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Efficacy of Flexibility Exercises on Joints' Pain, Stiffness And Physical Dysfunction In Patients With Systemic Lupus Versus Rheumatoid Arthritis

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Abstract: *Background: Joints' pain, stiffness and physical dysfunction are the main distressing symptoms for both rheumatoid arthritis and systemic lupus patients, which affect their ability of doing daily living activities.* ***The aim of the current study was to*** *evaluate efficacy of flexibility exercises on joints' pain, stiffness and physical dysfunction in patients with systemic lupus versus rheumatoid arthritis.* ***Design:*** *A Quasi-experimental research design was utilized.* ***Setting:*** *The current study was conducted at the rheumatology and rehabilitation outpatient clinics of Menoufia university hospital, Menoufia Governorate, Egypt.* ***Subjects:*** *A convenience sample consisted of 80 Adult patients with systemic lupus and rheumatoid arthritis divided equally into two groups who agreed to participate in the study and fulfilled the inclusion criteria.* ***Tools: 1.*** *Participants' characteristics questionnaire consisted of socio-demographic data and medical history.* ***2.*** *The Western Ontario Mac Master Scale had been adapted to quantify the magnitude of joints' pain, stiffness and physical dysfunction. The main results of this study revealed a high significant post-intervention improvement in different joint movement aspects especially among systemic lupus patients than in rheumatoid arthritis patients. Additionally, the Western Ontario Mac Master Scale mean total scores concerning joints' pain, stiffness and physical dysfunction subscales revealed a high significant improvement post intervention than pre among systemic lupus patients than rheumatoid arthritis patients.* ***Conclusion:*** *There was a negative correlation between flexibility exercises and joints' pain, stiffness and physical dysfunction as the daily application of flexibility exercises resulted in decreased joints' pain, stiffness and physical dysfunction.* ***Recommendations:*** *Flexibility exercise is simple and inexpensive therapy and must be included in the daily treatment regimen for all rheumatoid arthritis and systemic lupus patients to decrease joints' pain, stifnss, and improving physical dysfunction unless there is severe inflammation or swelling of joints. In addition, a training program must be implemented for rheumatology and rehabilitation nurses and patients with rheumatoid arthritis and systemic lupus as all are in a great need to know about the importance of proper daily application of flexibility exercises for those patients.*

KeyWords*: Flexibility exercises, Joints' pain, stiffness, and physical dysfunction, Systemic lupus, Rheumatoid arthritis.*

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I. Introduction

Joints' pain, stiffness and physical dysfunction are the main distressing symptoms for rheumatoid arthritis (RA) and systemic lupus (SLE) patients, which negatively affect their ability of doing daily living activities and consequently affect their quality of life [1].

Disability due to musculoskeletal disorders has increased by 45% from 1990 to 2010 and arthritis is listed as the fastest increasing major health condition and is ranked as the second cause of disability by World Health Organization (WHO) [2].

Arthritis is the most common cause of disability in the world-greater than both back pain and heart disease which, causes pain, aching, stiffness and swelling of the joints [1,3]. The most common types of arthritis are rheumatoid arthritis, gout, lupus and fibromyalgia [4].

The Center for Disease Control and Prevention (CDC) estimated that 54.4 million U.S.A. adults suffer from arthritis; equating about 25% of the U.S.A. population and by 2040, an estimated 78 million (26%) U.S.A. adult's ages 18 years or older are projected to have a diagnosed arthritis [5,6,7].

The general explanation for the cause of arthritis is that over time by increasing age, the joints simply wear out when the cartilage that lubricates the ends of the bones simply is worn thinner and thinner until one-bone wars directly on another [8].

Both rheumatoid arthritis (RA) and systemic lupus (SLE) are chronic, inflammatory autoimmune disorders where the immune system mistakenly attacks the own body's tissues [1,5,7].

Rheumatoid arthritis (RA) is a systemic autoimmune disease that presents as a symmetrical inflammatory polyarthritis, which affects the smaller joints at first such as hands and feet, before affecting larger joints causes inflammation and eventual damage to joints over time [8,9]. Rheumatoid Arthritis (RA) affects 1% of the world's population and about 0.3% of population in Egypt [5,7,9].

Patients with rheumatoid arthritis can suffer from immense pain, swelling, stiffness of the joints and fatigue [7,8]. Once the disease progress it can involve many joints and cause more disability and joints' physical dysfunction [9]. Although much effort has been expended on research into the causes and cures of RA, little progress has been made [9,10].

Systemic lupus erythromatosus (SLE) is a chronic autoimmune disease affecting almost all organ systems [11]. It is characterized by exacerbations (or flares) of disease activity [12]. Patients with lupus can experience muscle aches and pain (myalgia) or have inflammation of certain muscle groups (myositis), which causes weakness and loss of strength[11,12].

Lupus arthritis causes pain, stiffness, swelling, tenderness and warmth of joints [9]. The most affected joints are those farthest from the middle of the body, such as fingers, wrists, elbows, knees, ankles and toes [11,13]. General stiffness upon awakening, which gradually improves as the day goes on, is a key feature of lupus arthritis. However, there also may be joint pain later in the day [12,13].

