MS) prevalence varied between 1.41% and 14.1%, with the highest concentration of cases observed in

Cairo **Walton, et al., (2020).** It is a chronic inflammatory disease of the central nervous system, resulting in a diverse array of symptoms, including balance and coordination disorders, bowel and bladder dysfunction, vision impairments, speech difficulties, pain, cognitive dysfunction, sexual dysfunction, and mood alterations **Ghasemi, et al., (2017).**

MS significantly impacts a patient's life. The individuals impacted by this disease typically manifest symptoms at a young age, generally between twenty and forty years, a period when they are expected to engage in active lifestyles, establish families, and pursue fulfilling lives. Multiple Sclerosis presents various unpredictable complications that significantly disrupt the lives of those affected, exacerbating the challenges associated with the disease's inherent nature. Self-efficacy is influenced by chronic diseases, such as Multiple Sclerosis **Walton, et al., (2020).**

Bandura defines self-efficacy as an individual's belief in their capabilities to execute behaviors necessary for specific tasks. This belief is essential for enabling patients to alter their lifestyles in managing chronic conditions, as it serves as a fundamental mechanism for such change **Bandura, (1977).** Self-efficacy refers to an individual's belief in their capacity to achieve success in a specific context. Self-efficacy serves as a significant psychological determinant, indicating a patient's confidence in disease management and strongly predicting self-management capabilities **Wilski, et al., (2020).**

Evidence indicates that effective interventions have positively impacted self-efficacy and self-management regarding patients with MS. Nurses, integral to the healthcare team, engage directly with patients. By delivering health services, they facilitate treatment adherence, thereby decreasing both the frequency and duration of hospitalizations, as well as associated costs. Conversely, offer patients multidisciplinary support to achieve optimal comfort levels. Promote family involvement in caregiving and decision-making consistent with the patient's preferences. Educating patients on self-care is a critical objective for nurses and a significant outcome of this study **Stuchiner, et al., (2020).**

The second outcome of this study is medication satisfaction; an important factor in managing chronic diseases that typically necessitate long-term treatment plans to empower patients **Reynolds, et al., (2018)**. The decision-making process regarding the selection or switching of disease-modifying therapies (DMTs) should consider the balance between efficacy, side effects, and the long-term impact of treatment **Kapica-Topczewska, et al., (2020)**. Higher adherence to prescribed disease-modifying therapies (DMTs) improves disease control and may reduce the incidence of relapses in MS patients **Montalban, et al., (2015)**. Factors influencing treatment adherence encompass patient preference and satisfaction, convenience, side effects, as well as social and economic considerations **Thach, et al., (2018)**. Patient satisfaction with medication encompasses factors such as effectiveness, convenience, side effects, and overall satisfaction, offering insights into the patient's perception of their current treatment. Satisfaction serves as a significant indicator of treatment adherence among patients **Turčáni, et al., (2020)**.

Adherence to disease-modifying therapies (DMTs) is crucial for optimizing the therapeutic benefits in MS management and minimizing the incidence of clinical relapses **Montalban, et al., (2015)**. Conversely, non-adherence to treatment and care regimens elevates the risk of complications and mortality, as well as healthcare costs **Morillo Verdugo, et al., (2019).** The World Health Organization (WHO) indicates that adherence to treatment regimens is a critical determinant of treatment success. Inadequate compliance diminishes the intended clinical outcomes and, as a result, undermines the efficacy of health systems **Gerber, et al., (2017).** Nurses significantly contribute to improving treatment adherence by providing patient education **Giovannoni, et al., (2015).**

Education is a critical component of chronic disease management, facilitating patients' adaptation to disease-related complications. Nurses in the outpatient setting facilitate patients' transition from understanding their disease needs within a clinical context to incorporating those needs into their daily lives **Giovannoni, et al., (2015).** The Association of

Rehabilitation Nurses recently emphasized this as a competency model for professional rehabilitation nursing **Halper, et al., (2016)**. A cohesive model for MS in nursing practice promotes successful patients living by enhancing their capacity to live independently at home or in a community setting **Maloni, et al., (2015).**

Establishing care, continuing care, and sustaining care represent three essential categories within a comprehensive MS nursing practice model. This model serves as an instance of care in all areas of MS nursing, irrespective of the disease categorization or patient's impairment, forming a coherent framework for MS nursing practice **Burke, et al., (2011)**. Establishing care is the initial step in fostering relationships and promoting open communication with patients and their families or care partners. The components of establishing care encompass building trust, forming partnerships, identifying needs, disseminating information, and evaluating each patient's support network. These activities establish a foundation that enhances empowerment, cultivates positive attitudes, and nurtures hope, thereby facilitating the development of a robust therapeutic alliance between nurses and patients **Maloni, et al., (2015).**

As part of the second component, continuous care, nurses play an important role as advocates, counselors, and educators in the pursuit of optimal patient health. Patients are educated by nurses on how to deal with the symptoms of their illness and the potential adverse effects of their medications. The significance of taking medications as prescribed is emphasized. In addition to providing direct medical care, nurses educate their patients on self-care practices including self-injection, symptom management, and wellness initiatives that center on nutrition, physical activity, and stress management. Patients' health and feelings of agency over their disease can both be improved by self-care practice. Nurses can help MS patients cope with the numerous unknowns in their lives, both personally and professionally, as part of their ongoing care **Halper, et al., (2016).**

The cohesive model's third component, sustaining care, emphasizes patient well-being. MS nurses arrange referrals, find community and informational resources, and communicate with patients and families to maintain treatment. Following the patient's physical and emotional needs, MS nurses must collaborate with neurologists, primary care physicians, speech and language pathologists, rehabilitation specialists, psychologists, and social workers to provide sustainable care. MS nurses may also partner with government agencies, religious groups, and other organizations to help MS patients **Maloni, et al., (2015).**

Nurses in multiple sclerosis (MS) are essential in educating patients about their condition and treatment alternatives, facilitating treatment initiation and management, and promoting sustained adherence to therapy. Current research and development in treatments offer individuals with MS increased optimism regarding their future **Prakash, et al., (2015)**. So, this research aims to add new data regarding evaluating the effect of model-based educational intervention in improving satisfaction and self-efficacy for those patients.

