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Effectiveness of Exercises on Fatigue Level in Patients with Systemic Lupus Erythematosus

Fayza Kamel[1], Naglaa Mohamed El-Mokadem[2,*], Om Mohamed Abd El Latif[1], Atef Abo AL Soud[3]

[1]Medical Surgical Nursing Department, Faculty of Nursing, Menoufia University
[2]Critical Care Nursing Department
[3]Tropical Medicine, Faculty of Medicine, Menoufia University
*Corresponding author: naglaae@yahoo.com

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Abstract Systemic Lupus Erythematosus (SLE) is a rheumatic disease characterized by a variety of symptoms, especially fatigue and pain. Currently there is no effective pharmacological treatment for fatigue in SLE. Research suggests that exercise can reduce feelings of fatigue. **Aim:** to examine the effects of exercise intervention on fatigue level among patients with SLE. **Methods**: A quasi-experimental (pre-post test) design was used. The study was conducted at the Chronic Illness Clinics in Menoufia University Hospital, at Shebin El-Kom district, Menoufia Governorate. A convenient sample of 70 patients was recruited. **Tools**: A Semi Structured Demographic Sheet; Piper Fatigue Scale to assess fatigue level. **Results**: There was a statistically significant difference between the study and the control group regarding fatigue level post intervention, 54.3% and 40% of the study and the control groups respectively experienced severe fatigue pre intervention compared with 17.1% and 31.4% post intervention. Also, there was a relationship between fatigue level and gender as well as educational level among the study group. **Conclusion:** Fatigue should be considered as an important factor influencing patient daily life independent of disease activity. **Recommendations**: Prepare training programs for nurses about the importance of adding exercise to patient's schedule for the reduction of fatigue among patients with SLE along with the routine hospital care.

Keywords: *exercises, fatigue, nursing intervention, systemic lupus erthematosus*

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1. Introduction

Systemic Lupus Erythematosus (SLE) is a chronic multisystem autoimmune disease with a wide range of laboratory and clinical features. Although mild in severity in a significant number of patients, SLE can be severe and refractory to therapy in others and is associated with mortality rates higher than that of the general population [1].

There is evidence that the clinical features of SLE such as disease activity and inflammation [2] as well as co-morbid conditions such as anemia, hypothyroidism and fibromyalgia are thought to contribute to fatigue. [3,4]. Also, secondary features of SLE such as reduced sleep quality and physical de-conditioning as well as psychological variables are also believed to contribute to fatigue in SLE.

The relationship between disease activity and fatigue has been examined in eighty-one patients with SLE by Tayer et al., [5]. Participants underwent a clinical evaluation with the Systemic Lupus Activity Measure and completed self-reported questionnaires on psychosocial data, depression, feelings of helplessness and fatigue. The findings indicated that SLE disease status predicted fatigue at two different time points in the longitudinal analysis, independent of depression and helplessness, by using hierarchical multiple regression analyses.

Interleukin 1 (IL-1), IL-6 and tumor necrosis factor alpha (TNF-alpha) are pro inflammatory cytokines implicated in chronic fatigue. All of these are present in chronic inflammatory state of SLE [6]. Pro inflammatory cytokines have been indicated to promote oxidative and nitrosative stress with ending production of damage-associated molecular pattern molecules (DAMPS) that engage with Toll-like receptors (TLR) [7]. The interaction of DAMPS and TLR results in symptoms of extreme fatigue in SLE patients. Interferon α is another important cytokine that plays a role in disease pathogenesis and neuropsychological symptoms of SLE, such as fatigue, depression and seizures [8].

Iron-deficiency anemia causes a reduction in the levels of red blood cells and oxygen in the body. When iron supply is low, the body begins to use up its iron stores, preventing it from making enough red blood cells. This causes muscle ache and weakness. This pain results from a lack of oxygen in the muscles. Also, red blood cells remove carbon dioxide and waste products from the muscles. When red blood cells are low, toxins accumulate and cause general fatigue [9].

