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Effect of Sleep Quality Improvement Program on Fatigue and Depressive Symptoms of Rheumatoid Arthritis Patients

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Abstract: *Poor sleep quality is a common problem in rheumatoid arthritis patients that may lead to disease aggravation, increase fatigue and depression. This study aimed to examine sleep quality and its correlates to fatigue and depressive symptoms of rheumatoid arthritis patients.*
Design: *a quasi-experimental research design (study and control group) thirty patients for each one was utilized.*
Setting: *The study was conducted at physical medicine and rehabilitation outpatient clinic of university hospital at Menoufia governorate, Egypt.*
Subjects*: A purposive sample of 60 rheumatoid arthritis patients who fulfill the inclusion and exclusion criteria.*
Tools: *four tools were used for data collection;*
tool 1: *Structured interview questionnaire that consists of two parts; Part one: Patient's personal and medical data. Part two: patient's knowledge related to rheumatoid arthritis and sleep.*
Tool 2; *Piper Fatigue scale to assess the severity of fatigue.*
Tool 3: *Pittsburgh sleep quality index to measure quality of sleep.*
Tool 4: *Hamilton depression rating scale to assess the severity of depressive symptoms.*
Results: *There was statistically significant increasing in patient's knowledge related to rheumatoid arthritis and sleep for study group than control group. There was statistically significant decreasing in fatigue level and depressive symptoms as a result of improvement of sleep quality for study group than control group at the post program.*
Conclusion: *There was a positive and great effect of improvement of sleep quality on reducing fatigue level and depressive symptoms of rheumatoid arthritis patients.*
Recommendation: *The nurse must take into consideration the importance of improvement of sleep quality when providing patient care for reducing severity of fatigue and depressive symptoms of rheumatoid arthritis patients.*
Key words: *Sleep Quality Improvement, Fatigue, Depressive symptoms and Rheumatoid Arthritis.*

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I. Introduction

Rheumatoid arthritis (RA) affects about 1% of the population worldwide and 0.5–1 % of adults in developing countries, it is associated with increased mortality, high morbidity, and reduced health-related quality of life. The disease is three times more frequent in women than in men and the prevalence rises with age (Kiltz and van der Heijde 2009 [1]). In addition to disease progression (e.g., inflammation and joint damage), patients with RA experience a number of disabling symptoms. Poor sleep and fatigue are some of the most prevalent and burdening symptoms and can have debilitating effect on physical and/or cognitive functioning and health (Lee et al., 2009 [2]).

Pain, depression, lack of exercise, restless legs, and corticosteroid use are rheumatoid arthritis causative factors. Disordered sleep and fatigue are thought to play an important roles in the development of chronic pain and is associated with depression. Continuous pain, functional disability, tiredness, incapacity to work, economic limitations, and side effects of therapeutic drugs, which RA may bring about, affect these patients' quality of life (Luyster et al., 2011 [3]; Li et al., 2012[4]). Poor sleep is a common complaint in the general population, but is even more common in those with rheumatic diseases (Kirwan et al., 2011[5]).

Poor sleep in patients with RA has received greater attention from researchers in the past years, several areas on sleep remain unanswered. As such, whereas the sleep quality and quantity of sleep disturbances have been shown to be correlated with fatigue in several clinical populations and healthy individuals, little information is yet available about the association between sleep and fatigue in patients with RA (Ibn Yacoub et al., 2011 [6]).

Poor sleep and fatigue are some of the most prevalent and burdening symptoms and can have debilitating effect on physical and/or cognitive functioning and health (Cramp et al., 2013 [7]). Previous studies of patients with RA have shown that poor sleep may be affected by pain or contribute to increased pain and fatigue. A sleep quality improvement program was prescribed for the intervention group. Participants were assessed at baseline and then at the end for the duration of the program (Loppenthin et al., 2015 [8]). So that the nurse must take into consideration intervention related to improvement of sleep quality when providing nursing care to enhance good sleep quality that affect positively on patient's quality of life.

1.1 Significance of the study:

Rheumatoid arthritis is an autoimmune disease that causes inflammation to joints resulting in swelling, stiffness, pain and dysfunction of the affected joint in addition to other symptoms as loss of weight, low grade fever, fatigue and poor sleep that affect negatively in patient activities of daily living, overall quality of life and patients complain from depressive symptoms as a result of disease itself and the therapeutic regimen (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2018 [9]).

Poor sleep quality is a common problem for rheumatoid arthritis patients that lead to excessive fatigue and depression so it is very important for nurse to improve sleep quality for rheumatoid arthritis patients for reducing fatigue and depressive symptoms for rheumatoid arthritis patients.

1.2. Aim of the study:

The aim of the present study was to examine sleep quality and its correlates to fatigue and depressive symptoms of rheumatoid arthritis patients.

1.3. Research hypothesis:

1. Level of fatigue will be decreased for study group than control group of rheumatoid arthritis patients due to increasing patients' knowledge and improving sleep quality.
2. Depressive symptom will be reduced for study group than control group of rheumatoid arthritis patients after application of sleep quality improvement program.

