- *Basic Research*

Effect of Energy Conservation Strategies on Fatigue and Daily Living Activities among Patients with Myasthenia Gravis

Hamda Ahmed Mohamed Eldesoky[1]and Fatma Mohamed Elesawy[2]

[1]Assist. Professor of Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt. Nursing College, Najran University, Saudi Arabia. [2]Assist. Professor of Medical-Surgical Nursing, Faculty of Nursing, South Vellay University, Egypt.
Hamda.Ahmed@alexu.edu.eg

Abstract

Background: Myasthenia gravis (MG) is an autoimmune neurological condition characterized by impaired transmission at the neuromuscular junction. MG is a mostly curable condition, although it can cause substantial morbidity and even death. Properly undertaken energy conservation strategies enhance patients' quality of life and allow them to function independently in daily life. **Aims:** This study aimed to evaluate the effect of energy conservation strategies on fatigue and daily living activities among patients with myasthenia gravis. **Subjects and methods:** A quasi-experimental design with parallel groups. A purposive sample of sixty male and female adult patients diagnosed with MG. They were admitted to the neuropsychiatric department at Qena University Hospital. The patients were equally divided between the control group and the study group (n = 30 in each group). The researchers employed three data collection tools. First tool: "Structured interview questionnaire. " Second tool: "Global Fatigue Index. " Third tool: " Barthel Index of Activities of Daily Living (BIADL)." **Results**: The research findings indicated that prior to the energy conservation strategies sessions, the total mean score of fatigue in the study group was 33.5 ± 7.5, compared to 35.3 ± 6.1 in the control group. After eight weeks of performing the sessions, the mean score decreased dramatically to 25.3±6.5 in the study group, compared to 31.6±8.9 in the control group. Additionally, the total mean score of ADL in the study group was 13.2 ± 2.1, compared to 13.7 ± 2.3 in the controls prior to the energy conservation sessions. The mean score increased to 15.8±2 in the study group compared to 13.3±2.03 in the control group after eight weeks of follow-up from baseline. Furthermore, after 8 weeks, the implementation of energy conservation strategies showed a statistically significant difference within the study group, as observed in fatigue ($P = 0.003$) and activities of daily living (ADL) ($P < 0.001$). **Conclusion:** Implementing energy conservation strategies may effectively reduce fatigue levels and enhance independence while performing activities of daily living. **Recommendation:** Implementing energy conservation strategies for patients with MG during the initial stages of the disease can optimize their outcomes and encourage healthcare settings to adopt these strategies, along with education and training programs, to improve positive clinical outcomes.

Keywords:
Energy Conservation Strategies, Fatigue, Daily living activities, Myasthenia gravis.

Introduction

Myasthenia gravis (MG) is the most prevalent condition affecting the neuromuscular junction, a primary autoimmune disease often initiated by antibodies that attack the acetylcholine receptors (AChRs). It is characterized by fluctuating, fatigable weakening of the face, ocular, bulbar, limbs, respiratory, and axial muscles **(Hehir & Silvestri, 2018)**.

The global prevalence of MG is estimated to be between 150 and 200 per million people, affecting approximately 700,000 people worldwide. The disease has a female-to-male ratio of 3:2 in those under 30 and 1:15 in those over 50. Approximately 15-20% of patients experience life-threatening MG crises, usually within two years of diagnosis. In the past, a 50-80% mortality rate was associated with MG crisis. The current inpatient mortality rate overall MG is (2,2), with the crisis rate being higher at (4.47). Death in the MG crisis has been attributed to respiratory failure and advanced age (**Al-Zwaini & Ali, 2019; Dresser et al., 2021).**

Fatigue is a persistent and widespread sensation of exhaustion or the inability to engage in both mental and physical activities for a period of several days to weeks, which cannot be relieved by rest. **(Hoffmann et al., 2016).** The incidence of fatigue in MG trials ranges from 67% to 90%, as assessed by the Fatigue Severity Scale, and is recognized as a principal disabling symptom encountered by the majority of individuals with MG **(Weiss et al., 2024**).

Daily living activities (DLAs) refer to the routine chores that people perform on a daily basis, such as eating, walking, and brushing their teeth. On the other side, myasthenia gravis patients suffer from exhaustion and muscle weakness, which lowers their functional level and makes them more dependent **(Lee et al.,2018).** Fatigue and inability to perform daily activities have a detrimental impact on the quality of life and the ability to sustain a well-paid job. Additionally, this condition leads to a decline in mental and physical capacities, familial disputes, social isolation, fear, despair, diminished productivity, poor self-esteem, and an increase in financial challenges. An intervention is necessary at this time to enhance daily living activities through the application of effective fatigue management strategies **(Kim et al., 2016).**