More than 90 percent of SLE patients experience joint and/or muscle pain during the course of their illness and more than half of them complain of migrating joints pain as a first symptom [10,13].

The SLE national prevalence estimates suggests a yearly prevalence of 161,000 with definite SLE and 322,000 with definite or probable SLE of the USA population every year [9,10,13,14]. The Lupus Foundation of America estimates that 1.5 million Americans, and at least five million people worldwide, have a form of lupus [15]. The fact remains that lupus is a devastating and life-changing disease that currently has no cure [6]. Incidence of SLE in Egypt ranges from six to 35 new cases per. 100,000 population every year [14,16].

Compared to rheumatoid arthritis, lupus arthritis is less disabling and less likely to cause destruction of the joints [12,13].. Fewer than 10 percent of people with lupus arthritis will develop deformities of their hands and feet associated with weakening of cartilage and bone [12,14,15].

Stiffness is the difficulty or limited motion of a joint [16]. Patients with stiffness aren't able to move the joint through its full range of motion, but this movement can require force [14,15]. Joint stiffness caused by inflammation usually occurs or is worse immediately after awakening or after prolonged resting or immobility [16,17]. Morning stiffness commonly occurs with rheumatoid arthritis, systemic lupus and other types of inflammatory arthritis and gradually lessens with activity after an hour or longer[14,15,18]. Stiffness that gets worse as the day progresses is usually not caused by inflammation [18,19] .

One consistent fact is that pain is the most unpleasant symptom for both SLE and RA patients and usually associated with joint stiffness [15,19]. Pain is frequently reported as a major problem in people with RA [19,20,21] and pain relief is reported to be the most important reason for seeking medical care and is considered a major reason for which individuals take medication[22]. Pain is a subjective concept that can be defined only by the individual experiencing it [18,19,20]. In addition to joint stiffness, pain problems are one of the most common complaints in patients with RA and SLE and have a negative effect on patient's quality of life as they usually result in physical dysfunction [20,21,22,23].

About 80% of patients with arthritis are functionally independent and substantial functional disability is often observed over time with disease progress. One important goal in rehabilitation of those patients is the prevention of functional decline so, flexibility and streching exercises are frequently used for this purpose [21,24]. Flexibility exercises are also known as stretching or range-of-motion (ROM) exercises [25]. Flexibility is the ability to move a joint through a series of articulations in a full non-restricted, pain-free ROM [26]. While stretching exercises are techniques used to lengthen shortened soft tissues at the musculotendinous units to facilitate an increase in ROM [22,24]. They improve or maintain the flexibility of joints and lengthen muscles and tendons also, reduce tightness, and make the joints movement more efficient and safe [25,26].

There is an evidence suggests that six to twelve weeks of exercise intervention may slightly decrease pain intensity, may slightly improve physical function, and may lead to little difference in joints' stiffness [27].

Additionally, developing a consistent and balanced flexibility exercise plan have many important benefits for rheumatoid arthritis and lupus arthritis patients including fight against fatigue, improve sleep patterns, improve energy levels, increase joints' range of motion, increase bone and muscle strength, improve joint flexibility, reduce joint pain and prevent medical complications such as heart diseases [26,27,28].

The aim of the current study was to evaluate the efficacy of flexibility exercises on joints' pain, stiffness and physical dysfunction in patients with rheumatoid arthritis versus systemic lupus.

Research questions:

1. What is the relationship between flexibility exercises and joints' pain, stiffness and physical dysfunction for both systemic lupus and rheumatoid arthritis patients?

2. Is there a significant relationship between the two study groups regarding the efficacy of flexibility exercises application on joints' pain, stiffness and physical dysfunction?

Operational definition:
 Flexibility exercises defined as flexibility range of motion (ROM), also known as stretching exercises [24]. Flexibility is the ability to move a joint in a full non-restricted, pain-free ROM through using techniques to lengthen shortened soft tissues [25].
 Joints' pain, stiffness, and physical dysfunction defined as the main arthritis patient's subjective complains. Stiffness is the difficulty or limited movement of a joint, which consequently results in pain and physical dysfunction [26,27].

II. Subjects And Method

Design: A Quasi-experimental research design was utilized in this study. **Setting:** The current study conducted at the rheumatology and rehabilitation outpatient clinics of Menoufia university hospital.
Subjects: A convenience sample consisted of 80 Adult patients with systemic lupus and rheumatoid arthritis divided equally into two groups with the following criteria:

Inclusion criteria:
 Adult
 Male or female.
Exclusion criteria:
 Have swelling orsevere inflammation of joints.
Tools:
Two tools were used for data collection in this study:

1. Participants' characteristics questionnaire developed by the researcher to assess patients' socio-demographic data and was consisted of gender, Age, marital status, living, occupation, educational level, income and past medical and family history.

2. The Western Ontario Mac Master (WOMAC) scale had been adapted from [28,29, 30,31] which consisted of 24 items to quantify the magnitude of joints' pain, stiffness and physical dysfunction by assessing 17 physical functioning activities, five pain related activities and two stiffness categories.
Scoring system for (WOMAC) scale:
 The 17 physical functioning activities each item was given a score from 0-4
 The five pain related activities each item was given a score from 0-4
 The two stiffness categories each item was given a score from 0-6
The total score is calculated by finding the sum of all items in each category.