II. Subjects and method

2.1. Research design:

Quasi-experimental research design (study and control group) was utilized to achieve the aim of the study.

2.2. Setting:

This study was conducted at physical medicine and rehabilitation outpatient clinic of university hospital at Menoufia governorate, Egypt.

2.3. Sample:

A purposive sample of 60 chronic rheumatoid arthritis patients was selected by using the following equation: n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)] at power 80% and CI 95%, then assigned into two equal group; study (group 1) and control (group 2), thirty patients for each one. Study group: was given sleep quality improvement program in addition to routine care at the hospital. Control group: was given routine care at the hospital only. Inclusion criteria for the subjects were adult patients of both sexes in age group 21–60 with chronic rheumatoid arthritis, Conscious and agree to participate in the study. Exclusion criteria: patients with chronic renal and heart failure.

2.4. Tools of the study:

Four tools were used for collection of the data:

Tool 1: Structured interview questionnaire: It was developed by the researchers and consisted of two parts:

Part one: Patient's sociodemographic and medical data including patient's age, sex, education, marital state, place of residence and occupation, onset of the disease, chronic disease and rheumatoid arthritis medications.

Part two: patient's knowledge related to rheumatoid arthritis that consists of five questions as definition, causes, signs and symptoms, complications, treatment modalities. and sleep that consists of five questions as definition, stages, importance of good sleeping, signs and symptoms of sleep disturbances, management of sleep disturbances.

Scoring method: each question scored from 0 to 2. If the answer was correct and complete the score was 2. If the answer was correct and incomplete the score was 1. If the answer was incorrect the score was zero. All questions were summed up to give the total score that ranged from zero to twenty. The total score was categorized as the following: good from 80% to 100% (from 16 to 20), satisfactory from 60% to less than 80% (from 12 to less than 16) and unsatisfactory less than 60% (less than 12) [10].

Tool 2: Piper Fatigue scale:

It was developed by Piper et al., (1998) [11] for assessment of patient's experience of unusual or excessive tiredness during illness, receiving treatment or recover from illness. It consists of 22 items; response to these items was recorded on ten point scored measurements from 0 to 10, where zero indicates no fatigue and ten indicate sever fatigue. For calculation of total fatigue score: add the score of all items and divided them by 22 in order to keep the score on the same numeric 0 to 10 scale to give the severity codes as range from 1-3 indicate mild degree, range from 4-6 indicate moderate degree and range from 7-10 indicate sever degree.

Tool 3: Pittsburgh Sleep Quality Index:

It was adopted by Buysse et al., (1989) [12] to measure quality of sleep in the previous thirty days. It consists of nineteen questions in seven components containing subjective sleep quality, latency, efficiency, duration and disturbances of sleep, using of sleep medications and dysfunction of daytime activities. Every question is scored in four points likert scale from 0 to 3 as 0 indicates no difficulty while 3 indicates severe difficulty. The total component scores are summed up together to give a total score from 0 to 21. The higher score means worse sleep quality. a score less than five means good sleep quality while score more than five means poor sleep quality. The first 9 items contribute to the total score while item 10 doesn't contribute to the total score.

Component one: subjective sleep quality score is detected by examination the response of question number nine and assign scores as follow a score 0 indicates very good, 1 indicates fairly good, 2 indicates fairly bad, 3 indicates very bad. Component two: Latency of sleep score is the result of summation the response of questions two and five (a), if sum is equal 0=0; 1-2=1; 3-4=2; 5-6=3. Component three: Duration of sleep is detected from response of question four Score (>7=0; 6-7=1; 5-6=2; <5=3). Component four: Efficiency of sleep is detected from the response of questions one, three and four and calculated through the application of formula (Number of hours slept / Number of hours spent in bed) × 100. The sleep efficiency is scored as the following >85%=0, 75%-84%=1, 65%-74%=2, <65%=3. Component five: Disturbance of sleep is detected from the response of questions 5b to 5j and assign scores for each question as follows score 0 indicates not during the past month, 1 indicates less than once a week, 2 indicates once or twice a week, 3 indicates three or more times a week, then add the scores for all questions and assign component 5 score as follows if the sum is 0 the score is 0, if the sum from 1-9 the score is 1, if the sum from 10-18 the score is 2 and if the sum from 19 -27 the score is 3. Component six: Using of sleep medication is detected from the response of question number six and assign scores as follows score 0 indicates not during the past month, 1 indicates less than once a week, 2 indicates once or twice a week, 3 indicates three or more times a week. Component seven: dysfunction of daytime activities is detected from the summation of question number seven and eight and assign component seven score as follows if the sum is 0 the score is 0, if the sum from 1-2 the score is 1, if the sum from 3-4 the score is 2 and if the sum from 5-6 the score is 3.

Tool 4: Hamilton Depression Rating Scale (HDRS):

Hamilton Depression Rating Scale (Hamilton, 1967) [13] and Arabic version translated by Lotfy Fateem1998 [14]. This is a clinician rated scale to assess the severity of depressive symptoms in adults. It is the most widely assessment tool used in depression. The original version contains 17 items related to depressive symptoms that present over the past week and was developed originally for hospital in patients, emphasizing on depression symptoms (melancholic and physical).