Energy Conservation Strategies (ECS) are described as the " Identification and promotion of changes in daily activities that result in a reduction in the impact of fatigue through an organized analysis of the daily task, housework, and recreational activities in all pertinent settings." ECS is an alternative fatigue management strategy that has been linked to benefits in populations with other chronic conditions, such as multiple sclerosis and systemic lupus erythematosus (SLE). The ECS theory posits that chronic disease fatigue intensifies when an individual's energy expenditures exceed their energy consumption through daily activities, potentially restricting their engagement in life **(Hamed & Ibrahim, 2021).**

Energy conservation strategies are noninvasive, painless, simple to learn, and free of adverse effects. Additionally, it is cost-effective and increases the quality of life and sense of control that patients have over their condition. Therefore, involving patients in their care plan is a forward-thinking approach that empowers them to recognize their strengths and reduce the severity of their symptoms. This plan, consequently, fosters behavioral modifications that can enhance engagement in activities of daily living **(El Fadeel &El-Deen, 2020)**

Energy conservation involves implementing daily strategies by prioritizing tasks, adopting effective body positions, and arranging the household to minimize energy expenditures during daily activities. Energy conservation strategies can benefit for individuals with MG, as research indicates they possess a diminished energy capacity relative to healthy populations and must

allocate additional energy toward various health-related activities **(Fateh et al., 2022).** Energy conservation encompasses six techniques that involve maintaining a good balance between rest and work during the day; changing lifestyle to decrease energy consumption; using efficient and proper body mechanics; establishing priorities so that the essential task is completed first; utilizing assistive devices, such as a walker or wheelchair, to conserve energy; and environmental modification **(Sadeghi et al., 2016).**

The Neurology nurse encounters a challenge while providing care to a patient experiencing muscle weakness induced by myasthenia gravis. Nurses play a crucial role in delivering patient care and engaging with individuals regularly through assessment, planning, and education to enhance quality of life and reduce financial burdens. Consequently, the nurse must incorporate evidence-based novel therapies into the management plan; however, the resulting shifting in the treatment strategy indicates that the responsibilities of nurses in treating patients with MG widen **(Kołtuniuk et al.,.2017)**

Significance of the study:

Myasthenia Gravis (MG) is a long-term autoimmune condition that impairs the neuromuscular junction, causing diminished muscle endurance and strength with repetitive use. Exhaustion of muscles and weakness are the cardinal symptoms of MG, which tend to intensify by the end of the day following repeated exertion. Not only this, but Myasthenia Gravis disease also affects patients' quality of life and causes many psychological and social problems, as well as physical functioning impairments that require hospitalization **(Fan et al.,2020)**. Therefore, it was crucial to conduct the current study, which aimed to evaluate the effect of energy conservation strategies on fatigue and daily living activities among patients with myasthenia gravis, with the hope of reducing patient fatigue and enhancing daily functioning, consequently strengthening the nursing quality of care for those patients over the long term.

Aim of the Study: This study aimed to evaluate the effect of energy conservation strategies on fatigue and daily living activities among patients with myasthenia gravis.

Research hypothesis:

H1: The study group who practice energy conservation strategies have a significantly lower mean score of fatigue compared to the control group who receive routine hospital care.

H2: The study group that practices energy conservation strategies has a significantly higher mean score for daily living activities compared to the control group that receives routine hospital care.

Operational definition

Energy Conservation Strategies are nursing measures that serve as rehabilitation techniques for managing patients' fatigue, enhancing quality of life, and allowing them to function independently in daily life associated with MG. These strategies are created by authors and conveyed to patients during nursing sessions. These strategies reflect nursing recommendations for exercise, the use of assistive devices, body mechanics, diet, fluid intake, sleep habits, stress management, and planning and prioritizing activities.

Subjects and Methods:

Research design:

A quasi-experimental design, specifically the pre-post-intervention design, was selected to assess the benefits of targeted interventions. A pretest and posttest nonequivalent control group design. This method is used to assess the impact of an intervention by comparing scores on a variable before and after the intervention has been implemented, as declared **by Andrade (2021).**

Setting:

The current study was conducted at the neuropsychiatric department in addition to the outpatient clinic of Qena University Hospital. The neuropsychiatric department is located on the 4th floor and comprises two rooms, each with eight beds, providing care for patients with neurological disorders. The patient-to-nurse ratio in the unit is 2:1. The Neuropsychiatric Outpatient Clinic, located on the first floor, consists of two rooms: one for examinations and another for patient waiting areas.

Subjects:

The study population consisted of a purposive sample of 60 patients recruited over a six-month period for this research. These patients were recruited based on the specified inclusion criteria: ages between 20 and 60 years, ability to communicate from both genders, and free from other neuromuscular disorders, chronic pain, rheumatologic conditions, disabling orthopedic issues, or stroke within the past year.

- All subjects were divided equally into two groups: a study group and a control group, with each group consisting of 30 patients. The control group (I) obtained conventional hospital care. The study group (II) implements energy conservation strategies.
- The sample size was estimated by the researchers using G*power software version 3.1.9.7, which is based on T-tests with an effect size of 0.50, an alpha error probability of 0.05, and a power of 0.90 for the differences observed between pre, post, and follow-up tests. The program recommends a total of 60 newly diagnosed patients with myasthenia gravis (MG).