Autoimmune thyroid disease is common in lupus. About 6% of people with lupus have hypothyroidism. Hypothyroidism can cause weight gain, fatigue, depression, moodiness, and dry hair and skin.

Fibromyalgia can be seen in 70% of study populations coexisting with SLE [10]**.** It is thought that Fibromyalgia coexisting with SLE contributes to fatigue in SLE patients [11]. One study showed a prevalence of fibromyalgia in only 10% of 216 patients with SLE complaining of fatigue [5].

Sleep disturbances are common in patients with SLE [3,12,13,14]. Patients with SLE reported poor sleep quality including frequent awakenings and restlessness. Sleep–wake disturbances are thought to worsen the disease symptoms including fatigue and lower quality of life. A sleep quality was assessed in 100 women with SLE by utilizing the Pittsburgh Sleep Quality Index over a one-month period [15]. The findings of the study reflected moderate to severe sleep impairments in 56% of the SLE population.

Vitamin D inadequacy is highly prevalent in SLE patients due to the avoidance of sunshine, photo protection, renal insufficiency and the use of medications such as glucocorticoids, anticonvulsants, antimalarials and the calcineurin inhibitors, which alter the metabolism of vitamin D or down regulate the functions of the vitamin D receptor [16]. The relationship between fatigue and vitamin D insufficiency, defined as serum levels below 30 mg/ml, and deficiency, defined as serum levels below 10 mg/ml, were found in a study by Ruiz-Irastorza *et al*., [17]. It has been reported that there is an inverse relationship between vitamin D levels and fatigue in SLE. Individuals with SLE have reduced exercise capacity [18], reduced strength [19], reduced quality of life [20] and elevated levels of fatigue [21]. More than 50% of people with SLE describe fatigue as the most disabling disease symptom [22].

An observational study was conducted by Hassanalilou. et.al, [23] on 80 patients with SLE to evaluate the vitamin D insufficiency and changes in fatigue. The study findings revealed that increasing vitamin D levels have a positive effect on fatigue. A clinical trial conducted by Rifa et al., [24] to determine the effect of vitamin D supplementation on disease activity and fatigue condition in Systemic Lupus Erythematosus (SLE) patients with low level of Vitamin D. Subjects were randomized into two different groups (supplementation or placebo) using simple random sampling. Twenty subjects were allocated for the supplementation group and 19 subjects for the placebo group. Findings showed that there was a significant difference in the mean level of fatigue between the supplementation group and the placebo group.

SLE-related fatigue disrupts patients' normal daily life, affects work and social activities and 81% of patients indicated that healthcare providers are not providing adequate support in the management of SLE-related fatigue [25].

Physical activity can prevent long-term consequences of SLE such as obesity, osteoporosis and premature cardiovascular and cerebrovascular diseases risk [26]. Exercise increases plasma levels of high-density lipoprotein cholesterol and reduces triglyceride levels, thus preventing the occurrence of hypercholesterolemia, which is an important factor in the development of atherosclerosis [27]**.** Regular exercise is one of the single most important things patients can do to help combat fatigue [28]. Exercise can help people with lupus build stronger muscles, prevent joint stiffness, control fatigue and improve quality of life [29]. Therefore, adding exercise in patients with the SLE schedule has a significant impact on fatigue level.

1.1. Significance of the Study

Hifinger et al. (2016) indicated that the information about fatigue cannot be transferred between different countries and patients in high-income countries. Developed countries had higher levels of fatigue than patients from other countries. Furthermore, it was suggested that the country of residence has an important influence on the level of fatigue. It was also indicated that fatigue levels were variable across countries [30]. Most of the studies about fatigue in patients with SLE were conducted in western countries and very few from developing countries. Fatigue has not been systematically examined in Egyptian patients with SLE before. Thus, the purpose of this study was to examine fatigue in patients with SLE in a rural area in Egypt. Information generated from the current study may explain fatigue experienced by the Egyptian population residents in a rural area. Pharmacological therapies have increased the survival time of patients with Systemic Lupus Erythematosus (SLE), but the use of these drugs such as corticosteroids produces side effects, such as myopathy. Also, the use of corticosteroids may be associated with atrophy of the quadriceps and deltoid muscles and may exacerbate fatigue [31,32]. Research suggests that exercise can reduce feelings of fatigue [33,34]. A meta-analysis found that exercise results in significantly lower levels of fatigue, and this effect is superior to cognitive-behavioral therapy or pharmacological treatments. The physical and psychological beneficial effect of exercise has been proven in a number of different conditions, including depression [35]; fibromyalgia [36] and chronic fatigue syndrome [37]. However, there is a need for further research about exploring the beneficial effects of exercise on fatigue in SLE population.