Scoring of the HDRS-17 is as follows: a score of 0–7 is considered as being normal; a score of 8–16 suggests mild depression; a score of 17–23 indicates moderate depression; and scores over 24 indicate severe depression, with the maximum score being 52.

2.5. Data collection methods (procedures)

Development of tools:

The first tool was developed by the researchers, while the second one was developed by Chadran et al., (2007). The third tool was developed by Buysse et al., (1989) and the fourth one was developed by Hamilton, (1960). The first tool was tested for face and content validity by five academic staff experts in nursing and medical field, then modifications were done accordingly to achieve completeness and relevance of tools. Tools

were tested by test-retest reliability and Cronbach's Alpha was 0.90 for the first tool, 0.96 for second tool, 0.85 for the third tool and 0.92 for the fourth tool.

Pilot study:

A pilot study was conducted on 10 % of the patients representing the study sample to check clarity and accessibility of tools used for data collection then tools were modified according to the results. Patients that included in the pilot study didn't taken in the study sample.

Protection of human rights:

Verbal and written consent was obtained from subjects who fulfill the inclusion criteria to participate in the study after explanation the purpose of it. The researchers confirmed to their that participation in the study was anonymity and voluntary and can be withdrawn at any time if they needed without any effect on their care provided, moreover the nature of tools' questionnaire didn't harm their physically and psychologically.

Data Collection

- The data were collected from March 2018 to July 2018, after obtaining permission from the official authorities (Faculty of Nursing at Menoufia University and Menoufia University Hospital).
- Patients who fulfilled the inclusion and exclusion criteria and agreed for participation in the study were assigned and divided randomly into two equal groups study group (1) and control group (2) thirty patients for each group.
- The researchers dealt with the control group first (the time took two months) then the study group (the time took three months) to avoid mixing of information used for data collection.
- Each subject of study and control group were interviewed individually by the researchers in their routine follow up at physical medicine and rehabilitation outpatient clinic of university hospital.
- At the initial interview the researchers started gathering data from each patient in the sample (study and control group) by using four research tools in the form of tool 1: Structured interview questionnaire that consists of two parts; Part one: Patient's personal and medical data. Part two: patient's knowledge related to rheumatoid arthritis and sleep, tool 2; Piper Fatigue scale to assess the severity of fatigue, tool 3: Pittsburgh sleep quality index to measure quality of sleep and tool 4: Hamilton depression rating scale to assess the severity of depressive symptoms this session took about 30 – 45 minutes for each patient.
- Following the initial interview the researchers planning for patient's identification needs related to the research and preparing data in an illustrative colored booklet written in Arabic language and supported by illustrative pictures for illiterate patient to facilitate understanding. This information was given to the study group (group 1) only and used as a guidance for application of the program related to the research in the form of: rheumatoid arthritis: definition of rheumatoid arthritis, causes, signs and symptoms, treatment modalities. Sleep: definition of sleep, stages, importance of good sleeping, signs and symptoms of sleep disturbances, sleep quality improvement program.
- All patients of study group (1) were divided into three small subgroups, each one contains ten patients.
- The researchers implemented the research program for each subgroup through four teaching sessions one session per a week and each one took about 30 to 40 minutes then followed by 10 minutes at the end of each session the researchers made quick revision for receiving information and giving the freedom for patients to ask any questions.
- Each session was done in the waiting area at physical medicine and rehabilitation outpatient clinic through giving lecture and group discussion for theoretical part of the program and demonstration and redemonstration for applying of relaxation techniques in the form of deep breathing exercises.
- The researchers gave the prepared booklet for each patient of study group at the beginning of the first session to guide patients for understanding and application of interventions related to the program, also an illustrated video was displayed about deep breathing exercises on a computer for more clarification.
- In the first session the researchers explained information about rheumatoid arthritis as definition, causes, signs and symptoms, complications and treatment modalities.
- In the second session information about sleep was given which included definition, stages, importance of good sleeping, signs and symptoms of sleep disturbances, management of sleep disturbances.
- In the third session the researchers discussed with the patients interventions related to the program for improvement of sleep quality which included items about sleeping habits during daytime and nighttime, eating and drinking habits that affect on sleeping, adjustment of sleeping environment, exercise pattern that improve sleeping, relaxation techniques, medications and other supplements that affect on sleep.
- In the fourth session the researchers explained breathing exercises for reducing anxiety then allowing the patients to perform redemonstration for assurance of understanding and competent application for the procedure.

- The researchers evaluated all patients of study and control group one month after completing the fourth teaching sessions by using tool 1 part two, tool 2, tool 3 and tool 4.
- A comparison between study and control group was done to evaluate the effect of sleep quality improvement program on sleep quality, depressive symptoms and fatigue of rheumatoid arthritis patients.