For the Total WOMAC score:
- 0 = no pain/stiffness/difficulty in doing physical activities.
- (1-32) =mild pain/stiffness/difficulty in doing physical activities.
- (33-65) =moderate pain/stiffness/difficulty in doing physical activities.
- (66-99) = severe pain/stiffness/difficulty in doing physical activities.
- (100) =extreme pain/stiffness/difficulty in doing physical activities.

Reliability: ***Salaffi et al., (2003)***[29] tested the reliability of All the (WOMAC) Western Ontario and McMaster Universities subscales (pain, stiffness, and physical function) were internally consistent with Cronbach's coefficient alpha of 0.91, 0.81, and 0.84, respectively with strong test re-test agreement with ICCs of 0.86, 0.68, and 0.89, respectively, and when ***Basaran et al., (2010)***[30,31] tested the reliability and validity of the (WOMAC) osteoarthritis (OA) index WOMAC Internal consistency and reliability was evaluated by Cronbach's alpha and intra-class correlation coefficients (ICC) were ranged between 0.78-0.95 and 0.51-0.85 for hip and 0.78-0.94 and 0.61-0.71 for knee OA, respectively and demonstrated good reliability, while the current study instruments were reviewed and tested for validity by 5 experts in medical surgical nursing, modifications were done accordingly to ascertain relevance and completeness. **Reliability**: The WOMAC scale internal consistency was calculated using Cronbach's alpha coefficients and it was 0.94 indicated strong reliability. Test-retest reliability of the WOMAC ICCs was of 0.77 - 0.94 for SLE and 0.80 - 0.98 for RA, respectively.

Procedure for data collection:
The current study was carried out within eight months started from the first of February to the end of September 2016.
 Approval: An official permission to conduct this study was obtained from the director of Menoufia University hospital and the head nurses of the rheumatology and rehabilitation outpatient clinics after explaining the aim of the study.

Ethical consideration and Human Rights:
Only patients who agreed to participate and fulfill the inclusion and exclusion criteria were selected. During the initial interview, an informed consent was obtained from all subjects of both groups after explaining the purpose of the study. The researcher ascertained that all information is confidential and their participation in the study is voluntary and that they could withdraw from the study at any time they want.

Pilot study: -
A pilot study was conducted prior to data collection on eight patients (10%) to test all tools of the study for clarity, objectivity, relevance, comprehensiveness, practicability, feasibility and applicability. In addition, it was conducted to identify if there were any obstacles or problems that may be encountered during data collection. It also helped to estimate the time needed to fill in the study tools from each patient then the necessary modifications were carried out accordingly. Data collected through the pilot study was excluded from the current study.

Data collection Procedure:-
- Feasibility visits conducted at the rheumatology and rehabilitation outpatient clinics for the purpose of research participation.
- Each participant interviewed individually twice. Each interview took about 45 minutes.
- The first interview was carried out by the researcher for each participant of both study groups using tool I for collecting data about patient's socio-demographic characteristics and past medical and family history.
- Then the researcher used tool II for assessing the pre-intervention WOMAC scores regarding joints' pain, stiffness and physical dysfunction.
- After that, the researcher gave instructions about flexibility exercises using videos with demonstration and re-demonstration of the technique to teach the patient how to apply it correctly.
- The researcher instructed all subjects of both groups that procedure must be applied daily for 10 minutes every morning. Then the researcher applied revision and reinforcement according to participant's needs. In addition, the researcher corrected the wrong performance of technique and answered all participants' questions and before the end of the interview, the researcher gave a mobile copy of the video for each patient to assertain that each participnt could revise the proper technique before doing it.
- The second interview was carried out by the researcher for each participant of both study groups after two weeks during his/her next visit for follow up at the rheumatology and rehabilitation outpatient clinic using tool II to assess the post-intervention WOMAC scores regarding joints' pain, stiffness and physical dysfunction..
- A comparison between both study groups was carried out to evaluate the efficacy of flexibility exercises on joints' pain, stiffness and physical dysfunction.

III. Statistical Analysis

The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for Social Sciences, version 21, SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison between two groups and more were done using Chi-square test (χ^2). For comparison between means of two related groups (pre and post-test data) of parametric data, paired t-test was used. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $p<0.05$ for interpretation of results' significance.

IV. Results

Table (1) showed the socio-demographic characteristics and medical history of both groups of studied subjects. Revealed that the mean age of studied patients was 41.1 ± 12.3 years for SLE patients and 39.2 ± 9.2 years for RA patients. Majority of studied patients were females (70%) married (85%), live in rural area (67.5%), not work (83.8%), and 48.8% of them had primary education. Concerning income, 78.8% of them did not earn enough monthly income.

Table (2) Showed family and past medical history of studied patients; highlighted that approximately half of them had family history of the disease, and were hospitalized twice times.

Table 3: Showed the percent distribution of WOMAC joints pain subscale during different joint movements' pre and post intervention among both groups of studied patients, revealed a high significant

improvement in post intervention total joints pain subscale scores with a mean (7.1±1. for SLE & 15.9±1.3 for RA patients).