1.2. Aim of the Study

The aim of this study was to examine the effects of exercises intervention on fatigue among patients with Systemic Lupus Erythematosus.

1.3. Definitions of Variables

Dependent Variable

Fatigue: is theoretically defined as ″a feeling of tiredness, a lack of energy and endurance, or extreme exhaustion" [38]. It is experienced as a sensation beyond ordinary tiredness and something that rest does not always improve it [39].

Operational Definition of Fatigue: In the present study, fatigue is operationally defined as the obtained individuals` scores of fatigue as measured by Piper Fatigue Scale [40].

Exercise Intervention: the designed exercise intervention was theoretically defined as "the planned repetitive physical activity structured to improve and maintain physical fitness".

Operational Definition of Exercise Intervention: In the present study, the designed exercise intervention was operationally defined as the amount of daily exercises recorded through structured observational sheet.

1.4. Research Hypotheses

1. Individuals who received the exercise intervention are more likely to experience change in fatigue level more than individuals who didn't receive the intervention.
2. There is a relationship between the change in fatigue level and demographic variables such as age, gender, educational level, and occupation after intervention.

2. Methods

2.1. Research Design

A quasi-experimental (study/control group) design was used to examine the effects of exercise intervention on fatigue among patients with Systemic Lupus Erythematosus.

2.2. Sampling and Population

The study was conducted at the Chronic Illness Clinics in the teaching Hospital of Menoufia University, at Shebin El-Kom district, Menoufia Governorate. A convenient sample of 70 patients was recruited. These patients were approached over a one-year period from the beginning of May 2016 to the end of May 2017. These patients met the following inclusion criteria: a) adult patients, their age group between (19-65 years); b) free from chronic diseases such as, Diabetes Mellitus and Hypertension; c) confirmed diagnosis of Systemic Lupus Erythematosus (through antinuclear antibodies (ANA) testing and Erythrocyte Sedimentation Rate (ESR) more than 100 at 1st hour and; d) a willingness to participate in the study. Patients were excluded if they have: a) active sever myositis, nephritis, neurological involvement or cardiac or pulmonary disease, because performing exercises may be painful and increase fatigue level and; b) pregnant women, because pregnancy may increase fatigue level.

2.3. Sample Size Calculation

A previous study examined the effects of exercise on fatigue in patients with fibromyalgia. Findings of the study showed that 50% of patients considered themselves moderately improved by the treatment compared with 10% of the control group receiving flexibility training [36]. By assuming similar treatment responses with a = 0.05 and a power of 80%, we calculated that 30 subjects would be required for each group.

2.4. Tools

In order to achieve the purpose of the study, the following instruments were used:

I. **A Semi Structured Demographic Sheet:** It was used to collect data about age, gender, educational level, marital status, occupation, economic status and duration of illness. Data was collected by the investigator at the initial data collection point through a face-to-face interview with the patients.
II. **Piper Fatigue Scale (PFS):** It was developed by Piper [41] to assess fatigue level. It contains 22 items categorized into 4 reliable and correlated dimensions: behavioral severity (6 items) relating to the severity and degree of disruption in activity of daily living; affective meaning (5 items) relating to the emotional meaning attributed to fatigue; sensory (5 items) relating to the physical symptoms; and cognitive and mood (6 items) relating to mental and mood states. The score of the scale ranged from zero to ten. Total and subscale mean scores are derived from summing individual items and dividing by the number of items in the subscale/total scale to maintain the 0-10 scaling. With severity codes: (0) none, (1-3) mild, (4-6) moderate and (7-10) severe. The higher scores correspond to higher fatigue level.
III. **Designed Observational Sheet:** It was developed by the researcher to record patients' daily performance and duration of exercises per week.