2.6 Statistical analysis:

The collected data were tabulated, organized and analyzed by using SPSS software (statistical package for the social science software version 16**).** Quantitative data were described by $\overline{X}$ (mean) ± SD (standard deviation) then analyzed by using student t-test for comparison between two groups with normal distribution variables and using Mann-Whitney test for comparison between two groups that was not have normal distribution variables. Pearson correlation (r) test was used to measure the association between two quantitative variables.

Qualitative data were described in the form of number & percentage then comparison between two groups by using Chi-square test ($\chi 2$) and Fisher's exact test was used for 2 × 2 table and one cell has expected number less than 5. P value of > 0.05 is considered statistically non-significant, P value of < 0.05 is considered statistically significant, P value of < 0.001 is considered highly statistically significant.

III. Results

The study results were described in the following:

Table 1: described Percentage distribution of sociodemographic characteristics of the study and control groups. It was showed that more than half of the study groups were more than forty five years (56.7 % and 60%) with the mean age (45.67±8.02) and (46.27±7.23) for study and control group respectively. The majority of the study sample were female (70% and 73.3%), married (73.3% and 70%), illiterate (53.3% and 56.7%), didn't have work (76.7% and 70.0%) and coming from rural area (66.7 and 76.7) with family income not enough (60% and 66.7%) for study and control group respectively.

Table 2: revealed percentage distribution of medical data of the study and control groups. Regarding onset of the disease, about half of the study and control groups (46.7 and 53.3) were less than five years with the mean (5.63±3.40) and (5.80±3.79) for study and control group respectively. More than half of the study and control groups (63.3% and 56.6%) didn't have chronic disease. Concerning family history around two third of study and control groups (76.7% and 83.3%) had family history of rheumatoid arthritis.

Table 3: showed percentage distribution of patient's knowledge related to rheumatoid arthritis and sleep of study and control groups at pre and post-program. At the pre program more than half of the study and control groups (63.3% and 73.3%) had unsatisfactory knowledge, the difference was not statistically significant. But at the post program there was highly statistically significant difference between study and control groups about rheumatoid arthritis and sleep knowledge as (53.3%) of study group had good knowledge and (30.0%) had satisfactory knowledge opposite to (70%) of control group had unsatisfactory knowledge and 30% had good knowledge and p value = 0.000.

Table 4: presented comparison between study and control groups regarding severity of fatigue at pre and post-program. There wasn't statistically significant difference between study and control group regarding fatigue as more than half of the study group (60.0%) with the mean (7.40±2.01) and the control group (66.7%) with the mean (7.87±1.81) had sever fatigue and p value = 0.789. while in the post program there was highly statistically significant difference between study and control group as more than half of the study group (63.3%) had moderate fatigue and (20.0%) had mild fatigue with the mean (4.70±1.47) while more than half of the control group (56.7%) had sever fatigue and (43.3%) had moderate fatigue with the mean (6.87±1.94) and p value = 0.000.

Table 5: showed comparison between study and control groups regarding severity of depressive symptoms at pre and post-program. At the pre program the majority of the study (63.3%) with the mean (22.43±7.19) and control group (73.4%) with the mean (24.07±7.43) had sever depressive symptoms, this difference wasn't statistically significant as p value = 0.526. While at the post program the majority of study group had mild depressive symptoms (60.0%) and moderate symptoms (33.3%) with the mean (14.30±4.11), the majority of control group had severe symptoms (66.6%) and moderate symptoms (26.7%) with the mean (23.33±5.72), this difference was highly statistically significant as p value = 0.000.

Table 6: presented correlation between total sleep score and total knowledge, fatigue and depressive symptoms score of study and control groups at the post program. There was statistically significant negative correlation between total sleep score and total knowledge score for study and control group at the post program and statistically significant positive correlation between total sleep score and total fatigue and depressive symptoms score for study and control groups at the post program.

Figure 1: illustrated that the majority of the study group had very good (26.7%) and fairly good (40%) subjective sleep quality in contrary to very bad (50%) and fairly bad (43.3) for control group at the post program, the difference was highly statistically significant between two groups as p value = 0.000.

Figure 2: clarified that about one third (33.3%) of the study group had mild difficulty and (6.7%) had sever difficulty for latency of sleep compared to (73.3%) of the control group had sever difficulty of sleep latency at the post program, this difference was highly statistically significant between two groups as p value = 0.000.

Figure 3: described that more than one third (40%) of the study group slept from six to seven hours during the night and (26.7%) slept more than seven hours during the night in contrary to (60%) of control group slept less than five hours at the post program, this difference was highly statistically significant between two groups as p value = 0.000.

Figure 4: revealed that the majority of the study group (93.3%) had sleep efficiency more than 65% in contrary to (43.3%) had sleep efficiency less than 65% at the post program, this difference was highly statistically significant between two groups as p value = 0.000.

Figure 5: clarified that about half of the study group (53.3%) had mild sleep disturbance in contrast to (63.3%) for control group had sever sleep disturbance at the post program, this difference was highly statistically significant between two groups as p value = 0.000.

Figure 6: illustrated that half of the study group (53.3%) using sleep medication less than one time a week compared to (30.0%) of control group using sleep medication more than three or more times a week at the post program, this difference was highly statistically significant between two groups as p value = 0.000.