Tools for data collection:

To accomplish the aims of the study, three data collection tools were employed:

Tool I: Structured Interview Questionnaire. The researchers developed it to collect bio-demographic and clinical data **(Alekseeva et al., 2018; Salari et al., 2021).** It consists of two sections:

Section one: Bio-demographic data. This section collects data on participants' demographics, including age, gender, education, occupation, marital status, place of residence, and living status.

Section Two: Clinical Data. This section includes the patient's clinical history, as well as their family history of myasthenia gravis. Medical health history, including type, duration, symptoms, current medication, thymectomy operation, and comorbidities.

Tool II: Global Fatigue Index (GFI):

- It is a self-administered questionnaire adopted by Belza et al. (1995); it is derived from the Multidimensional Assessment of Fatigue (MAF), which includes 15 items scale that evaluates fatigue according to four categories: degree and severity (items 1and 2), distress caused (item 3), impact on various activities of daily living (items 4-14), and timing of fatigue (item 15).
- A numerical rating GFI scale was employed for questions 1–14, scaled from one to ten points, with one point indicating no complications and ten points indicating severe complications. Furthermore, question 15 is divided into four subpoints, each with multiple-choice options, ranging from more complicated to less complicated ones.
- The scoring scale is as follows: To score item 15, which assesses the frequency of fatigue, the responses are converted from a 1–4 scale to a 2.5–10 scale by multiplying by 2.5. This adjusted score, along with the scores from items 1–14 (degree, severity, distress, and impact on daily life), is used to calculate the **(GFI)**.

The total GFI can range:

- From 1 to less than 20, indicating mild fatigue
- From 20 to less than 35, indicating moderate fatigue
- From 35 to 50, indicating severe fatigue

The validity and reliability of GFI; Cronbach's alpha > 0.9 reflects high internal consistency and test-retest reliability (intraclass correlation coefficient r = 0.80). The alpha value of 0.93 indicates that the tool is highly reliable.

Tool III: Barthel Index of Activities of Daily Living (BIADL)

- This tool, created by **Collin et al. (1988)**, is used to assess an individual's level of independence in mobility and performing basic daily activities. It includes ten items that evaluate functions such as feeding, bathing, dressing, personal hygiene, bladder and bowel control, toileting, transferring between chair and bed, stair climbing, and walking.
- The **(BIADL)** provides a cumulative score, with greater emphasis placed on mobility and continence tasks. Scoring is distributed as follows: Bathing and grooming are rated with either 0 or 1 point each. Feeding, dressing, toileting, bowel and bladder control, and stair use are each rated on a scale of 0, 1, or 2 points. Transfers and walking are scored 0, 1, 2, or 3 points. The maximum possible score is 20, with higher scores reflecting greater independence:

  - A score of 0 indicates total dependence.
  - Scores between 1 and 16 suggest the individual requires assistance.
  - Scores from 17 to 20 indicate full independence. The reliability of the BIADL has been confirmed with a Cronbach's alpha of 0.92, indicating high internal consistency.

Study framework:

The study followed a three-phase process

I-Preparatory phase:

- Ethical approval to perform the study was obtained from the Research Ethical Committee of the Faculty of Nursing, South Valley University (**Serial number SVU-NUR-MED SUR-22-2-12-2024**). Moreover, official permission from the Faculty of

Nursing at South Valley University was obtained by the study's responsible authorities after they explained the study's aim.

- The researchers created a written, instructional, and colorful booklet with images to help each patient understand energy conservation strategies on an individual basis. This booklet included information on the nature of the disease, its causes, symptoms, aggravating factors, treatments, and the significance of energy conservation strategies and techniques, all of which were illustrated with photos.

- To assess content and construct validity, the developed tool and instructional booklet were presented to a panel of five specialists with backgrounds in medical-surgical nursing and neuropsychiatric medicine to ensure their relevance and to make any necessary adjustments.

- A pilot study was performed on 10% of the total participants to test the tool's clarity and reliability. Necessary changes were implemented based on the results, and these participants were excluded from the main study.

II-Implementation phase:

1. The process of gathering data begins with presenting oneself to the patients, greeting them, and then explaining the study's goal to those who meet the inclusion criteria. Following this, patients were randomly assigned to two groups: one serving as a control and the other as the study group.
2. Before initiating the energy conservation strategies sessions, the researchers used three study tools to gather essential information regarding patients' sociodemographic and clinical data. The GFI and BIADL tools were filled out to assess the degree of independence and fatigue in each group.
3. During the first visit, the researchers conducted individual interviews with participants from both groups to assess their initial responses.
4. Following that, the researchers tailored approaches to motivate the patients in the study group to apply energy conservation strategies. The researchers planned the following measures to fulfill the study's goal:

- Gave patients instructions that included scheduling rest periods throughout the day, budgeting their energy, scheduling rest periods, practicing appropriate body mechanics and posture, segmenting daily activities into manageable components, prioritizing tasks, educating them on ergonomic principles, evaluating the (ADLs) performance, and making environmental adjustments.