Table 4: Highlighted a high statistical significant difference observed for comparison between mean total stiffness scores pre and post intervention among SLE patients.

Table 5: Efficacy of flexibility exercises on joints' pain, stiffness and physical dysfunction for both groups of studied patients This table revealed a high significant improvement (p = 0.000) in the different joints movement aspects especially among SLE patients.

Table 6: Efficacy of flexibility exercises on WMOAC total score between both groups of studied patients. Highlighted the correlation between the WMOAC Index total scores among both groups of SLE and RA studied patients. This table revealed a high significant improvement in different joints movement aspects especially among SLE patients than among RA patients.

Fig.1: Arithmatic mean and standered deviation of total score physical functionning activities subscale in different situations of joint movements pre and post intervention for both SLE and RA groups. Illustrated a high statistical significant difference was observed for comparison between mean total physical functionning activities subscale scores pre and post intervention among SLE patients.

Fig.2: Percentage distribution of WMOAC index total scores pre and post intervention for both SLE and RA groups demonstrated that, in pre WMOAC intervention, majority (65%) of SLE and (62.5%) of RA patients suffered from moderate pain/stiffness/difficulty. The post WMOAC intervention showed that (100%) of SLE patients suffered from mild pain/stiffness/ difficulty, while the percentage of RA patients who suffered from severe pain/stiffness/difficulty increased from 22.5% to 25% and three quarters (75%) of them suffered from moderate pain/stiffness/difficulty post intervention. **Fig.3:** Arithmatic mean of WMOAC Index total scores pre and post intervention for both SLE and RA groups revealed a high significant improvement in joints' pain/stiffness/difficulty post intervention and the difference was highly significant statistically (P=0.000). In addition, comparing different categories of joints' pain/stiffness/difficulty, as well as mean total pain/stiffness/difficulty subscales scores, among SLE patients' pre (53.7± 19.2) and post (26.2±2.9) WMOAC intervention.

Table 1: Distribution of studied patients according to their socio-demographic data

Socio demographic data		Groups: Systemic Lupus Erythromatosus (SLE) No	%	Groups: Rheumatoid Arthritis (RA) No	%	Total No	%	P value
Age groups	20 –30 Y	9	22.5%	13	32.5%	22	27.5%	$\chi^2 = 6.7$ P=0.08 NS
	31 - 40 Y	9	22.5%	13	32.5%	22	27.5%	
	41 - 50 Y	7	17.5%	9	22.5%	16	20%	
	51 -60 Y	15	37.5%	5	12.5%	20	25%	
X ± SD		41.1±12.3 years		39.2±9.2 Y		80	100%	t=1.3, P=0.09NS
Sex	male	92	2.5%	15	37.5%	24	30%	Fisher exact test=0.22 NS
	female	31	77.5%	25	62.5%	56	70%	
Marital	Single	2	5%	3	7.5%	5	6.3%	LR=1.65, P=0.64 NS
	Married	35	87.5%	33	82.5%	68	85%	
	Widowed/ Divorced	3	7.5%	4	10%	7	8.7%	
Residence	rural	29	72.5%	25	62.5%	54	67.5%	Fisher exact=0.47 NS
	Urban	11	27.5%	15	37.5%	26	32.5%	
Occupation	work	5	12.5%	8	20%	13	16.2%	Fisher exact =0.36 NS
	No work	35	87.5%	32	80%	67	83.8%	
Education	read and write	12	30%	13	32.5%	25	31.2%	LR=0.07, P=0.9NS
	Primary education	20	50%	19	47.5%	39	48.8%	
	secondary education	3	7.5%	3	7.5%	6	7.5%	
	high education	5	12.5%	5	12.5%	10	12.5%	
Income	enough	6	15%	11	27.5%	17	21.2%	Fisher exact= 0.27 NS
	not enough	34	85%	29	72.5%	63	78.8%	
Total		**40**	**100%**	**40**	**100%**	**80**	**100%**	

LR = Likelihood Ratio NS=not significant

Table2: Family and past medical history of studied patients

Family and past medical history		Groups: Systemic lupus erythromatosus (SLE)		Groups: Rheumatoid Arthritis (RA)		Total		P value
Family history	Yes	19	47.5%	17	42.5%	36	45%	χ^2=0.2,P=0.6 NS
	No	21	52.5%	23	57.5%	44	55%	
Hospitalization	Yes	17	42.5%	8	20%	25	31.3%	χ^2=4.7, P=0.03 Sig.
	No	23	57.5%	32	80%	55	68.8%	
If Yes, cause of it	Medical	3	17.6%	5	62.5%	8	32%	χ^2=17.2, P=0.000 HS.
	Surgical	14	82.4%	3	37.5%	17	68%	
Subtotal		**17**	**100%**	**8**	**100%**	**25**	**100%**	
If Yes, number of hospitalization:	Once	4	23.5%	1	12.5%	5	20%	LR =6.4, P=0.02 Sig.
	Twice	9	53.0%	6	75%	15	60%	
	≥ 3 times	4	23.5%	1	12.5%	5	20%	
Subtotal		17	100%	8	100%	25	100%	
Total		**40**	**100%**	**40**	**100%**	**80**	**100%**	

Answering Research Question Number 1; What is the relationship between flexibility exercises and joints' pain, stiffness and physical dysfunction for both systemic lupus and rheumatoid arthritis patients?