Figure 7: showed that nearly half of the study group (46.7%) had mild dysfunction of daytime activities compared to (80%) of the control group had sever dysfunction of daytime activities at the post program, this difference was highly statistically significant between two groups as p value = 0.000.

Table 1: Percentage distribution of sociodemographic characteristics of the study and control groups:

Socio demographic Characteristics	study (N=30)		Control (N=30)		χ^2 p value
	No.	%	No.	%	
Age:					
- < 35	2	6.6	3	10.0	0.429
- 35 – 45	11	36.7	9	30.0	0.807
- > 45	17	56.7	18	60.0	
Age / years ($\bar{X}$ ±SD):	45.67±8.02		46.27±7.23		t = 0.304 p value= 0.762
Sex:					
- Male	9	30.0	8	26.7	0.000*
- Female	21	70.0	22	73.3	1.000
Marital state:					
- Single	2	6.6	1	3.3	
- Married	22	73.3	21	70.0	1.785
- Divorced	2	6.6	5	16.7	0.618
- Widow	4	13.3	3	10.0	
Level of education:					
- Illiterate	16	53.3	17	56.7	1.964
- Primary education	4	13.3	6	20.0	0.580
- Secondary education	8	26.7	4	13.3	
- Higher education	2	6.7	3	10.0	
Occupation:					
- Employer	5	16.7	6	20.0	0.382
- Manual work	2	6.6	3	10.0	0.826
- Don't work	23	76.7	21	70.0	
Residence					
- Urban	10	33.3	7	23.3	0.328*
- Rural	20	66.7	23	76.7	0.567
Income					
- Enough	12	40.0	10	33.3	0.072*
- Not enough	18	60.0	20	66.7	0.789

t: Student t test * Fisher's exact test

Table 2: Percentage distribution of medical data of the study and control groups:

Medical data	study (N=30)		Control (N=30)		χ^2 p value
	No.	%	No.	%	
Onset of the disease (years):					
- < 5	14	46.7	16	53.3	0.800
- 5 – 10	9	30.0	6	20.0	0.670
- > 10	7	23.3	8	26.7	
Years ($\overline{X}$ ±SD):	5.63±3.40		5.80±3.79		U = 0.179 p value = 0.858
Chronic disease:					
- Free from disease	19	63.3	17	56.6	0.397
- Hypertension	6	20.0	8	26.7	0.820
- Diabetes mellitus	5	16.7	5	16.7	
Family history:					
- Rheumatoid arthritis	23	76.7	25	83.3	2.560
- Heart disease	4	13.3	3	10.0	0.465
- Diabetes mellitus	1	3.3	2	6.7	
- Renal disease	2	6.7	0	0.0	

U: Mann-Whitney test

Table 3: Percentage distribution of patient's knowledge related to rheumatoid arthritis and sleep of study and control groups at the pre and post-program:

Knowledge assessment	Study (N=30)		Control (N=30)		χ^2 p value
	No.	%	No.	%	
Pre program:					
- Good	0	0.00	0	0.00	0.308*
- Satisfactory	11	36.7	8	26.7	0.579
- Unsatisfactory	19	63.3	22	73.3	
Total knowledge pre-program ($\overline{X}$ ± SD)	9.98 ± 3.32		9.57 ± 3.11		t = 0.482 p value=0.632
Post program:					
- Good	16	53.3	0	0.00	25.846
- Satisfactory	9	30.0	9	30.0	0.000
- Unsatisfactory	5	16.7	21	70.0	
Total knowledge post-program ($\overline{X}$ ± SD)	16.30 ± 3.03		11.27 ± 2.73		t = 6.761 p value=0.000

* Fisher's exact test

Table 4: Comparison between study and control groups regarding severity of fatigue at the pre and post-program:

Severity of fatigue	Study (N=30)		Control (N=30)		χ^2 p value
	No.	%	No.	%	
Pre program:					
- Mild	0	0.00	0	0.00	0.072*
- Moderate	12	40.0	10	33.3	0.789
- Sever	18	60.0	20	66.7	
Total fatigue pre-program ($\overline{X}$ ± SD)	7.40 ± 2.01		7.87 ± 1.81		t = 0.944 p value=0.349
Post program:					
- Mild	6	20.0	0	0.00	13.67
- Moderate	19	63.3	13	43.3	0.001
- Sever	5	16.7	17	56.7	
Total fatigue post-program ($\overline{X}$ ± SD)	4.70 ± 1.47		6.87 ± 1.94		t = 4.876 p value= 0.000

* Fisher's exact test

Table 5: Comparison between study and control groups regarding severity of depressive symptoms at the pre and post-program:

Severity of depressive symptoms	Study (N=30)		Control (N=30)		χ^2 p value
	No.	%	No.	%	
Pre program:					
- Mild	3	10.0	1	3.3	1.286
- Moderate	8	26.7	7	23.3	0.526
- Sever	19	63.3	22	73.4	
Total depression pre-program ($\overline{X}$ ± SD)	22.43±7.19		24.07±7.43		t-test = 0.752 p value= 0.455
Post program:					
- Mild	18	60.0	2	6.7	24.698
- Moderate	10	33.3	8	26.7	0.000
- Sever	2	6.7	20	66.6	
Total depression post-program ($\overline{X}$ ± SD)	14.30±4.11		23.33±5.72		t-test = 6.663 p value= 0.000