Significance of Study

A fulfilling life necessitates the mitigation of negative emotions alongside the enhancement of positive experiences and an adequate quality of life (QOL). MS, an autoimmune disease, is among the most prevalent chronic neurological conditions that impair the nervous system and diminish the quality of life (QOL) **Ghasemi, et al., (2017)**. MS is unpredictable, chronic, and transformative characteristics, induces significant distress in individuals, particularly during the initial phases of the condition, nurses should develop and sustain adaptable care strategies that enhance the patient-nurse relationship to improve patient outcomes **El-Kattan & El-Zayat, (2019).**

The application of a comprehensive cohesive model in MS nursing practice is regarded as the gold standard in clinical care. This approach fosters acceptance and enhances understanding of ongoing care, which includes supervision, wellness services, activities,

exercise, health education, emotional and social support, and varying levels of assistance with activities of daily living (ADLs) **Kapica-Topczewska, et.al (2020).** Despite the limited application of the comprehensive cohesive model in MS nursing practice in existing studies, this research aims to evaluate the effect of model-based educational intervention (comprehensive cohesive model) on improving treatment satisfaction and self-efficacy for patients with multiple sclerosis.

Operational Definition:

Model-based educational intervention refers to a structured program designed and implemented using the Comprehensive Cohesive Model of Nursing Care. This model integrates key nursing principles to deliver patient-centered education that enhances understanding, promotes self-management, and improves patient outcomes. The intervention includes tailored educational sessions, ongoing support, and practical guidance to address treatment satisfaction and self-efficacy, focusing on the specific needs of patients with multiple sclerosis (MS).

Study's aim:

Evaluate the effect of model-based educational intervention on improving treatment satisfaction and self-efficacy for patients with multiple sclerosis

Study's hypothesis
- Patients' understanding of multiple sclerosis will be enhanced after the application of model-based educational intervention.
- Patients' satisfaction with their medications will be improved after the application of model-based educational intervention.
- Patients' self-efficacy will be improved after the application of model-based educational intervention.

Subjects and Methods

Study Design
A quasi-experimental design was used.

Study Setting

The study was completed at the neurology department and neurology outpatient clinics at Mansoura University Hospital.

Subjects:

A purposive sample of 90 patients was divided equally into two groups, a control group and a study group each one 45 patients was included based on the following criteria:

Inclusion criteria:
- Patients of both genders aged 20-60 years and able to converse.
- Medical documents confirmed the diagnosis of MS.
- Availability and willingness to participate in the study.
- Having mild to moderate disability based on the expanded disability status scale

The Expanded Disability Status Scale (EDSS):
- This scale was created by **Kurtzke, (1983)** to measure disability levels for MS patients. Significantly disabled patients (EDSS score 4 or higher) were excluded. The EDSS used a few neurological exam functional system scores (FSS). Half points were given for better specificity on a 0–10 scale. Higher numbers indicated a more severe handicap, whereas lower numbers indicated less. Before enrolling in this study, one researcher examined participants' EDSS scores with a doctor. Furthermore, individuals exhibiting substantial medical complications, behavioral disorders, cognitive deficits, and apparent auditory or visual impairments were excluded.

Exclusion Criteria:
- Patient's aged under 20 or more than 60 years old
- Pregnant women
- Severe Mental or cognitive disability

Sample calculation:

It was determined using G*Power version 3.1.9.7 software based on a previous study **(El-Kattan & El-Zayat, 2019)**, with an effect size of 0.74, alpha error probability of 0.05 and a study power of 95%. According to these parameters, the required sample size was calculated to be 41 patients per group. To account for a potential 10% dropout rate, the

sample size was increased to 45 patients per group.

Tools for Data Collection:

The four following tools were employed to gather the required data and accomplish the objectives of the study.

Tool I: Structured Interview Questionnaire:

The researchers created this tool after going through relevant literature reviews **Shawli, et al., (2019)** and included two parts:

Part 1: Demographic data of patients including age, gender, marital status, education, job, and income.

Part 2: Health History such as number of relapses, disease duration, and type of MS.

Tool II: Multiple Sclerosis Knowledge Questionnaire (MSKQ):

Giordano, et al., (2010) created and adapted a self-assessment instrument for patients with multiple sclerosis to test their comprehension of the disease, comprising twenty-five multiple-choice questions about the definition, pathophysiology, causes, risk factors, genetic predisposition, diagnosis, relapses, and medications of the disease. The researchers subsequently condensed the twenty-five questions to twenty-four questions based on the results of testing the tool's validity.

Scoring system:

A correct response was awarded a score of one, whereas unanswered questions received zero. The overall knowledge was computed to be twenty-four, then was converted into percentages as following:

Knowledge levels	Scores	Percentages
Poor knowledge	Less than 12	less than 50%
Fair knowledge	12 to less than 18	50% to less than 75%
Good knowledge	18-24	75% or more

Tool III: Treatment Satisfaction Questionnaire for Medication (TSQM)

It was created by **Atkinson, et al., (2004)** a validated tool designed to assess patient satisfaction with medication over the past 2–3

weeks or since it was last taken. TSQM (Version 1.4) was used for this study. It consisted of 14 questions divided into four subscales: Effectiveness, which assesses the medication's ability to manage symptoms, meet expectations, and act quickly (items 1–3), Side Effects, which evaluated the presence, severity, and impact of side effects on physical and mental functioning and overall satisfaction (items 4–8). Participants without side effects skip this section. Convenience explores ease of use, planning, and adherence to the medication regimen (items 9–11), and Global Satisfaction, measured confidence in, benefits of, and overall satisfaction with the medication (items 12–14). Responses were recorded on a Likert-type scale of 5 or 7 points, except for item 4 in the Side Effects subscale, which was a yes/no question about the presence of side effects. If studied patients reported no side effects (answering "no" to item 4), the remaining Side Effects items (5–8) were skipped.

Scoring system:

Responses for each dimension (effectiveness, side effects, convenience, and global satisfaction) were aggregated, and then scores were transformed to a 0–100 scale for comparability, with higher scores indicated greater satisfaction.