Table 3: Percent distribution of joints pain subscale in different situations of joint movements' pre and post intervention among both groups of studied patients

	Situations of joints movements	Pain subscale									
		Never 0 (%)		Rare 1 (%)		Somimetimes 2 (%)		Often 3 (%)		Always 4 (%)	
		SLE	RA	SLE	RA	SLE	RA	SLE	RA	SLE	RA
PRE- INTERVENTION											
1	while walking on flat surface			10	2.5	15	12.5	22.5	22.5	52.5	62.5
2	at night while in bed			0	0	5	5	22.5	25	72.5	70
3	while going up & down stairs			0	0	2.5	0	22.5	22.5	75	77.5
4	while sitting or lying			0	0	0	0	22.5	22.5	77.5	77.5
5	while standing upright			0	0	0	0	30	30	70	70
	Mean total pain score for SLE (pre)	**15.5±1.8***									
	Mean total pain score for RA (pre)	**15.6±1.6**									
POST- INTERVENTION											
1	while walking on flat surface			35	0	35	7.5	30	22.5	0	70
2	at night while in bed			22.5	20	77.5	0	0	0	0	0
3	while going up & down stairs			40	0	37.5	0	20	25	2.5	75
4	while sitting or lying			20	0	80	0	0	27.5	0	72.5
5	while standing upright			57.5	0	37.5	2.5	5	20	0	77.5
	Mean total pain score for SLE (post)	**7.1±1.2****									
	Mean total pain score for RA (post)	**15.9±1.3**									

*t pre=0.4,P=0.6 NS(not significant) **tpost=31.2,P=0.000HS(high significant)

Table 4: Percent distribution of joints stiffness subscale in different situations of joint movements pre and post intervention among groups of studied patients

	Situations of joints movements	Stiffness subscale									
		Never 0 (%)		Rare 1 (%)		Somimetimes 2 (%)		Often 3 (%)		Always 4 (%)	
		SLE	RA	SLE	RA	SLE	RA	SLE	RA	SLE	RA
PRE- INTERVENTION											
1	After awakening in the morning	0	0	0	0	20	2.5	27.5	30	52.5	67.5
2	After sitting, lying, or resting latter in the day	0	0	60	55	40	45	0	0	0	0
	Mean total stiffness score for SLE (pre)	4.7±0.9*									
	Mean total stiffness score for RA (post)	5.1±0.8									
POST- INTERVENTION											
1	After awakening in the morning	0	0	35	0	35	5	0	5	35	35
2	After sitting, lying, or resting latter in the day	32.5	5	60	22.5	7.5	20	35	20	0	22.5
	Mean total stiffness score for SLE (pre)	2.8±0.9**									
	Mean total stiffness score for RA (post)	6.1±1.5									

*t pre=2.1, P=0.04 Sig (significant) **tpost=11.8, P=0.000HS (highly significant)

Answering Research Question Number 2; Is there a significant relationship between the two study groups regarding the efficacy of flexibility exercises application on joints' pain, stiffness and physical dysfunction?

Table 5: Efficacy of flexibility exercises on joints' pain, stiffness and physical dysfunction for both groups of studied patients

Pain, Stiffness, and physical functions' subscale total scores		Patients Groups				Total		P value
		Systemic lupus erythromatosus (SLE)		Rheumatoid Arthritis (RA)				
		No	%	No	%	No	%	
Pain subscale total score pre-intervention	Moderate pain	5	12.5%	4	10.0%	9	11.3%	Fisher test=1.0 N S
	Bever pain	35	87.5%	36	90.0%	71	88.8%	
Pain subscale total score post-intervention	Mild pain	13	32.5%	0	0.0%	13	16.3%	X^2=76, P=0.000H S
	Moderate pain	27	67.5%	1	2.5%	28	35.0%	
	Bever pain	0	0.0%	39	97.5%	39	48.8%	
Stiffness subscale score pre-intervention	Mild stiffness	14	35.0%	9	22.5%	23	28.8%	X^2=1.5' P=0.2 N S,
	Moderate stiffness	26	65.0%	31	77.5%	57	71.3%	
Stiffness subscale score post-intervention	Mild stiffness	39	97.5%	5	12.5%	44	55.0	X^2=58.4, P=0.000H S
	Moderate stiffness	1	2.5%	35	87.5%	36	45.0%	
Physical function subscale total score pre-intervention	Moderate difficulty in doing physical functions	12	30.0%	13	32.5%	25	31.3%	X^2=0.1' P=0.8 N S,
	High difficulty in doing physical functions	28	70.0%	27	67.5%	55	68.8%	
Physical function subscale total score post-intervention	Low difficulty in doing physical functions	19	47.5%	0	0.0%	19	23.8%	X^2=61.3, P=0.000H S
	Moderate difficulty in doing physical functions	21	52.5%	6	15.0%	27	33.8%	
	High difficulty in doing physical functions	0	0.0%	34	85.0%	34	42.5%	

Table 6: Efficacy of flexibility exercises on WMOAC index total scores for both groups of studied patients.