Table 6: Correlation between total sleep score and total knowledge, fatigue and depressive symptoms score of study and control groups at the post program:

Total knowledge, fatigue and depressive symptoms score at post program	Total sleep score of study group at post program (N=30)		Total sleep score of control group at post program (N=30)	
	R	p-value	R	p-value
Total knowledge	- 0.447	0.007	- 0.336	0.035
Total fatigue score	0.584	0.000	0.361	0.025
Total depressive symptoms score	0.625	0.000	0.323	0.041

Figure 1: Percentage distribution of study and control groups in relation to subjective sleep quality scores at the post-program.

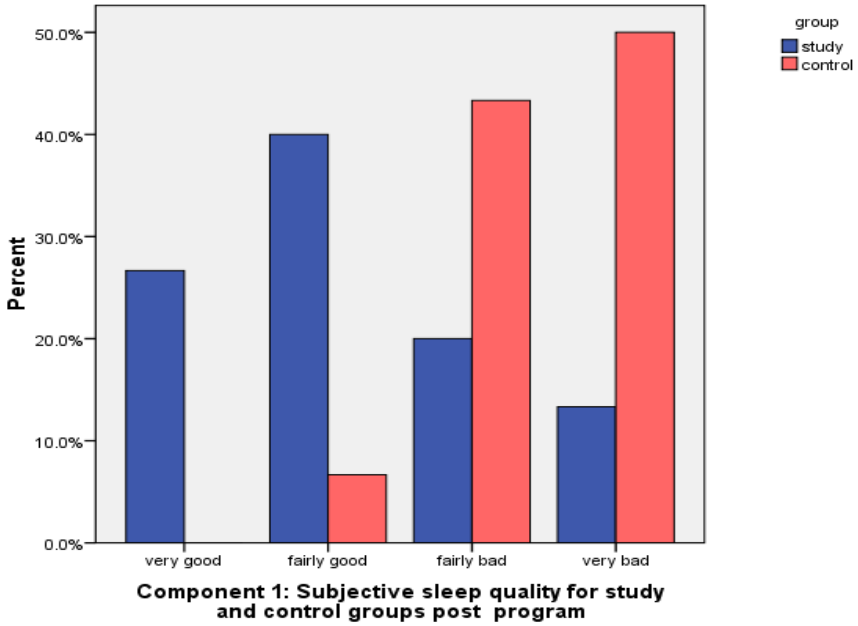


Figure 2: Percentage distribution of study and control groups in relation to latency of sleep scores at the post-program.

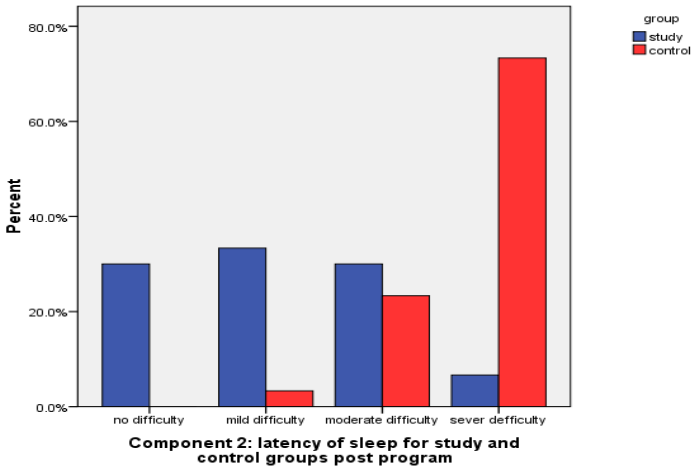


Figure 3: Percentage distribution of study and control groups in relation to duration of sleep scores at the post-program.

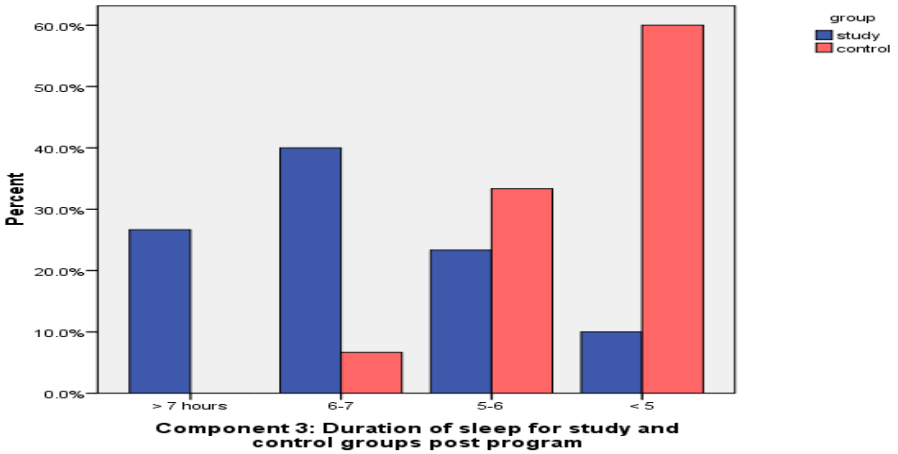


Figure 4: Percentage distribution of study and control groups in relation to efficiency of sleep scores at the post-program.