Tool IV: Multiple Sclerosis self-efficacy scale:

It is a widely used tool in clinical practice to identify areas where patients may need additional support, helping healthcare providers tailor interventions to improve self-management and overall quality of life. **Rigby, et al., (2003)** designed it to measure the confidence of individuals with MS in managing their symptoms and maintaining functional abilities. It consisted of fourteen questions categorized as follows:

Dimensions	Questions
Independence and activity	2, 5, 6, 8, 13
Worries and interests	3, 4, 9, 10
Personal control	7, 11, 12
Social confidence	1, 14

Scoring system

According to a six-point Likert scale, the responses ranged from strongly disagree (1) to

strongly agree (6). The total score was calculated by summing the responses for all items, resulting in a possible score range of 14 to 84, with higher scores indicating greater self-efficacy. Negatively worded items (questions 3, 4, 9, 10, 12, and 14) are reverse scored to maintain consistency, where a response of 1 is recorded as 6, 2 as 5, and so on.

Tool validity:

The study instruments' clarity, relevance, understandability, and suitability for usage were evaluated by a jury of seven experts in medical surgical nursing and neurology to determine their validity. In response to their recommendations, we implemented the required modifications.

Reliability test:

The reliability was evaluated to ascertain if all items of the study tool measured the same variable and to examine the conceptual coherence of the items utilized. Cronbach's alpha test was employed to assess the internal consistency of the tools, yielding reliability estimated of 0.941 for Knowledge, 0.884 for treatment satisfaction, and 0.880 for self-efficacy.

Pilot study:

A pilot study was performed on 10% of the sample (9 patients) was performed to evaluate the utility, precision, and relevance of the research instruments and implement necessary modifications. Additionally, it provided an estimate of the duration required to complete the questionnaires. After the pilot investigation, modifications were implemented based on the findings. The study sample excluded patients who participated in the pilot study.

Ethical consideration:

An official communication was submitted through the nursing faculty of Mansoura University to the hospital's organizational authorization to obtain permission to conduct the study. The researchers explain the study's goal, beginning date, and commencement time to the neurology department's head to obtain approval for patients' interviews. All participants in the study were allowed to withdraw at any time or to decline answering specific questions without justification, following the study's objectives and nature explanation.

Field Work

The fieldwork launched in November 2021 and persisted until March 2022. The subsequent steps of the study were engaged. Data were collected using the following phases:

Assessment phase

This phase entailed the development of structured instruments. The tool I was developed by researchers after a thorough review of the literature and multiple scholarly **(Al-Hamdan, et al., (2021); Farran, et al., (2021); Abulaban, et al., (2019).** Tools II, III and IV were utilized. The researchers recruited eligible patients from the inpatient and outpatient units at the designated location after assessing their level of disability using the expanded disability status scale. Subjects in both groups were taking approximately 25–35 minutes to fill out the study tools in the pre-test.

Planning phase:

During this phase, the researchers set the general and specific objectives for developing the model-based educational intervention following a review of the literature and an assessment of the patients' actual needs, which were identified through the pretest.

The general objective of developing the model-based educational intervention is to enhance the overall treatment satisfaction and self-efficacy of patients with multiple sclerosis (MS). This is achieved by addressing their specific needs, improving their understanding of the condition and its management, and fostering confidence in their ability to adhere to treatment and self-care practices.

The specific objectives of developing the model-based educational intervention included:

▪ Enhancing patients' understanding of multiple sclerosis, including its symptoms, progression, and treatment options.

▪ Building self-efficacy through increasing patients' confidence in managing their condition and adhering to the prescribed treatment plans.

▪ Enhancing treatment satisfaction through addressing patients' concerns and preferences to improve their satisfaction with the care and treatment they received.

▪ Encouraging active participation through using a comprehensive cohesive model of care where patients were actively involved in their care and decision-making process.

Implementation Phase

A model-based educational intervention based on a nursing care comprehensive cohesive model was developed according to patients' identified needs, objectives, care priorities, and anticipated outcomes. This model focused on improving treatment satisfaction and self-efficacy among patients. A designed booklet and PowerPoint presentations were developed to offer patients with a comprehensive overview of essential information regarding therapies, which included an overview of the disease, how to diagnose, treatment modalities and nursing management of side effects of the medication, dietary lifestyle, and nursing strategies to enhance self-efficacy of the patients based on an educational model.

For the study group: the researchers applied model-based educational intervention.

The appliance of a model-based educational intervention model (comprehensive cohesive model of nursing care:

Essential responsibilities for the care of MS patients can be grouped into three main areas of the cohesive nursing model: establishing care, continuing care, and sustaining care. The three interrelated dimensions that make up this framework allow for the provision of care to all multiple sclerosis patients, irrespective of disease classification or disability level. These topics were covered in three sessions, one each of theory and practice:

Establishing Care was the initial session that commenced with a meeting in person and was conducted as a theoretical session following the pretest aimed to foster a robust therapeutic alliance between nurses and patients, establishing a foundation for empowerment, supportive attitudes, and hope. The care establishment process involved building trust, forming partnerships, addressing information needs, facilitating information exchange, and evaluating each patient's support system.

Continuing Care: aimed to focus on enhancing health status through personal meetings. The session combined theoretical and practical elements. Within the framework of continuous care, the nurse educators instructed patients on practicable methods for handling disease symptoms and side effects of the drugs, while emphasizing the significance of treatment compliance. Nurses provided medical care and serve as guidance counselors, aiding patients in adopting self-care strategies that enhanced health and foster a sense of self-control over their illness, comprising self-injection, health practices, nutrition, physical activity, and stress management. Nurses assisted patients not only with family and employment issues but also in navigating the health and life uncertainties associated with multiple sclerosis.

Sustaining Care: the third component emphasized the preservation of patient wellbeing and consisted of both theoretical and practical components delivered through face-to-face interviews. Nurses responded to the changing patient and caregivers requirements by facilitating inquiries, recognizing information and community reserves, and providing consultation, and advocated for the establishment of collaborative partnerships between multiple sclerosis patients and other healthcare professionals

Every session commenced with a summary of the material from the prior meeting, tracked by the purposes of the new topics, utilizing clear language to align with the patients' comprehension levels. The entire duration of each one varied based on subject and patient response, with patients presented during all intervention meetings. Learning was enhanced through discussion, motivation, and reinforcement during each meeting. Additionally, each client received a copy of the content for future reference, serving as a method of direct reinforcement.