- Furthermore, the researchers disseminated simplified, image-based educational booklets that they had created as a home message for patients.

- The study group received four teaching sessions, the first of which included the explanation of energy conservation strategies during the initial interview (first week). The session also covered techniques for implementing the plan, including lifestyle modifications and balancing between rest and work throughout the day to lower energy expenditure. During the second session, participants learned how to use their bodies correctly and efficiently, how to prioritize tasks so that the most important ones are completed first, how to utilize assistive devices such as a wheelchair or walker to conserve energy, and how to adapt their surroundings to meet their specific needs. The third session included practical training with a physical therapist on a set of exercises

that strengthen patients' muscles, such as (exercises to strengthen the muscles of the eyes, mouth, neck, arm, hand, leg, and foot) and discussed the optimal timing, type, and quantity of exercises to be performed. During the fourth session, patients reviewed all the prior instructions, and the researchers double-checked that they were serious about incorporating energy-saving techniques into their everyday lives. About thirty minutes were allotted for each session.

- Additionally, further emphasizing the value of the suggested energy conservation strategies, weekly mobile phone calls were made throughout the 8-week study as a reminder intervention.
- However, upon completing the data collection phase, the control group was provided with an illustrative Arabic booklet to uphold the principle of fairness.

III. Evaluation phase

In this phase, follow-up assessments were performed twice for both groups: at the fourth week and again at the end of the eighth week, utilizing the GFI and BIADL tools.

Ethical consideration:

- The Faculty of Nursing's Ethics Committee (**Serial number SVU-NUR-MED SUR-22-2-12-2024**) authorized the research idea.
- Informed consent was obtained from the participants after outlining the nature and goals of the study,
- Anonymity and confidentiality were guaranteed.
- At any time during the research, the patient was free to withdraw from the study without providing a reason or to decline participation altogether.

Statistical analysis:

Data analysis was conducted using SPSS version 25. Descriptive statistics, including frequencies, percentages, and the mean (standard deviation), were used to present the data. The Chi-square test was used to compare categorical variables between groups. Monte Carlo: Adjust the chi-square statistic when more than 20% of the cells have an expected count that is below. The student t-test was used to compare two studies of normally distributed quantitative variables.

Results

Table 1 shows that the study group's mean age was 30.8 ± 8. 8 years, while the control group's mean age was 32.9 ± 9.6 years. In addition, females comprised 60.0% of the study group and 62.0% of the control group. Furthermore, 63.0% of the study group and 80.0% of the participants in the control group were married. Regarding educational attainment, 40.0% of the study group and 33.3% of the control group completed secondary school. Also, 46.4% of the study group and 60.0% of the controls were unemployed and housewives. According to the residents, 73.3% and 66.7% of the study and control groups, respectively, came from rural regions. Finally, 93.3% of the study group and 83.3% of the control group live with their families. Furthermore, the sociodemographic characteristics of the two groups did not differ significantly.

Table 2 shows that 100.0% of the study group and 93.0% of the control group had no family history of the condition. In addition, 42.0% and 40.0% of the study and control groups, respectively, had a generalized form of MG. Whilst the study group recorded 66.7%, the control group recorded 63.3% of illness duration of (1<5 years). Approximately 23.3% of the study group and 30.0% of the control group reported experiencing limb weakness. Moreover, 96.7% and 93.3% of the study and control groups, respectively, were adhering to medications such as Cholinesterase Inhibitors. As regards the presence of comorbidities, 36.7% and 30.0%, respectively, of both study and control groups had hypertension. Moreover, health-related data did not show a statistically significant difference between the two groups.

Table 3 demonstrates that during the baseline assessment, 56.7% of the control group reported experiencing moderate fatigue, followed by 53.3% at the fourth week and 60.0% at the end of the eighth week. Conversely, 50.0% of the study group reported moderate fatigue at baseline. They recorded 43.3% of mild fatigue (in the fourth week) and 50.0% (in the eighth week) following the implementation of energy conservation strategies.

Table 4 shows that at baseline, 60.7% of the study group and 66.7% of the control group needed help with activities of daily living. While 36.7% of the study group, compared with 66.7% of the control group, still needed help in the fourth week. Additionally, by the end of the eighth week, 50.0% of the patients in the study group were independent, compared with 66.7% of the control group, who still needed help.

Table 5 shows that at baseline, the total mean fatigue scores between the control and study groups revealed no statistically significant difference (t-test = 1.010, P = 0.317). After implementing energy conservation strategies, a statistically significant difference was observed between the study and control groups in the fourth and eighth weeks (t-test = 2.170, P = 0.034) and (t-test = 3.139, P = 0.003), respectively.