WMOAC index total scores		Groups: Systemic lupus erythromatosus (*SLE*) N=40		Groups: Rheumatoid Arthritis (RA) N=40		Total N=80		P value
WMOAC total score pre intervetion	Mild pain/stiffness/difficulty (1-32))	6	15.0	6	15.0	12	15.0%	X^2=0.07 P=0.9 NS
	Moderate pain/stiffness/difficulty (33-65)	26	65.0%	25	62.5%	51	63.7	
	Sever pain/stiffness/difficulty (66-99)	8	20.0%	9	22.5%	17	21.3	
	Mean±SD	53.7±19.2		54.7±19.2				t=0.2,P=0.8 NS
WMOAC total score post intervetion	Mild pain/stiffness/ difficulty(1-32))	40	100.0%	0	0.0%	40	50.0%	X‘=80, P=0.000HS
	Moderate pain/stiffness/ difficulty (33-65))	0	0.0%	30	75.0%	30	37.5%	
	Sever pain/stiffness/difficulty (66- 99)	0	0.0%	10	25.0%	10	12.5%	
Mean±SD		26.2 ± 2.9		58.0±14.3				t=13.7, P=0.000 HS
Total		40	100%	40	100%	80	100%	

Fig.1: Arithmatic mean and standerd deviation of total score physical functionning activities subscale in different situations of joint movements pre and post intervention for both SLE and RA studied patients

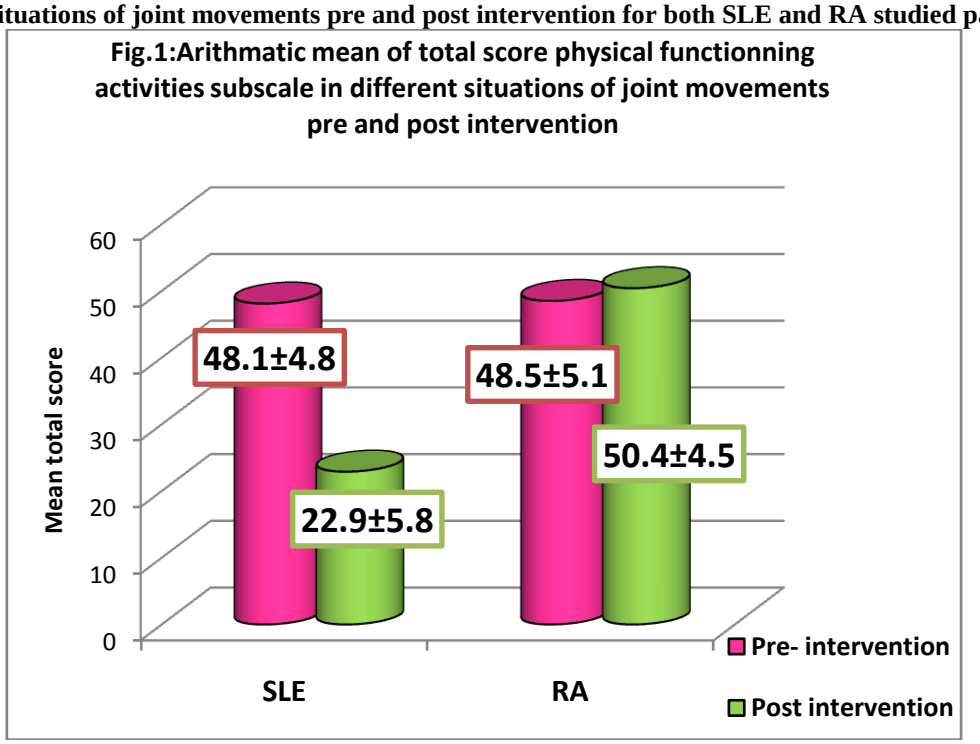


Fig.2: Percentage distribution of WMOAC index total score pre and post intervention for both SLE and RA groups