For the control group: no intervention was implemented. Patients receive only routine nursing and medical instructions.

Evaluation Phase

To ascertain the level of satisfaction and self-efficacy experienced by MS patients with their treatment plans, it was helpful to reevaluate the MS treatment satisfaction questionnaire and the MS Self-Efficacy Scale (MSSS) for the study and control groups and compare the results to

determine the effectiveness of the model-based educational intervention.

For the post-test, patients in the study and control groups were assessed using tool II immediately after the application of the model-based educational intervention. Additionally, they were assessed using tool III and tool IV one month following the application of model-based educational intervention.

Statistical Analysis:

The data was analyzed using IBM SPSS software package version 20.0 (IBM Corp., Armonk, NY). Qualitative data were described using numbers and percentages, while quantitative data were characterized using mean and standard deviation. The normality of the data distribution was assessed with the Shapiro-Wilk test. Statistical significance was evaluated at the 5% level. Reliability was measured using Cronbach's Alpha, and statistical tests included the Chi-square test, Independent Samples t-test, and Mann-Whitney test. Correlations between study variables were determined using the Pearson coefficient.

Results

Table 1 shows participant demographics: This study included 90 patients: 45 participants in each group. The study group had (82.2%) female patients and (17.8%) males patients while the control group had (71.1%) female and (28.9%) males. The study group had 55.6% middle-aged (30–40) participants and the control group 57.7%. 64.5 percent of research participants and 71.1% of control group members were married. This was one of many factors affecting working status because (53.3%) of the study group and (56.6%) of the control group were not working, and (66.7%) and (60%) of the study group and (60%) of the control group had insufficient monthly income. There were no significant differences between the two groups in age, gender, marital status, educational level, working status, or monthly income (P>0.05). See Table 1 for information.

A Comparisons between the studied groups studied regarding the type of the disease was presented in Figure 1: (80% and 84.4%) of the study and control groups respectively, had relapsing-remitting multiple sclerosis while a small portion (6.7%) had

secondary progressive multiple sclerosis in both groups

A Comparison between the studied groups regarding the duration of disease was presented in Figure 2: (66.7% and 62.2%) of the study and control groups respectively, had multiple sclerosis from 5 to < 10 years where (15.6% & 17.8%) in both groups respectively had multiple sclerosis for more than 10 years.

Figure 3 showed a Comparison between the studied groups regarding the number of relapses: in the study group there was (55.6%) of patients had 3-4 times the number of relapses and (6.7%) hadn't relapsed but (24.4%) had more than 6 times wherein the control group there was (53.3%) of patients had 3-4 times number of relapses and (9.8%) hadn't relapses and (17.8%) had more than 6 times of relapses.

Table 2 illustrated the comparison between the groups studied regarding their total knowledge: in the study group (82.2%) of the patients had a poor level of knowledge whereas only (4.4%) had good knowledge before the implementation of model-based educational intervention but after the program (75.6%) had good knowledge and only (4.4%) had poor knowledge. In the control group (80%) of the patients had a poor level of knowledge where only (2.2%) had good knowledge but after 3 months of routine care still (2.2%) had good knowledge and only (77.8%) had poor knowledge. There was no statistical significance between both groups before the program with p value of (0.478) while after the program p value represented highly significant with p (<0.001*).

Table 3 presented the comparison between the studied groups regarding their treatment satisfaction The global satisfaction score was 40.83 ± 24.01 for the study group and 39.58 ± 24.64 for the control group before implementation of the program whereas after implementation of the program for the study group was 59.03 ± 18.49 and 40.28 ± 25.51 for the control group after routine care. Patients exhibited the highest satisfaction levels with Effectiveness scoring a mean of 65.19 ± 11.57, followed closely by the domains of Side effects with a score of 58.22 ± 20.67) in the study group post-program. In the control group, patients exhibited the highest satisfaction levels with Effectiveness scoring a mean of 47.16 ± 14.49,

followed closely by the domains of Side effects with a score of 43.56 ± 25.41 after routine care. Finally, there was high statistical significance between the study and control group with p (<0.001*) after the program.

As shown, in Table (4), Comparison between the studied groups regarding their self-efficacy mean scores: The overall mean score of self-efficacy in the study group was 41.51 ± 11.20 before the program and 62.64 ± 10.99 after the program while in the control group the overall mean score of self-efficacy was 40.87 ± 10.89 before the study and 31.44 ± 11.33 after the routine care. There was a highly statistically significant difference between the two study and

control groups regarding the mean self-efficacy scores ($p = 0.001$).

Table (5) represented the correlation between the study variables among the studied groups before and after the implementation of the model-based educational intervention: A strong positive correlation between knowledge and global satisfaction among studied groups with highly statistically significant p (<0.001*) before and after the program was noticed. In addition, to before and after the program, there is a strong positive correlation between Knowledge and self-efficacy with high statistical significance (<0.001*). Also, Global satisfaction and self-efficacy show a strong positive correlation with high statistical significance (<0.001*)
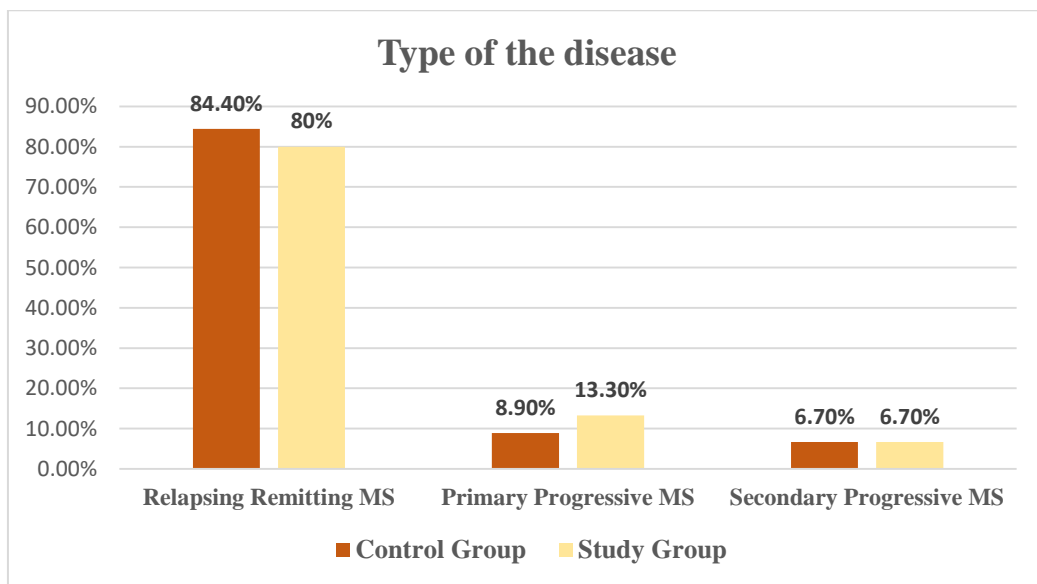
Table (1): Comparison between the studied groups according to their demographic data (n =90)