Table 6, comparing the study and control groups at the baseline assessment, showed no statistically significant difference in the total mean scores of activities of daily living (t-test = 0.134, P = 0.425). Furthermore, after the fourth week of implementing energy conservation strategies, the study and control groups exhibited a statistically significant difference (t-test = 3.847, P < 0.001), which persisted after the eighth week (t-test = 3.903, P < 0.

Table 1: Percentage distribution of the study and control groups' sociodemographic characteristics (n=60).

Sociodemographic characteristics	Study group N=30		Control group N=30		χ^2	P. value
	No.	%	No.	%		
Age (year)						
< 40	17	56.7	22	73.3	1.832	0.176
> 40-65	13	43.3	8	26.7		
Mean± SD	30.8±8.8		32.9 ±9.6		*t*=0.391	0.376
Gender						
Male	12	40.0	10	33.3	0.287	0.287
Female	18	60.0	20	66.7		
Marital status						
Single	3	10.0	5	16.7	2.151	0.573
Married	24	80.0	19	63.3		
Divorced	1	3.3	2	6.7		
Widow	2	6.7	4	13.3		
Educational attainment						
Illiterate	2	6.7	3	10.0	0.763	0.889
Read & write	5	16.7	7	23.3		
Secondary education	12	40.0	10	33.3		
University level	11	36.7	10	33.3		
Occupation						
Unemployed & housewife	14	46.7	18	60.0	1.122	0.773
Employee	10	33.3	8	26.7		
Free work	3	10.0	2	6.7		
Retired	3	26.7	2	6.7		
Place of residence						
Urban	8	26.7	10	33.3	0.317	0.573
Rural	22	73.3	20	66.7		
Living status						
Living alone	0	0.0	2	6.7	2.061	0.508
Lives with family	28	93.3	25	83.3		
Lives with relatives	2	6.7	3	10.0		

χ^2= chi square **** Significant P value ≤0.05***

Table 2: Percentage distribution of health-related data of both the study and control group (n=60).

Clinical data	Study group N=30		Control group N=30		χ^2	P. value
	No.	%	No.	%		
Family history						
Yes	0	0.0	2	6.7	2.096	0.150
No	30	100.0	28	93.3		
Type of MG						
Ocular	9	30.0	7	23.3	0.341	0.771
Generalized	21	70.0	23	76.7		
Duration of illness (years)						
<1 year	7	23.3	6	20.0	2.151	0.573
1 to 5 years	19	63.3	20	66.7		
6 to 10 years	3	10.0	2	6.7		
>10 years	1	3.3	2	6.7		
Symptoms *						
Vision disturbance (blurred, diplopia)	6	20.0	5	16.7	0.111	0.739
Ptosis	7	23.3	9	30.0	0.341	0.559
Difficulty in swallowing	8	26.7	8	26.7	-	1.00
Slurred speech	5	16.7	3	10.0	0.577	0.448
Limb weakness	9	30.0	7	23.3	0.341	0.559
Shortness of breath	2	6.7	2	6.7	-	1.00
Voice change	1	3.3	2	6.7	0.351	0.554
Treatment*						
Cholinesterase Inhibitors	29	96.7	28	93.3	0.351	0.554
Glucocorticoids	24	80.0	23	76.7	0.098	0.754
Immunosuppressants	11	36.7	13	43.3	0.287	0.558
None	1	3.3	2	6.7	0.351	0.554
Thymectomy surgery						
Yes	13	43.3	16	53.3	0.601	0.438
No	17	56.7	14	46.7		
Comorbidities*						
Hypertension	11	36.7	9	30.0	0.300	0.584
Diabetes	5	16.7	4	13.3	0.419	0.945
Hyperlipidemia	10	33.3	9	30.0	0.77	0.781
No	18	60.0	21	70.0	0.695	0.417

χ^2= chi-square **** Significant P value ≤0.05***

****The total differs due to multiple responses provided by each participant.***

Table 3: Frequency and percentage distribution of the study and control groups' overall fatigue scores over the study period (n=60).

Total fatigue score	Study group (n=30)						Control group (n=30)						χ^2 (P1)	χ^2 (P2)	χ^2 (P3)
	Baseline		4 weeks follow-up		8 weeks follow-up		Baseline		4 weeks follow-up		8 weeks follow-up				
	No	%	No	%	No	%	No	%	No	%	No	%			
Mild (5<20)	0	0.0	13	43.3	15	50.0	2	6.7	4	13.3	4	13.3	2.370 (0.310)	7.003 (0.038) *	9.391 (0.011) *
Moderate (20<35)	15	50.0	12	40.0	11	36.7	17	56.7	16	53.3	18	60.0			
Severe (35–50)	15	50.0	5	16.7	4	13.3	11	36.7	10	33.3	8	26.7			

P1: The differences between study and control as a baseline ***P2: The differences between study and control at 4 weeks Follow-up***
P3: The differences between study and control at 8 weeks Follow-up ***χ^2= chi square*** **** Significant P value ≤0.05***

Table 4: Comparison between the studied groups according to the Barthel Index of Activities of Daily Living during the study period (n=60)