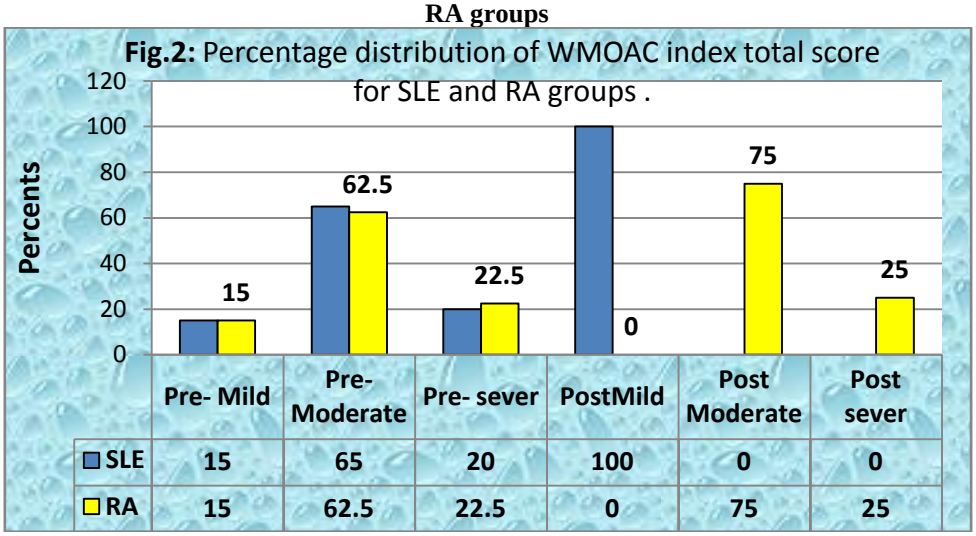
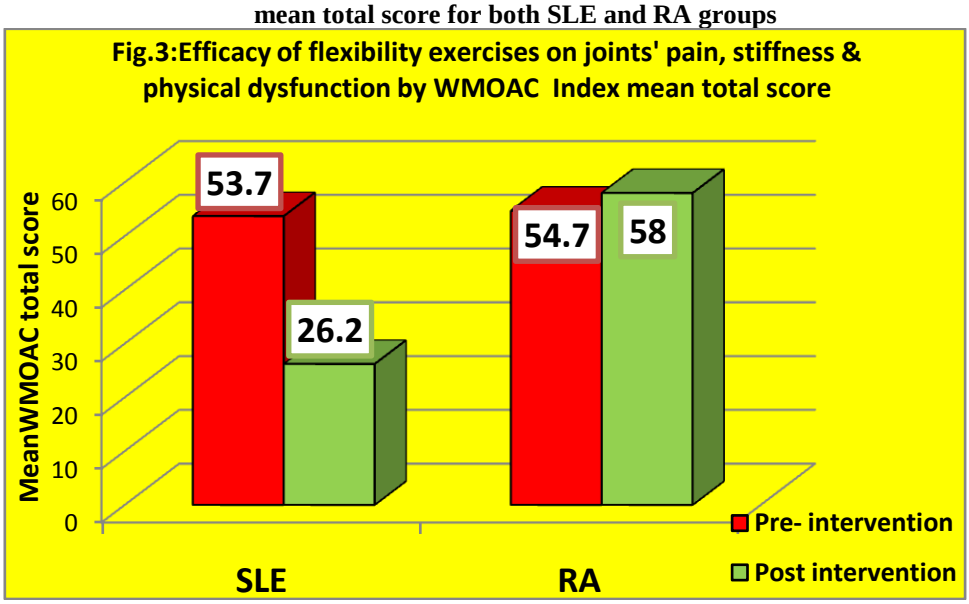


Fig.3: Efficacy of flexibility exercises on joints' pain, stiffness and physical dysfunction by WMOAC Index mean total score for both SLE and RA groups



V. Discussion

Joints' pain, stiffness and physical dysfunction are the most commonly reported complaints among patients with rheumatoid arthritis and also in patients with systemic lupus, and usually associated with impaired ability for doing daily living physical activities [32]. They were documented as the main negative distressing symptoms experienced by a large number of rhaumatoid arthritis and systemic lupus patients and consequences can be overwhelming [33]. The person with Joints' pain, stiffness and physical dysfunction need more efforts and help from his/her surroundings to perform daily physical activities [34]. Therefore, the various treatment strategies used with those patients including flexibility exercises as a restorative and rehabilitative therapy provides an effective mean to restore the joints' normal function and consequently decrease pain and stiffness [27,34].

Regarding patients' socio-demographic characteristics results of the current study revealed that approximately two thirds of studied patients were in younger age groups (20 - 30 years and 31 - 40 years), while a quarter of studied patients were in older age groups (50 – 60 years), with a mean age of (41.1 ± 12.3) years for SLE patients and (39.2 ± 9.2) years for RA patients. However, the difference was not significant statistically (P>0.05) these results were consistent with ***Pascoe et al., (2017)*** "who studied patient and physician-reported satisfaction with systemic lupus erythematosus treatment in US clinical practice" [(35)]. Majority of studied patients in current study were females (70%) married (85%), live in rural area (67.5%), not work (83.8%), and 48.8% of them had Elementary education. As regards to monthly income, 78.8% of the studied patients didn't

earn enough monthly income. These results were inconsistent with ***Schmeding & Schneider (2013)*** "who studied Fatigue, health-related quality of life and other patient-reported outcomes in systemic lupus erythematosus, stated that around half of their study subjects were secondary school graduates and the their mean age were 49.55 ± 21.10 years" [(36)] but, ***Petri et al., (2013)*** agreed with these results as they stated that "the majority of studied patients were females (85%) married (68%)" [(37)].

Concerning family and past medical history results of the current study highlighted that approximately half of studied patients had family history of the disease; however, the difference between the two studied groups was not significant statistically. More over regarding hospitalization, one third of studied patients were hospitalized and the majority (68%) mentioned that the cause of hospitalization was due to surgical reasons with a higher significant percentage among SLE (82.4%) than Rheumatoid Arthritis (37.5%). In addition, more than half of SLE, and three quarters of RA patients were hospitalized twice times. There was a significant difference between the two groups of patients regarding the number of hospitalization (P=0.02).