| Demographic data	Control Group (N=45)		Study Group (N=45)		Test of Significance	P-Value
	N	%	N	%		
Age						
- <30	3	6.7	6	13.3	$X^2= 1.686$	0.640
- 30-<40	26	57.7	25	55.6		
- 40-<50	9	20	6	13.3		
- ≥50	7	15.6	8	17.8		
Mean±SD	40.36±7.90		40.47±10.54		t = 0.57	0.955
Gender						
- Male	13	28.9	8	17.8	$X^2= 1.553$	0.213
- Female	32	71.1	37	82.2		
Marital status						
- Single	7	16.6	11	24.4		
- Married	32	71.1	29	64.5	$X^2= 1.179$	0.758
- Divorced	4	8.9	3	6.7		
- Widow	2	4.4	2	4.4		
Educational level						
- Primary	8	17.8	9	20		
- Secondary	26	57.8	26	57.8	$X^2= 0.106$	0.948
- University	11	24.4	10	22.2		
Work status						
- Working	20	44.4	21	46.7		
- Not working	25	55.6	24	53.3	$X^2= 0.045$	0.832
Income						
- Not enough	27	60.0	30	66.7	$X^2=0.503$	0.478
- Enough	18	40.0	15	33.3		

X^2: Chi-square test   *t: Independent samples t-test*   ***Significant at P ≤ 0.05**

Figure (1): Comparison between the studied groups regarding the type of disease (n =90)
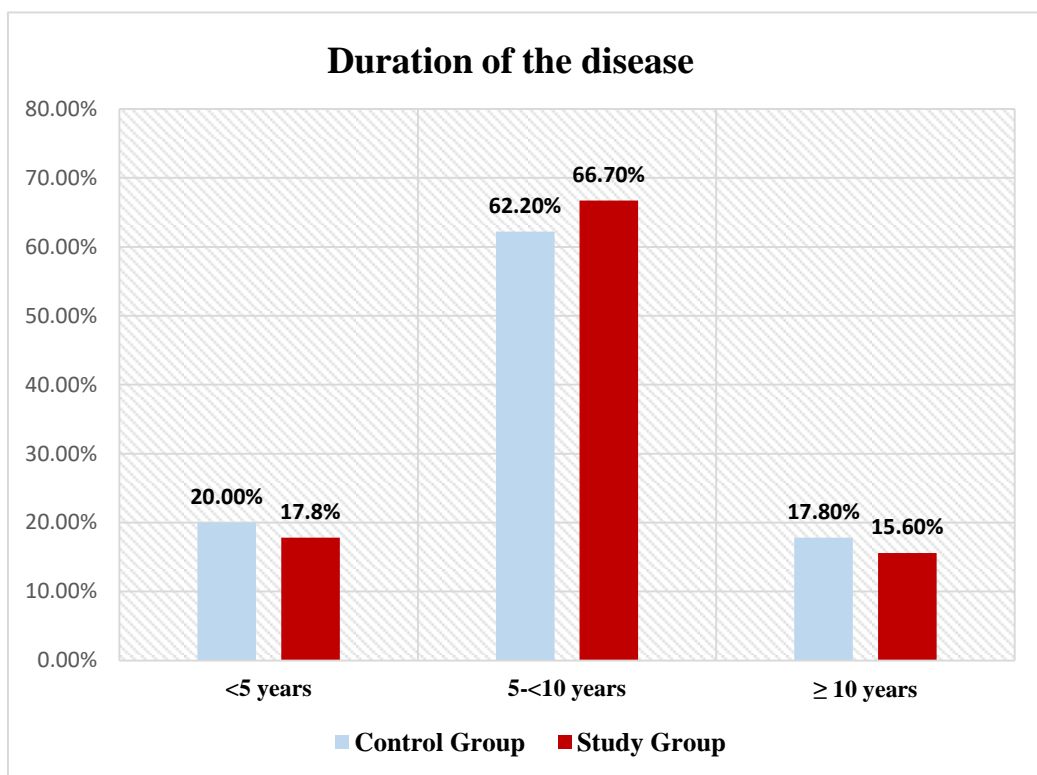
Figure (2): Comparison between the studied groups regarding the duration of disease (n =90)
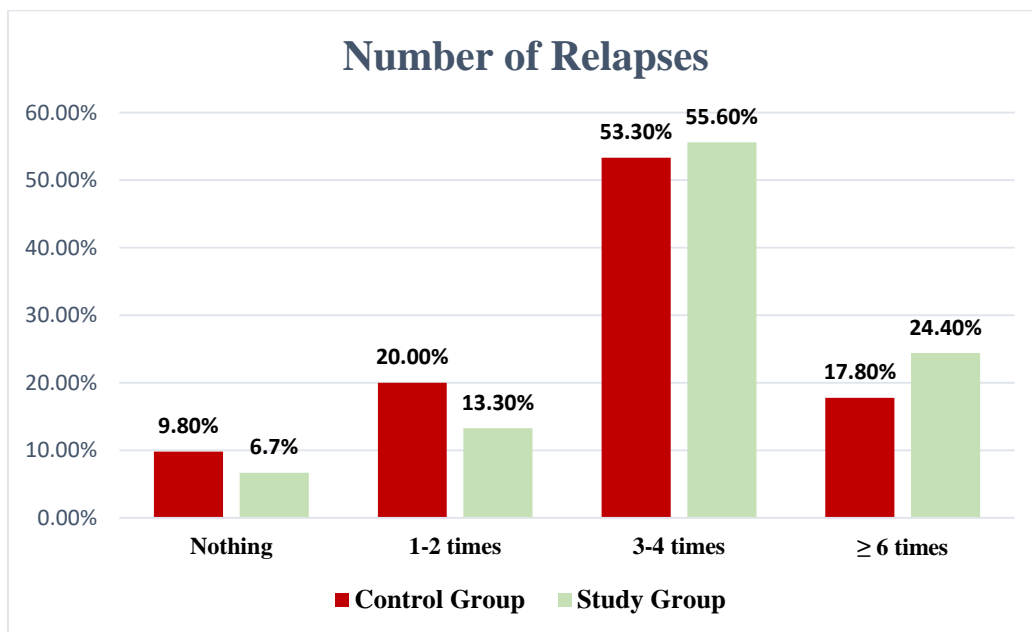
Figure (3): Comparison between the studied groups regarding the number of relapses (n =90)