Activity levels	Study group (n=30)						Control group (n=30)						χ^2 (P1)	χ^2 (P2)	χ^2 (P3)
	Baseline		4 weeks follow-up		8 weeks follow-up		Baseline		4 weeks follow-up		8 weeks follow-up				
	No	%	No	%	No	%	No	%	No	%	No	%			
Completely dependent (0–6)	10	33.3	5	16.7	5	16.7	7	23.3	8	26.7	8	26.7	0.904 0.713	12.305 (0.002) *	13.679 (0.001) *
Needs help (7–13)	18	60.0	11	36.7	10	33.3	20	66.7	20	66.7	20	66.7			
Independent (14–20)	2	6.7	14	46.7	15	50.0	7	23.3	8	26.7	8	26.7			

P1: The differences between the study and control as a baseline ***P2: The differences between the study and control at 4 weeks Follow-upP3: The differences between the study and control at 8 weeks Follow-up*** ***χ^2= chi square*** **** Significant P value ≤0.05***

Table (5): Comparison of fatigue mean scores among studied groups during the study periods (n=60)

Fatigue scales	Study group N=30	Control group N=30	P .value	t-test
	$\bar{X}$ ±SD	$\bar{X}$ ± SD		
Baseline	33.5±7.5	35.3±6.1	1.010	(0.317)
4 weeks follow-up	27.3±8.7	32.3±8.9	2.170	(0.034) *
8 weeks follow-up	25.3±6.5	31.6±8.9	3.139	(0.003) *

t= independent t-test ***Significant P value ≤0.05***

Table (6): Comparison of mean scores of daily living activities among studied groups during the study periods(n=60)

Fatigue scales	Study group N=30	Control group N=30	P .value	t-test
	$\bar{X}$ ±SD	$\bar{X}$ ± SD		
Baseline	13.2±2.1	13.7±2.3	0.134	(0.425)
4 weeks follow-up	15.6±3.05	13.10±2.0	3.847	(<0.001) *
8 weeks follow-up	15.8±2.9	13.3±2.03	3.903	(<0.001) *

t= independent t-test ***Significant P value ≤0.05***

Discussion:

Myasthenia gravis is a chronic autoimmune condition characterized by the presence of autoantibodies that circulate in the body and attack elements of the neuromuscular junction (NMJ) in skeletal muscles, potentially progressing to a fatal manifestation over time. Muscle weakness is the most distinctive sign, and it typically worsens with prolonged exertion and improves with relaxation. From moderate eye involvement to severe widespread weakness, the severity can range **(Lorenzoni et al., 2020).** Patients with myasthenia gravis often experience fatigue and struggle with daily living tasks. In light of this, the current study was conducted to evaluate the effect of energy conservation strategies on fatigue and daily living activities among patients with myasthenia gravis.

The current study's findings revealed no statistically significant difference between the studied groups regarding sociodemographic and baseline data. Thus, the patients in both groups are statistically identical and are dispersed similarly. More than half of the participants in both groups were under the age of 40. The mean age of participants in the study and control groups was 30.8±8.8 and 32.9±9.6 years, respectively. The results align with those of **Elkady, Ahmed, and Abd El-Naby (2023)**, who reported a mean age of 33.96 ± 9.81 years, with nearly three-quarters of the participants falling within the 20-40 years age range. Additionally, this result does not align with **Hamed & Ibrahim (2021),** who reported that almost half of the patients in the study were over the age of forty, with a mean age of 44.12 ± 6.32.

The result also indicated that more than half of the patients in both groups were females. The study's findings were consistent with those of **Al-Ahmer and Elshony (2021),** who reported that three-quarters of the study population consisted of females. The higher proportion of females in the study population may be attributable, in part, to the fact that women undergo continuous hormonal changes, with estrogen being a potent stimulant of autoimmune disease. Taking oral contraceptives, which can affect hormone levels, may be another reason why some women develop MG **(Desai & Brinton, 2019).**

An additional factual explanation is that MG primarily affects women under the age of 40, which provides further evidence supporting this theory **(Thomsen, Vinge, Harbo, & Andersen, 2021).** The participants' ages ranged from twenty to forty when the condition first manifested, as shown earlier. The current study's results contradicted those of **Suppiah et al. (2022),** who conducted a cross-sectional study to investigate the daily living activities and quality of life of MG patients. They found that men comprised more than half of the participants, with an average age ranging from 48 to 55 years.

In terms of marital status, it was noted that approximately two-thirds of individuals in both groups were married. The findings align with those of **Alanazy (2019)**, who reported that approximately two-thirds of the people studied were married. In terms of educational attainment, a third of the patients surveyed in both groups had completed secondary education**.** This finding was consistent with that of **Hamed and Ibrahim (2021)**, who similarly found that more than half of their patients had completed secondary school. Regarding occupation, it was discovered that more than half of the patients in both groups who were questioned about their occupation were unemployed or housewives. This finding contradicts the findings of **Alanazy (2019),** which revealed that more than one-third of the patients surveyed were employees.