Questionnaires were completed by the participants themselves or through personal interview and took about 20 minutes to complete.

2.5. Validity and Reliability

The reliability of the Piper Fatigue Scale was reported in a study of 110 consecutive cancer patients. Internal consistency was evaluated using Cronbach's alpha for the entire PFS-R (22 items) was 0.95. The construct validity was verified by correlating PFS score and other similarly constructed tools. It was found that there was a significant correlation ($p \leq 0.001$) with Profile of Mood States (POMS) [42]. In the current study, the test-retest reliability of PFS-R (22 items) was 0.92 with seven patients and a period of a two-week interval.

2.6. Ethical Considerations

The permission for conducting the study was obtained from the Faculty of Nursing and hospital director to carry out the study after explaining the purpose of the study. Oral consent was obtained from subjects who met the study's inclusion criteria to participate in the study at the initial interview. Subjects were informed about the purpose, procedure, and benefits of participating in the study. The investigator explained that participation in the study is voluntary and the patient can withdraw from the study at any time without penalty. It was also emphasized that refusal to participate or to withdrawal from the study would not affect any aspect of the care they receive from the hospital. Confidentiality and anonymity of patients was assured through coding all data and put all data sheets in a closed cabinet. The nature of the questionnaires didn't cause any physical or emotional harm to the participants.

2.7. Pilot Study

A pilot study was conducted on 10% of the study sample (seven patients) to test the practicality and applicability of the questionnaire and to detect the obstacles and the problems that might be encountered during the data collection. The pilot study was also conducted to estimate the time needed to fill in the study questionnaires. Subjects participating in the pilot study were excluded from the final analysis of the studied sample.

2.8. Data Collection Procedure

Patients who met the study inclusion criteria were interviewed individually by the researcher. The data collection process continued for one year from the beginning of May 2016 to the end of May 2017. Both groups were matched against the study inclusion criteria as much as possible in relation to age and sex. Seventy adult patients with systemic lupus erythematoues were randomly assigned into two equal groups, 35 each group. Assigning the subjects to the study and control groups took place by writting the names of the subjects on slips of paper, placed in a container, mixed well and then drawn out one at a time until assigning the required sample. The researcher drew the names out of the container. The study group received the designed exercise intervention for three months**.** The control group received the routine hospital care.

The rational for the duration of the exercise intervention is based on the existing evidence that the most successful exercise programs consist of between one and a half to three hours a week of exercise for 8 to 15 weeks.

2.8.1. The Study Intervention

The study group received the exercise intervention including oral instruction supported by a written instruction booklet that consisted of:

Exercise Instruction. Participants were given the designed exercise intervention for two sessions about (range of motion exercises for all joint based on the recommendation of the American College of Rheumatology (ACR) and Arthritis Foundation which suggest that people with SLE perform flexibility exercises and aerobic exercise such as walking [43].

Flexibility Exercises: These consisted of range of motion exercises (ROM) by performing flexion, extension and avoiding hyper-extension movements to prevent joint ache. The following exercises were utilized: Neck ROM, Shoulder ROM, Elbow ROM, Wrist ROM, Hip ROM, Knee ROM & Foot ROM.

Aerobic Exercise: This included exercises such as walking for 20 to 30 minutes per day, three days a week and being physically active throughout the day. Adherence to exercise intervention was assessed using the design sheet given to participants to record days and the total number of minutes in which recommended designed exercise interventions were achieved. Each participant was scheduled for a minimum of six follow up sessions, for three consecutive months (follow up every week at the first month, every 2 weeks at the second month and third month of the intervention); follow ups were undertaken through participant interview or through phone calls as available. Each session took about 20 to 30 minutes. Participants received verbal instructions supplemented by written material that was supported by pictures as an illustrative guide for more clarification to participants.