Table (2): Comparison between the studied groups regarding their total knowledge scores before and after the implementation of model-based educational intervention (n =90):

Knowledge levels	Before				After			
	Control Group (N=45)		Study Group (N=45)		Control Group (N=45)		Study Group (N=45)	
	No	%	No	%	No	%	No	%
Poor ($< 50\%$)	36	80.0	37	82.2	35	77.8	2	4.4
Fair ($50\%- < 75\%$)	8	17.8	6	13.4	9	20.0	9	20
Good ($\geq 75\%$)	1	2.2	2	4.4	1	2.2	34	75.6
Significance test	$X^2= 0.633$		P= 0.729		$X^2= 60.547$		P=<0.001[*]	
Min. – Max. Mean ± SD	5.0 – 20.0 10.00 ± 3.44		6.0 – 22.0 10.49 ± 3.70		5.0 – 20.0 10.11 ± 3.55		10.0 – 24.0 19.16 ± 3.77	
Significance test U(p)	926.00 (0.478)				114.50 (<0.001*)			

X^2: Chi-square test   **U:Mann Whitney test   *Significant at P ≤ 0.05**

Table (3): Comparison between the studied groups regarding their treatment satisfaction mean scores before and after the implementation of the model-based educational intervention (n =90):

Treatment satisfaction domains	Before		After	
	Control Group (N=45)	Study Group (N=45)	Control Group (N=45)	Study Group (N=45)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Effectiveness	46.91 ± 14.09	47.53 ± 14.04	47.16 ± 14.49	65.19 ± 11.57
Significance test U(p)	983.50 (0.814)		362.00 (<0.001*)	
Side effects	43.11 ± 24.81	43.56 ± 25.17	43.56 ± 25.41	58.22 ± 20.67
Significance test U(p)	1003.50 (0.942)		651.50 (0.003*)	
Convenience	41.36 ± 22.18	42.96 ± 22.80	42.10 ± 23.22	57.53 ± 21.46
Significance test U(p)	965.50 (0.704)		637.00 (0.002*)	
Global satisfaction	39.58 ± 24.64	40.83 ± 24.01	40.28 ± 25.51	59.03 ± 18.49
Significance test U(p)	981.00 (0.799)		593.00 (<0.001*)	

SD: Standard Deviation   *U: Mann Whitney test*   ***Significant at P ≤ 0.05***

Table (4): Comparison between the studied groups regarding their self-efficacy mean scores before and after the implementation of the model-based educational intervention (n =90):

Self-efficacy domains	Before		After	
	Control Group (N=45)	Study Group (N=45)	Control Group (N=45)	Study Group (N=45)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Independence and activity	14.40 ± 4.52	14.47 ± 4.62	14.60 ± 4.67	22.64 ± 4.31
Significance test t(p)	0.069 (0.945)		8.496 (<0.001*)	
Worries and concerns	12.00 ± 3.54	12.36 ± 3.63	12.11 ± 3.59	18.18 ± 2.84
Significance test t(p)	0.471 (0.639)		8.895 (<0.001*)	
Personal control	9.02 ± 1.83	9.13 ± 1.93	9.16 ± 1.91	13.00 ± 2.50
Significance test U(p)	984.00 (0.815)		236.00 (<0.001*)	
Social confidence	5.44 ± 1.18	5.56 ± 1.20	5.58 ± 1.32	8.82 ± 1.59
Significance test U(p)	955.00 (0.628)		142.50 (<0.001*)	
Overall self-efficacy	40.87 ± 10.89	41.51 ± 11.20	31.44 ± 11.33	62.64 ± 10.99
Significance test t(p)	0.277 (0.783)		9.012 (<0.001*)	

*t: Independent samples t-test　　　U: Mann Whitney test　　　*Significant at P ≤ 0.05*

Table (5): Correlation between the study variables among the studied groups before and after the implementation of model-based educational intervention (n =90):

Variables	r P	Before		After	
		Control Group(N=45)	Study Group(N=45)	Control Group(N=45)	Study Group(N=45)
Knowledge vs. global satisfaction	r P	0.916 (<0.001*)	0.881 (<0.001*)	0.925 (<0.001*)	0.927 (<0.001*)
Knowledge vs. self-efficacy	r P	0.956 (<0.001*)	0.924 (<0.001*)	0.957 (<0.001*)	0.984 (<0.001*)
Global satisfaction vs. self-efficacy	r P	0.980 (<0.001*)	0.988 (<0.001*)	0.981 (<0.001*)	0.950 (<0.001*)

*[r: Pearson coefficient　　　　*significant at p ≤ 0.05*

Discussion

Among young individuals, multiple sclerosis (MS) ranks as the highest for progressive neurological illness and is the most common non-traumatic cause of disability worldwide. This disorder, which affects primarily women between the ages of 20 and 40, ranks third among the causes of impairment in adults. The global MS patient population exceeds 2.5 million. **(Ben-Zacharia, et al., 2018)**.