The current study found that the majority of patients in both groups lived with their families and were from rural areas; this may be because people living in rural areas are less likely to be single and more likely to value family life, which could explain this phenomenon. These findings were in line with those of **Jeong et al. (2018),** who discovered that most individuals with the disease lived with their relatives.

Concerning family history, the current study found that almost all patients in both groups surveyed did not have a family history. The study findings were in line with those of **Elkady, Ahmed, and Abd El-Naby (2023),** who reported that practically all subjects had no family history of the disease. This seemingly contradictory outcome is understandable given that few Egyptian hospitals have a formal system in place to record cases of hereditary autoimmune illnesses, and even fewer Egyptians are aware that their own families may be at risk of developing such diseases. The study's results showed that roughly two-thirds of patients in both groups suffered from generalized myasthenia gravis, the most common type of MG. This finding was corroborated by **Jeong et al. (2018**), who reported that more than half of the study's participants suffered from generalized myasthenia gravis (MG).

Concerning initial signs and symptoms, ptosis and limb weakness affect nearly one-third of the studied patients in both groups. Consistent with the study's findings, **Algahtani et al. (2021)** carried out the study**.** Who concluded that the participants in this study exhibited a variety of symptoms, including ptosis, diplopia, impaired vision, and weakened limbs. Despite this, the study found that the onset of symptoms was most severe in the third decade of the patients' lives. Regarding the duration of diseases, more than half of the patients in both groups reported a disorder duration of one to five years. These findings matched with those of **Alanazy (2019),** who noted that more than half of individuals with myasthenia gravis had experienced the condition for four years or longer. Nonetheless, this finding contradicts the results of **Vitturi et al. (2020),** who reported a mean disease duration of 10.6 ± 7.5 years in their cross-sectional study on adherence to medication among MG patients in Brazil.

The present study demonstrated that all MG patients in both groups utilized cholinesterase inhibitors as part of their treatment regimen. This result is consistent with the findings of a survey conducted by **Sanders et al. (2018),** who reported that immune-modulating agents and cholinesterase inhibitors were the most frequently used treatments among participants. As regards the presence of comorbidities, more than one-third of both the study and control groups had hypertension. Moreover, there was no statistically significant difference between the two groups in terms of all health-related data. The present research aligns with the result of **Hassan et al. (2022),** who found that nearly half of the patients they studied had hypertension and were taking antihypertensive medication, with a higher proportion of patients showing hypertension.

Regarding thymectomy surgery, the current study found that more than half of the control group patients and nearly half of the study group patients had undergone the procedure, underscoring its role in MG pathogenesis and treatment. This finding was reinforced by **Hoffman et al. (2016)**, who reported that more than half of the patients underwent thymectomy.

Consequently, various studies have indicated that most MG patients experience a significant decline in their ability to carry out daily living activities due to fatigue. The results of the current study suggest that the application of energy conservation strategies (ECS) in the study group led to a significant decrease in fatigue compared to the control group. The results support the study's premise by showing that the control and study groups experienced significantly different levels of exhaustion after energy-saving measures were implemented. Considering that energy-saving measures permit adequate relaxation and sleep, both of which contribute to reducing fatigue, this conclusion is logical. Furthermore, these methods outline how to perform ADLs with minimal effort by minimizing unnecessary motions and utilizing proper body mechanics **(Fateh et al., 2022).**

Furthermore, energy conservation strategies optimize the use of assistive devices, reducing energy waste and losses. Most participants thought the ECS intervention was dependable and helpful for the workstation approach and something they could incorporate into their lives to reduce fatigue and improve overall health; therefore, it was likely well-received and accepted. The results of this study corroborate those of **Farragher et al. (2020),** which demonstrated that energy management education effectively reduces fatigue among participants with chronic kidney disease requiring dialysis. Prior research by **El Fadeel and El-Deen (2020**) found that energy conservation measures significantly reduced fatigue levels in patients with systemic lupus, which supports the results of this study.

The current study found that nearly two-thirds of the study and control groups needed assistance with daily activities at baseline. Furthermore, the study group that participated in energy conservation sessions differed significantly from the control group that received routine hospital care in terms of mean scores for activities of daily living at the end of the fourth and eighth weeks of the intervention. The results of the investigation provide credence to the second research hypothesis. This finding may be viewed as encouraging patients who employ energy-saving strategies to learn how to adjust their activities according to their energy level. Additionally, they found that taking brief breaks enabled them to regain their composure before returning to work. Greater engagement in daily activities is possible as a result of less fatigue brought on by energy-saving techniques. The results of the present study align with those of **Caplan et al. (2016) and Kim et al. (2016)**, which support energy conservation strategies that may effectively decrease fatigue and increase participation in

daily living activities. In general, energy conservation strategies are effective in reducing fatigue and enhancing day-to-day productivity. They are also safe, easy to use, cost-effective, and self-administered. Patients gain confidence and are better able to live independently, which encourages them to change their behavior for the better and become more involved in their daily lives.