2.8.2. The Initial Session

The first time the researcher met the participants was considered the baseline measure. Participants were interviewed in the chronic illness clinics to fill the study questionnaires. The study questionnaires included: a) a semi-structured interview questionnaire that included socio-demographic data such as age, gender, marital status, educational level, income, occupation and duration of the disease; and b) the Piper Fatigue Scale.

2.8.3. The Final Session (post-intervention):

The researcher interviewed the participants again after three months at the end of the intervention and re-administered the study questionnaires to identify the effects of exercise on fatigue among patients with systemic lupus erythematosus. The duration of three months of intervention was chosen because it is the suggested time to capture the change in fatigue level [44].

3. Results

Table 1. The Sociodemographic Characteristics of the Sample

Socio-demographic characteristics	Studied Groups			
	(Study) (n=35)		(Control) (n=35)	
	No.	%	No.	%
Age (years):				
Mean ± SD	28.68 ± 7.25		30.48 ± 8.67	
Range	19.0 – 48.0		19.0 – 47.0	
Gender:				
Male	4	11.4	3	8.6
Female	31	88.6	32	91.4
Education:				
Illiterate	12	34.3	9	25.7
Primary	10	28.6	4	11.4
Secondary	8	22.9	13	37.1
University	5	14.3	9	25.7
Occupation:				
Employee	5	14.3	4	11.4
Not employee	30	85.7	31	88.6
Income:				
Enough	15	42.9	10	28.6
Not enough	20	57.1	25	71.4
Marital status:				
Single	18	51.4	16	45.7
Married	17	48.6	18	51.4
Widowed	0	0.0	1	2.9

Table 1: Showed that seventy adult patients who attended the Chronic Illness Clinics in the teaching Hospital of Menoufia University, at Shebin El-Kom district, Menoufia Governorate were approached over a one-year period from the beginning of May 2016 to the end of May 2017. The mean age of patients in the study and control group was 28.68 ± 7.25 and 30.48 ± 8.67 years old respectively. Regarding gender, the majority of

the groups were females, 88.6% for the study group and 91.4% for the control group. Regarding educational level, about 34.3% and 25.7% of the study and control groups were illiterate respectively while about 14.3% and 25.7% of the study and control groups had university education respectively. Only 14.3% and 11.4% of the study and control groups were employees respectively. Regarding income, about 57.1% and 71.4% of the study and control groups stated that the monthly income of their families was not enough respectively. Regarding the marital status, about 51.4% and 45.7% of the study and control groups were single respectively while about 48.6% and 51.4% of the study and control groups were married respectively.

Table 2: Illustrated that there was a statistically significant difference between the study and the control group regarding the classification of fatigue level post intervention. Regarding the severity of fatigue level, 54.3% and 40% among the study and control groups respectively experienced severe fatigue level pre intervention compared with 17.1% and 31.4% post intervention among the study and control groups respectively.

Table 3: Showed that there was a highly statistically significant difference between the study and the control group (61.22 ± 7.79), and (139.91 ± 8.73) respectively regarding the total fatigue level score with p value (≤0.001) post intervention. There was a highly statistically significant difference post intervention comparing to pre intervention in all fatigue subscales (behavior/severity subscale, affective meaning, sensory subscale and cognitive and mood subscale among the study and the control group.

Table 2. Classification of Fatigue Level of the Studied Sample

	Studied Groups				χ^2	P value
	Study Group I N(35)		Control Group II N(35)			
Pre intervention	NO	%	NO	%	1.43	0.48
No fatigue	0	0%	0%	0%		
Mild	7	20%	9	25.7%		
Moderate	9	25.7%	12	34.3%		
Sever	19	54.3%	14	40%		
Post intervention						
No fatigue	5	14.3%	0	0%	7.80	0.05 S
Mild	14	40%	10	28.6%		
Moderate	10	28.6%	14	40%		
Sever	6	17.1%	11	31.4%		

No fatigue (0), Mild (1-3), Moderate (4-6), Sever (7-10).