In a healthcare system, evaluating how satisfied people with multiple sclerosis are with the medical care, treatment, and knowledge they get about the illness and services is important. The contentment of the patients may also influence their involvement in MS therapy, which could lead to better clinical results. Furthermore, one of the standards for judging the caliber of medical treatment given in a

hospital setting is measuring patient satisfaction, which may help in understanding their opinions **(Alhazzani, et al., 2019).**

This study discusses five primary topics: information regarding the sociodemographic and health status of the patients; how the model-based educational intervention affected their knowledge; how the model-based educational intervention affected their self-efficacy; how the model-based educational intervention affected their treatment satisfaction; and correlations between the variables under investigation.

The demographic data indicated that over fifty percent of both the study and control groups were aged between 30 and 40; the mean age ± SD was 40.36±7.90 and 40.47±10.54, respectively. In this study, females constituted the predominant portion of the participants in both the experimental and control groups. The

female-to-male ratio of the study group exceeded four to one, aligning with the normally higher prevalence of MS in females compared to males. Comparable findings were also reported in several investigations conducted on individuals with multiple sclerosis (**Kerling, et al., 2015; Bagheri, et al., 2015**). Furthermore, **Ortona, et al., (2016)** in their research on autoimmune disorders indicated that multiple sclerosis is typically diagnosed in young people and affects females two to three times more frequently than males. This is reasoned since multiple sclerosis is presumed to be associated with female hormones during the reproductive age.

In our study, more than half of the study and control groups were married and had completed secondary school. This finding is consistent with **Dehghani, (2021)** who stated that about two-thirds of the intervention group were married, also **Abd'Elamgied Salime, et al., (2020)** study on Egyptian MS patients assessing the impact of nursing intervention on fatigue for MS patients reported that more than half of the study sample was married. Contrary to the results of the current study, **Silva, et al., (2009)** showed that being single is associated with an increased risk of MS; also, **Afrasiabifar, et al., (2020)** reported that more than half of the participants were unmarried, and **Hersche, et al., (2019)** reported that, most of the sample studied had university education.

The study's results indicated that more than fifty percent of both the study and control groups were unemployed and experienced inadequate income. **Radmehr, et al., (2015)** corroborated this conclusion by indicating that most study participants were unemployed. **Rakhshan, et al., (2018)** further emphasized that more than fifty percent of the patients were unemployed. These findings were supported by a study by **Saad & Elsayed, (2021)** indicated that more than two-thirds of the patients examined were employed. The findings align with those of **Wendebourg, et al., (2017)** in Cochrane, whose research titled "Patient education for individuals with multiple sclerosis-associated fatigue: A systematic review" demonstrated that over three-quarters of their sample were unemployed. The current results align with those of **Abulaban, et al., (2019)** in Saudi Arabia; whose study titled

"Multiple Sclerosis Patients Knowledge in Saudi Arabia" indicated that roughly half of the patients examined are unemployed. However, in contrast to the findings of this study regarding work status, those of **Estrutti, et al., (2019),** who discovered that about two-thirds of participants in their study on the employment status of MS patients in Brazil were employed, and **Bijani, et al., (2022)**, who observed that around three-quarters of the intervention group were employed. Seifi.

According to the income results of the current study, two-thirds of the study and control groups had low income. It is consistent with a study conducted in Egypt by **ABDEL-AZEM, et al., (2021),** which found about half of the patients had to take out loans due to inadequate income, and about one-quarter of patients did not have enough money. This is supported by **Moghadda, (2018)** discovered that the income of over half of the respondents was inadequate. This suggests that people with multiple sclerosis typically experience challenges in motor skills, increased fatigue, and cognitive impairments, which impact their employment capabilities and subsequently affect their income. From this point on, it is important to emphasize the role of nurses in sustaining care sessions for low-income patients, as well as in establishing connections outside of the healthcare team, such as with governmental agencies, religious groups, and other organizations that can provide support to MS patients.

Regarding the type of MS, the study revealed that most of both the study and control groups had relapse-remitting MS. This is in the same line with **Bijani, et al., (2022)** who stated that more than half of the intervention group had relapse-remitting MS As well as **Abd'Elamgied Salime, et al., (2020)** stated that more than one-third of them had relapsing-remitting (RRMS) type. Additionally, **Wilski, et al., (2021)** reported that over eight out of ten MS patients were diagnosed with relapsing remitting MS, which affects approximately 85% of individuals.

The current study indicates that relapsing-remitting MS was predominant, comprising the majority of both the study and control groups, with two-thirds of participants in each group

diagnosed with the disease 5–10 years prior. The current study indicated that most groups had previous relapses, with over half experiencing three to four relapses annually. The findings align with those of **Wilski, et al., (2021)**, which indicated that the majority of individuals experienced a relapsing-remitting form of the illness, with a mean duration of 11 years. The findings corroborate those of **Marck, et al., (2018),** who reported that more than 75% of the patients in their study had experienced relapses previously. **Salime, et al., (2022)** provide evidence for this conclusion, indicating that nearly 50% of the studied sample had a disease duration of 2-5 years, with approximately two-thirds diagnosed with Relapsing Remitting MS.

Additionally, it was shown by **Dashti, et al., (2016)** that more two two-thirds of individuals experienced the condition for 1-4 years. However, according to **Dehghani, (2021),** the majority of the intervention group experienced relapsing-remitting symptoms, and over half of them had a relapse fewer than once in the past year. According to **Gerges, et al., (2018),** the average duration of the condition was 14.5 years, with instances ranging from 1 to 28 years. Moreover, this goes against the findings of **Omrani, et al., (2018),** who verified that the average duration between the onset of symptoms and the diagnosis of the disease was approximately two years; **Nabil Abd Elsalam & Abd Elsatar Ali, (2022)** found that approximately 75% of MS patients required hospitalization between one and three times annually, and 26% experienced relapses annually.

These results highlight the importance of patient education, particularly through model-based educational interventions in Continuing Care sessions. Such programs focus on improving health status, promoting treatment compliance, and assisting patients in adopting self-care strategies. This approach enhances health outcomes and fosters a sense of self-control over illness, leading to a direct positive effect on health and a reduction in disease relapses and hospitalizations.