Conclusion

The findings of the current study suggest that implementing energy conservation strategies may be beneficial in reducing fatigue and improving daily living activities in patients with MG. Furthermore, the study's results support both research hypotheses.

Recommendations

- It is recommended that energy conservation strategies be implemented for patients with MG during the initial stages of the disease to optimize their outcomes.
- Furthermore, the current study should be replicated with a larger sample size across diverse geographical regions.
- Increase nurses' awareness of the importance of implementing strategies that can contribute to reducing the length of hospital stay, lowering the risk of complications, and improving positive clinical outcomes.
- In this context, the study may provide guidelines for implementing other evidence-based nursing practices.

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الملخص العربى

تأثير استراتيجيات الحفاظ على الطاقة على التعب وأنشطة الحياة اليومية لدى مرضى الوهن العضلي الوبيل

المقدمة: الوهن العضلي الوبيل (MG) هو مرض مناعى ذاتى يُضعِف التواصلَ بين الأعصاب والعضلات، مما يؤدي إلى حدُوث نوبات من الضُعف العضلي. يُعد الوهن العضلي الوبيل حالة قابلة للشفاء في الغالب، على الرغم من أنه قد يُسبب اعتلالًا كبيرًا،ويسبب الوفاة. تُحسّن استراتيجيات الحفاظ على الطاقة المُتبعة بشكل صحيح جودة حياة المرضى، وتُمكّنهم من أداء وظائفهم اليومية باستقلالية.

الهدف من الدراسة: تقييم تأثير استراتيجيات الحفاظ على الطاقة على التعب وأنشطة الحياة اليومية لدى مرضى الوهن العضلي الوبيل.

افتراضات البحث:

افتراضية 1: المرضى الذين يعانون من الوهن العظمى الوبيل ، والذين تطبق عليهم استراتيجيات الحفاظ على الطاقة يشعرون بدرجات إرهاق أقل، من أولئك الذين لا يمارسونها.

افتراضية 2:المرضى الذين يعانون من الوهن العظمى الوبيل ، والذين تطبق عليهم استراتيجيات الحفاظ على الطاقة يشعرون بتحسن فى أنشطة الحياة اليومية ، من أولئك الذين لا يمارسونها.

منهجية البحث : : تم استخدام تصميم بحثي تجريبي لاجراء هذه الدراسة على 60 مريضا يعانون الوهن العضلي الوبيل فى قسم الأمراض العصبية والنفسية بمستشفى جامعة قنا.

أدوات البحث: تم استخدام ثلاث أدوات في هذه الدراسة لجمع البيانات.

- **الأداة الاولى :** استيان المقابلة المنظم الخاصة بالبيانات الاجتماعية والديموغرافية والاكلينيكية للمريض
- **الأداة الثانية** : مؤشر التعب الشامل (GFI)
- **الأداة الثالثة:** مؤشر بارثيل لأنشطة الحياة اليومية (BIADL)

النتائج: لقد اسفرت نتائج البحث عن الاتى: قبل تطبيق استراتيجيات الحفاظ على الطاقة، بلغ متوسط درجة التعب في مجموعة الدراسة 33.5 ± 7.5، مقارنةً بـ 35.3 ± 6.1 في المجموعة الضابطة. بعد ثمانية أسابيع ، انخفض متوسط الدرجة بشكل كبير إلى 25.3 ± 6.5 في مجموعة الدراسة، مقارنةً بـ 31.6 ± 8.9 في المجموعة الضابطة. بالإضافة إلى ذلك، بلغ متوسط درجة أنشطة الحياة اليومية في مجموعة الدراسة 13.2 ± 2.1، مقارنةً بـ 13.7 ± 2.3 في المجموعة الضابطة قبل تطبيق استراتيجيات الحفاظ على الطاقة. ارتفع متوسط الدرجة إلى 15.8 ± 2 في مجموعة الدراسة مقارنةً بـ 13.3 ± 2.03 في المجموعة الضابطة بعد ثمانية أسابيع من المتابعة من خط الأساس. علاوة على ذلك، بعد 8 أسابيع، أظهر تطبيق استراتيجيات الحفاظ على الطاقة فرقًا ذا دلالة إحصائية ضمن مجموعة الدراسة، كما لوحظ في التعب ($P = 0.003$) وأنشطة الحياة اليومية ($P < 0.001$).

الخلاصة: ان تطبيق استراتيجيات الحفاظ على الطاقة تقلل مستويات التعب بشكل فعال ويُعزز الاستقلالية أثناء أداء أنشطة الحياة اليومية.

التوصيات: : تطبيق استراتيجيات الحفاظ على الطاقة لمرضى الوهن العضلي الوبيل خلال المراحل الأولى من المرض أن يُحسّن نتائجهم، وتُشجيع مؤسسات الرعاية الصحية على تبني هذه الاستراتيجيات، إلى جانب برامج التثقيف والتدريب، لتحسين النتائج السريرية الإيجابية.