Table 3. The Effect of Exercise Intervention on Fatigue Level Among Studied Groups

Item	Studied Groups		Student`s t- test	P value
	Study Group I (n=35)	Control Group II (n=35)		
	Mean ± SD	Mean ± SD		
Behavior/ severity				
• Pre	38.0 ± 3.27	38.34 ± 3.37	1.12	0.26 NS
• Post	16.40 ± 3.18	37.14 ± 4.30	22.89	≤0.001 HS
Affective meaning				
• Pre	33.97 ± 4.81	32.40 ± 5.48	1.27	0.20 NS
• Post	13.68 ± 2.76	31.71 ± 4.12	21.50	≤0.001 HS
Sensory				
• Pre	35.57 ± 1.06	35.05 ± 2.27	1.21	0.23 NS
• Post	14.94 ± 2.44	34.05 ± 4.73	21.19	≤0.001 HS
Cognitive & mood				
• Pre	36.35 ± 7.27	36.37 ± 4.76	0.01	0.98 NS
• Post	16.20 ± 1.69	36.34 ± 4.47	24.92	≤0.001 HS
Total Piper Fatigue Scale score:				
• Pre	143.97 ± 8.45	142.17 ± 11.15	0.75	0.45 NS
• Post	61.22 ± 7.79	139.91 ± 8.73	39.10	≤0.001 HS