In terms of knowledge, the current study demonstrated that most of the study and control groups had low levels of knowledge before the implementation of the model-based educational intervention, but following the intervention three-quarters of the study group had good levels of knowledge, while the majority of the control group had poor levels of knowledge. Support our findings by reporting that after the intervention, the mean knowledge score of patients in the intervention group was considerably greater than that of the control group. This finding is corroborated by a study conducted by **Daniali, et al., (2016),** which indicated that patients receiving information during a face-to-face interview demonstrated greater knowledge retention for up to six months and reported fewer relapse periods. **Heesen, et al., (2012)** demonstrated the positive effect of educational intervention on the progression of multiple sclerosis. This highlights the significance of ongoing education, which greatly increases patients' awareness through model-based educational intervention (cohesive model) in nursing practice that was implemented in this study. Furthermore, there was no statistical significance observed between the two groups before the program, with a p-value of 0.478. However, following the program, the p-value indicated a high level of significance at p (<0.001), thereby demonstrating a positive outcome of the study program on the study group.

A study by **Tkáčová, (2020)** in Iran assessed the effect of self-care education on the quality of life of MS patients, revealing that the intervention group's average total knowledge score was considerably greater than that of the control group post-intervention. A study on fatigue and self-management in MS patients conducted by **Afrasiabifar, et al., (2016)** demonstrated that the intervention group's T-test indicated a significant difference before and after the intervention, along with a notable increase in knowledge. **Costello, et al., (2008)** demonstrated in their study that patients with multiple sclerosis necessitate education that explicitly elucidates the facts concerning the potential progression and characteristics of the disease, its symptoms, and the significance of diagnostic assessments.

The present study found that the study group's mean scores on treatment satisfaction domains increased more than those of the

control group when the model-based educational intervention was put into practice. Our findings were supported by **Haase, et al., (2016),** who reported that the adherent patients in this trial had significantly higher mean treatment satisfaction scores than the non-adherent patients. According to **Brochet, et al., (2022),** the results demonstrated good patient-reported treatment satisfaction in the four domains over 6 months. Additionally, according to **Thach, et al., (2018)**, participants expressed high levels of satisfaction with treatment across all treatment satisfaction questionnaires for medication TSQM vII measures (i.e., satisfaction with effectiveness, convenience, and global satisfaction). Furthermore, the findings align with those from a study by **Hanson, et al., (2013)**, which evaluated satisfaction with disease-modifying therapies (DMT) using the TSQM vI. The scores obtained were 70.1 for effectiveness, 79.4 for side effects, 71.7 for convenience, and 68.9 for global satisfaction subscales, respectively. So based on the outcome of this study, patients must comprehend the significance of their medications, therapies, and lifestyle modifications to enhance adherence to the prescribed plan. Adherence results in improved outcomes, thereby improving satisfaction.

Additionally, the TENERE trial by **Vermeersch, et al., 2017** indicated that patients were more satisfied with teriflunomide than injectable DMTs (GA and IFNβ) using the TSQM. This finding is in line with the study by **Turčáni, et al., 2020. Hanson, et al., (2013)** reported that the mean convenience, efficacy, and global satisfaction scores for MS patients using fingolimod were 71.7, 70.1, and 68.9, respectively; our study's equivalent scores were 57.53, 65.19, and 59.03. Additionally, in **2017, Fernández, et al.,** assessed the level of drug satisfaction among Spanish MS patients using injectable DMTs, they found that patients' average scores for global satisfaction, efficacy, and convenience were 68.8, 66.8, and 72.5, respectively, suggesting that they were reasonably satisfied with their treatment**.** On the other hand, **Glanz, et al., (2014),** found no statistically significant differences in the overall means of treatment satisfaction.

The study group exhibited a statistically significant enhancement in mean scores of self-efficacy domains following the implementation of the model-based educational intervention, in contrast to the control group. A study by **Kazemi, et al., (2022)** corroborates our findings, indicating that the intervention group's mean self-efficacy score exceeded that of the control group at the two-month follow-up and after the implementation of the continuous care model. Furthermore, **Maslakpak and Raiesi, (2014)** demonstrated that the implementation of a self-management program resulted in a significant increase in the mean self-efficacy score of the intervention group. **Dahmardeh and Amirifard, (2018)** demonstrated that a self-care program grounded in the Orem model enhanced patients' self-efficacy in managing multiple sclerosis.

The findings align with those of **Bijani et al. (2022),** who reported a statistically significant difference in self-efficacy mean scores between the two groups, measured immediately after and three months post-intervention. The intervention group exhibited a significantly higher self-efficacy score compared to the control group. Another study indicates that leveraging peer group experiences can enhance health literacy among MS patients, subsequently improving their self-efficacy and self-care practices. A meta-analysis indicated that short-term group interventions led by peer facilitators yield small yet significant enhancements in patient empowerment and self-efficacy when compared to standard therapies **Dehghani, et.al (2021).**

The current study found that knowledge, global satisfaction, and self-efficacy were significantly correlated (P<0.001*). Similarly, a systematic review by **Safdar, et al., (2021)** verified that knowledge-sharing and self-efficacy are positively correlated. **Fraser, et al., (2013)** explained that people with multiple sclerosis can benefit physically and emotionally from educational interventions, even if they are conducted over the phone and are centered on self-promotion. In actuality, those who have higher levels of self-efficacy are more equipped to handle difficulties and problems. This contradicts the findings of **Claflin, et al., (2021),** who found no

correlation between MS knowledge and self-efficacy, HL, or resilience. These results are indicative of improved knowledge level, and treatment satisfaction of patients through empowering them in terms of self-care. However, in that study, a model-based educational intervention program was held according to the self-management model provided the comprehensive cohesive mode of MS in nursing practice.

Conclusion

The study results concluded that implementing model-based educational intervention significantly enhanced knowledge, treatment satisfaction, and self-efficacy in patients with multiple sclerosis, suggesting its potential as a standard care model.

Recommendations

Based on the current study results, the following recommendations are suggested:

▪ Model-based educational intervention (cohesive nursing model) is recommended to be used by nurses to provide continuous care and interventions for MS patients.

▪ Future research should be implemented to study the effect of model-based educational intervention on MS patients in distinctive settings.

▪ Enhancing nursing training about new nursing intervention modalities assisted by advanced technology.

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