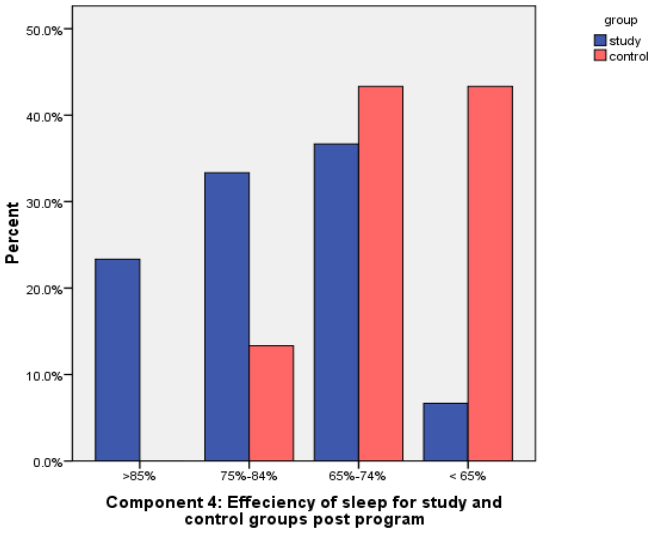


Figure 5: Percentage distribution of study and control groups in relation to disturbance of sleep scores at the post-program.

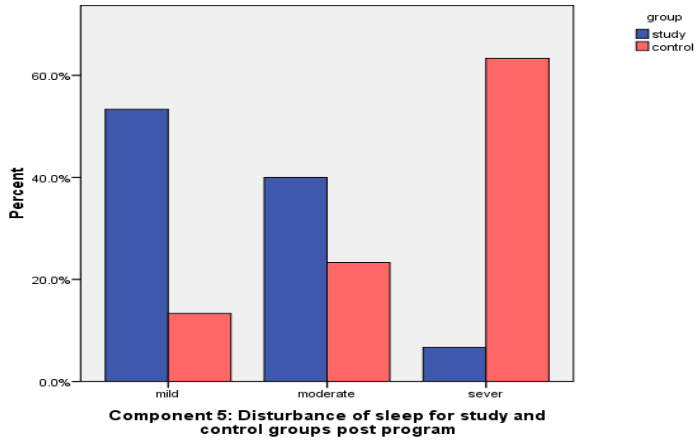


Figure 6: Percentage distribution of study and control groups in relation to using of sleep medication scores at the post-program.

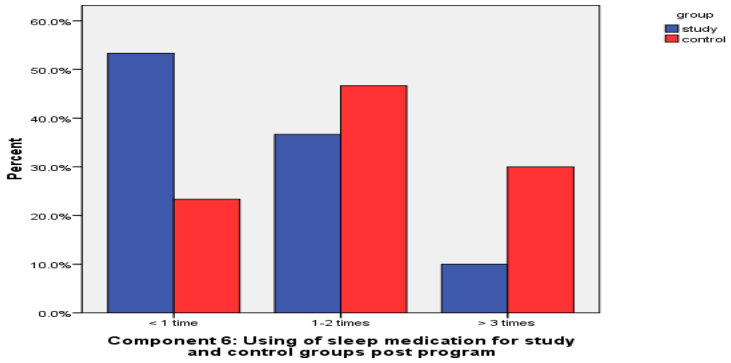
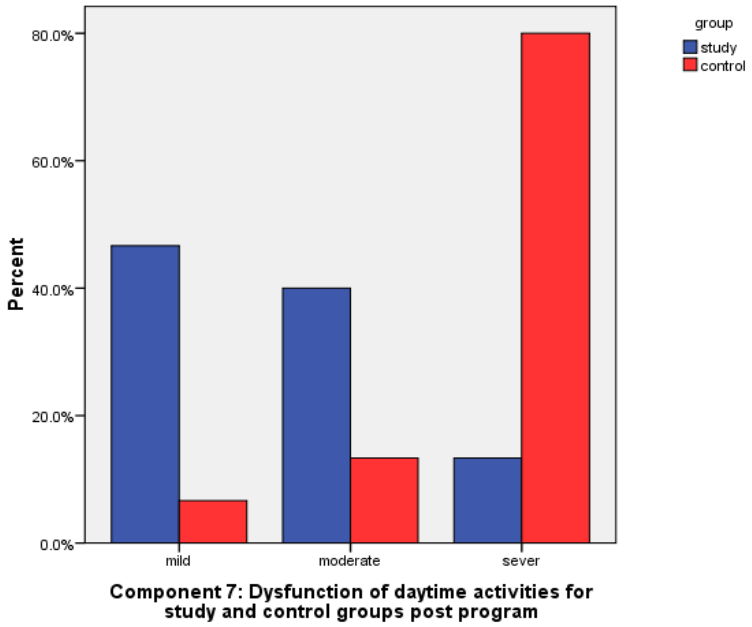


Figure 7: Percentage distribution of study and control groups in relation to dysfunction of daytime activities scores at the post-program.