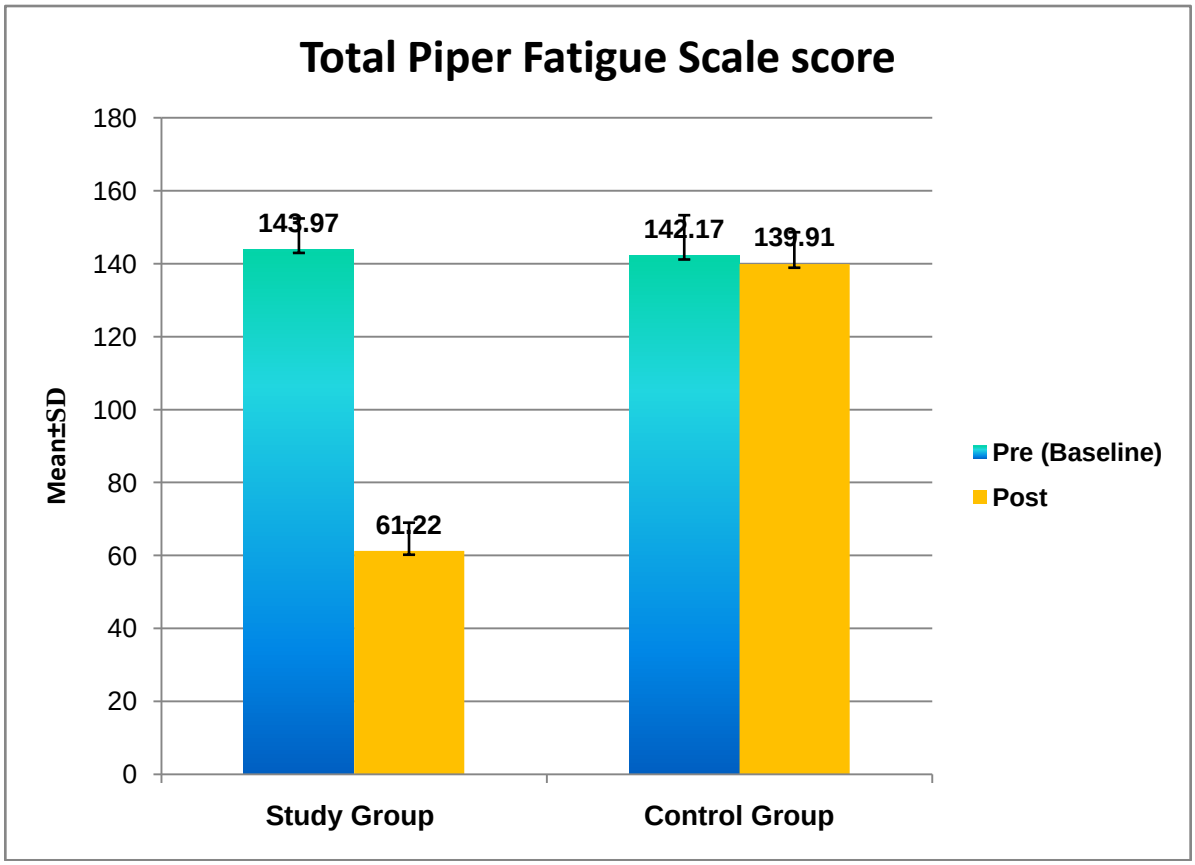

Figure 1. The Effect of Exercise Intervention on Fatigue Level among Studied Groups

Figure 1 showed that there was a difference in the total fatigue score level post intervention comparing to pre intervention among the studied group.

Table 4: Showed that there was a relationship between fatigue level, gender and educational level among the study group.

Table 4. The Relationship Between Fatigue Level and the Demographic Characteristics of the Study Group Post Intervention

Demographic Characteristics	Mean score of the Fatigue level of Study Group (n=35) Mean ± SD	Test of Significance	P value
	r= 0.22	Spearman's rho	0.20 NS
Gender: Male Female	 69.50 ± 3.41 60.16 ± 7.58	t= 4.27	0.003 S
Education: Illiterate Primary Secondary University	 69.41 ± 2.84 60.20 ± 5.67 55.37 ± 5.70 53.0 ± 2.44	F=23.03	≤0.001 HS
Occupation: Employee Not employee	 59.20 ± 8.13 61.56 ± 7.83	t=0.62	0.53 NS
Income: Enough Not enough	 61.80 ± 7.57 60.80 ± 8.13	t=0.37	0.71 NS
Marital status: Single Married	 60.44 ± 7.95 62.05 ± 7.78	t=0.60	0.54 NS

4. Discussion

Systemic lupus erythematosus (SLE) is an autoimmune disease that is characterized by fatigue. However, little research has been conducted to determine non-pharmacological strategies, such as exercise, that can be engaged in the prevention and treatment of fatigue in patients with SLE. Therefore, the purpose of the current study was to examine the effect of exercise intervention on fatigue among patients with Systemic Lupus Erythematosus.

4.1. The Effect of Exercises on Fatigue

Fatigue is the most common and unpleasant symptom of patients with systemic lupus erythematosus (SLE). For patients living with SLE, the very thought of exercising can be painful because of tiredness, joint ache, and wanting to rest. The beneficial effects of exercise for people with SLE, such as building stronger muscles, preventing joint stiffness, controlling fatigue and avoiding weight gain, has been reported in previous studies [45,46]. The current study hypothesized that individuals who received the exercise intervention experienced less fatigue levels than individuals who did not receive the intervention. The present study findings supported the hypothesis and revealed that there was a statistically significant reduction in the total score of fatigue level post intervention compared with pre intervention. The findings of the current study are similar to what was reported by del Pino-Sedeño et al. [47,48] who concluded that aerobic exercise appears effective in reducing fatigue in individuals with SLE. In addition to reducing physical symptoms of SLE, it enhances physical fitness and improves health-related quality of life [49,50].

Similar findings have been reported in a systematic review, with meta-analyses, which was conducted to evaluate whether exercise has a harmful effect on disease activity in SLE, and explored the effects of exercise on cardiovascular function and risk factors, physical fitness and function and health-related measures. Exercise interventions were reported to be safe, while adverse effects were rare. Meta-analyses suggest that exercise does not adversely affect disease activity, positively influences depression, improves cardio-respiratory capacity and reduces fatigue, compared to controls. Exercise programmers had no significant effects on CV risk factors compared to controls. O'Dwyer et al., (2017) concluded that therapeutic exercise programs appear safe, and do not adversely affect disease activity. Fatigue, depression and physical fitness were improved following exercise-based interventions. [51].