IV. Discussion

Poor sleep quality is a common problem in rheumatoid arthritis patients that may lead to disease aggravation, increase fatigue and depression. So our study aimed to examine sleep quality and its correlates to fatigue and depressive symptoms of rheumatoid arthritis patients.

Characteristics and medical data of the studied groups :

From sociodemographic characteristics of the studied groups. The present study revealed that more than half of the study groups were more than forty five years. The majority of the study sample were female, married, illiterate, didn't have work, coming from rural area with family income not enough, didn't have chronic disease and had family history of rheumatoid arthritis. This finding is in agreement with Szady et al., (2017) [15] described patients characteristics with rheumatoid arthritis that involved 31.58% male and 68.42% female patients, between 34 and 78 years of age and more than two third of patients 76.32% were married. Also Elsayad (2014) [16] noted more than half of the study group was ≥ 45 years, married, illiterate, don't work and had family history of rheumatoid arthritis. In the same line Luyster et al., (2011) [17] noted The patients with rheumatoid arthritis had an average age of 58.47 years, and 76% were female.

Regarding knowledge related to rheumatoid arthritis and sleep of the studied groups:

Concerning knowledge about rheumatoid arthritis and sleep the result evidenced that there was no statistically significance difference exist between study and control groups related to knowledge at pre program while at the post program there was statistically significant difference between study and control groups as half of the study group had good knowledge and one third had satisfactory knowledge opposite to more than two third of control group had unsatisfactory knowledge and one third had good knowledge, From the perspective of the researchers increasing patients' knowledge of the study group than control group was acheived through educational session in the program that provided by the researchers this peoved the importance of nursing role as a teacher. This finding is on the same line with Bastable et al., (2003) [18] and Fagermoen and Hamilton (2006) [19] noted that health care team especially nurses as it considered one of the most important member for providing patient care should responsible for teaching and educating patient to increase patient participation and completing care plan.

Concerning sleep quality, fatigue and depressive symptoms of the studied groups:

The result revealed statistically significant improvement of all components of Pittsburgh Sleep Quality Index containing subjective sleep quality, latency, efficiency, duration and disturbances of sleep, using of sleep medications and dysfunction of daytime activities and reducing fatigue, depressive symptoms for study group than control group at the post program. This finding is on the same line with durcan et al., 2014 [20] concluded that performing exercise which considered one component of the sleep improvement program in our research of rheumatoid arthritis patient leading to improvement in sleep quality and reducing fatigue. There are many suggested mechanisms that discuss the relation between sleep and exercise. Exercise has an antidepressant action which in turn reducing anxiety that considered one of the important causes of hyper arousal and insomnia. Also exercise is thought leading to improvement in circadian rhythms and thermoregulation, both of them affected on the sleep quality. Santos, et al., 2007 [21] suggested that exercise affects sleep as a result of mild elevation of proinflammatory cytokines, interleukin (IL-1,IL-6) and tumor necrosis factor-α. Mild elevation thought to enhance sleep while increasing level result in insomnia. This is consistent with the findings patients with rheumatoid arthritis have low sleep quality. Also on the same line Driver et al., 2000 [22] suggesting that acute exercise with highly endurance activity leading to high elevations in inflammatory cytokines that may increasing nighttime wakefulness.

Regarding correlation between total sleep score and fatigue, depressive symptoms score of study and control groups at the post program.

There was statistically significant negative correlation between total sleep score and total knowledge score as increasing knowledge leading to improve quality of sleep for study and control group at the post program and statistically significant positive correlation between total sleep score and total fatigue and depressive symptoms score it means that improvement of sleep quality leading to reducing fatigue and depressive symptoms for study and control groups at the post program. this finding is in consistence with Ndosi et al., 2014 [23] concluded that improvement of physical function, quality of life and reducing pain of rheumatoid arthritis patients after giving nursing interventions in the follow up and increasing overall rheumatoid arthritis patients satisfaction after nursing consultations Koksvik et al., 2013 [24]. Also Primdahl et al., 2014 [25]. Also Loppenthin et al., 2015 [26] noted correlation between fatigue severity and disorders of sleep among rheumatoid arthritis patients as patients who complain from lower sleep quality described more

fatigue. Luyster et al., (2011) [17] concluded the correlation between sever level of depressive symptoms, pain, fatigue and reducing functional activity with poor sleep quality.

Conclusions

There was a positive and great effect of improvement of sleep quality on reducing fatigue level and depressive symptoms of rheumatoid arthritis patients**.**

Recommendations for practice and research

The nurse must take into consideration the importance of improvement of sleep quality when providing patient care for reducing severity of fatigue and depressive symptoms of rheumatoid arthritis patients.

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