However, the study findings are different from what was reported by Daltroy, et al., [52] who examined the effectiveness of unsupervised home exercise programs in 37 subjects with rheumatoid arthritis and 34 with systemic lupus erythematosus. Subjects were randomly assigned to control or stationary bicycling at home, using bicycles. Exercise subjects (with bicycles) did better than controls, but not significantly, on all outcome measures (exercise tolerance test, fatigue, depression and helplessness) at 3 months.

4.2. Fatigue and Socio-Demographic Characteristics

Fatigue has been associated with advancing age [53,54], female sex [55,56] and lower socioeconomic status [53]. Low educational level may affect a patient's ability to understand and seek appropriate clarification of uncertainties regarding the disease, the treatment, or the expected outcomes. Lack of knowledge can increase anxiety and suffering from living with a disease with uncertain progress and unpredictable flares. The current study hypothesized that there is a relationship between the change in fatigue level and some demographic variables such as age, gender, educational level and occupation post intervention. The current study supported the hypothesis. The present study findings revealed that there was a significant relationship between gender, educational level and fatigue level in the study group post intervention while there was no relationship between age, occupation and fatigue level in the study group post intervention.

The findings of the current study are similar to what was reported by Engberg et al., [57] who conducted a study to examine the pattern of fatigue in the general population and to explore the associations with age, sex, socioeconomic status, self-reported physical activity, sitting time and self-rated health. One thousand, five hundred and fifty-seven out of 2500 invited subjects in the Northern Sweden MONICA Study 2014, aged 25–74 years filled out the Multidimensional Fatigue Inventory (MFI-20), consisting of four subscales: General Fatigue (GF), Physical Fatigue (PF), Reduced Activity (RA) and Mental Fatigue (MF). The study findings showed that fatigue was associated with female sex as well as with lower age. University-educated people have lower levels of fatigue. However, the findings of the current study are different from what was reported by Fonseca, et. al., [58] who examined the Silent Burdens in Disease: Fatigue and Depression in One hundred forty-eight female participants with SLE. The study findings revealed that there were significant correlations seen between fatigue level, age, and educational level in SLE. A possible explanation of the study findings may be due to the small sample size (35 patients).

5. Limitations of the Study

- Lack of representation of males in the sample is one of the limitations of the study. Most of the participants in this study were female participants (88.6% for the study group and 91.4% for the control group). Although this is consistent with gender distribution of SLE in the general population, the findings may have underrepresented the concerns of males with SLE. Thus, the findings of the study might only be applicable among female SLE patients.
- The findings of the current study should be interpreted with caution because of the bias associated with using the convenient sample, whereas lack of random sampling may contribute to sample selection bias and limits the generalization of the findings.

- Another limitation of the study is using a self-reported questionnaire to measure fatigue level, whereas possible reactivity in completing the questionnaire in a socially desirable direction can occur.

6. Implications for Nursing Practice

- Fatigue is an important factor influencing patient daily life independent of disease activity. Patients with severe fatigue should be assessed for possible poor Quality of Life.
- Prepare training programs for nurses about the importance of adding exercise to a patient's schedule for the reduction of fatigue among patients with systemic lupus erythematosus along with the routine hospital care.
- Distribute designed booklets about the importance of exercise at the chronic illness clinics to benefit individuals with SLE who suffer from fatigue.

7. Conclusion

Fatigue should be considered as an important factor influencing patient daily life independent of disease activity. Also, it can be concluded that adding exercise to a patient's schedule had a significant effect on the reduction of fatigue among patients with systemic lupus erythematosus

8. Recommendations

The study findings showed that patients with SLE benefited from the exercise intervention. It is important to notice that the study included only patients with low to moderate disease activity. Thus, there is a need to examine the effects and safety of exercise for patients with high disease activity. Replication of this study is recommended with several design changes such as, using larger sample size; using of randomized selection to achieve appropriate representation of population; and conducting the study in a larger scale to include multi-centers.

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