The current stury results were in agreement with ***Parsons et al., (2016)*** who mentioned that "the majority of rhaumatoid arthritis and SLE patients had family history of the disease and were hospitalized at least twice" [(38)]. These results were on contrary with ***Mathias et al., (2017)*** who stated, "Majority of rhaumatoid arthritis and SLE patients were hospitalized many times due to medical reasons" **[(39)].**

Regarding joints' pain, the current study results illustrated that there was a higher percentages of joints' pain experienced by all subjects in pre intervention stage, at all the five situations of joint movements for both SLE and RA patients with more or less similar mean total pain subscale scores with no statistical significant difference. These results in line with ***del Pino-Sedeño et al.,*** (2014) who mentioned that "the majority of the patients experienced joints' pain at the different situations of joint movements and verbalized their pain as throbbing, cramping, aching and stabbing**"[(40)].**

More over the current study results illustrated that there was an improvement in joints' pain subscale scores post-intervention at all the five situations of joint movements among SLE patients than among RA group subjects with a high statistically significant difference. These results in line with ***Bidonde et al.,*** (2017) who studied "the effect of aerobic exercise training for adults with fibromyalgia and demonstrated that the daily use of aerobic exercise intervention may slightly decrease joints' pain intensity" **[(41).]**

In addition the present study results highlighted that a high significant difference was observed for comparison between mean total pain subscale score pre and post intervention among SLE patients which was in agreement with ***Wu ML et al., (2017)*** who studied "The Effectiveness of Exercise in Adults With Systemic Lupus Erythematosus and indicated that 12 weeks of an aerobic exercise program that is supervised by health professionals could reduce pain and increase vitality for patients with SLE" **[(42).]**

Regarding joints' stiffness, the current study results illustrated that, in pre intervention stage, there was a higher percentages of joints' stiffness -after awakening in the morning- situation for both SLE and RA patients with a statistically significant difference of the mean total stiffness subscale scores.This result in line with ***Mathers & Pfleger (2017)*** *who studied "Physical and occupational therapy in the management of arthritis* mentioned that the majority of arthritis patients complain of joints' stiffness usually come early in the morning or "after awakening in the morning" situation" **[(43).]**

In addition, the present study also showed that there was an improvement in joints' stiffness subscale scores among SLE patients than among RA group subjects after applying flexibility exercises with a high statistically post intervention significant difference. These results may be due to reduced adherence of RA patients and it is likely that participants were no longer maintain regular daily exercises to maintain joints' functional improvements but this data was not collected.

Moreover, the current study stated a high significant difference observed in the comparison between mean total stiffness subscale scores pre and post intervention among SLE patients.

These results in agreement with ***Wolfe et al., (2000)*** who made "a pilot study on the effects of exercise in patients with systemic lupus erythematosus, they reported a remarkable decrease in the joints' stiffness scale scores after using different types af exercises" and also ***Bidonde et al.,*** **(2017)** who stated that "if arthritis patients with mild disease maintain a 12 weeks of moderate intensity exercise programe for at least 20 minutes, 3 days a week had the greatest influence to decrease joints' stiffness intensity" **[(44, 41).]**

Regarding joints' physical function, the current study results illustrated that, in pre intervention stage, there was a higher percentages of difficulty in doing physical functions for both RA and SLE patients. There was an improvement in the mean total physical activities scores post intervention than pre with a high significant difference statistically among SLE patients than in RA patients. Moreover, a high significant difference observed in the comparison between mean total physical functions score pre and post intervention among SLE patients. These results are because RA is a more progressive disease than SLE, so regular exercise of sufficient intensity is needed to maintain improvement in physical functions.

Several studies[41,42,44] confirmed the results of th ecurrent study as they mentioned that "maintaing a supervised exercise program for both arthritis and systemic lupus patients is very helpful in increasing patient's joints physical functioning abilities and effective in improving their quality of life".

Regarding the efficacy of applying flexibility exercises on joints' pain, stiffness and physical dysfunction in patients with systemic lupus versus rheumatoid arthritis the current study highlited that there was a high significant improvement in joint's pain/stiffness/difficulty for SLE subjects post intervention on WMOAC scale total score. Unfortunately, this significant result was not observed among RA patients. This result could be attributed to the nature of rheumatoid arthritis (RA) as a degenerative and controversial disease, because both improvement and deterioration of the patients' condition were expected to occur.

These results were contradicted with ***Simone et al (2009)*** and ***Brorsson et al (2012)*** as they stated that "joints' pain, stiffness and difficulty experienced by rheumatoid arthritis and SLE patients never decreased or resolved by any kind of exercises but only by steroides and routine medications" [45,46].

Several studies agreed with the current study results and "affirmed that exercises training is commonly recommended for individuals with fibromyalgia" [43,44,45,46].

Moreover, ***Hermine et al.,*** (2015) mentioned that "pain intensity, fatigue, stiffness, and physical function of joint movements for both rauhmatoid arthritis and systemic lupus patient are markedly improved after (6 to 24 weeks) ROM exercise program" [47].

In addition to ***Simone et al.,*** (2009), ***Sultan et al.,*** (2012) who have "used a ROM training exercises program to reduce pain and stiffness of joints in different types of arthritis patients and showed an improvement in the pain perception and degree of stiffness in SLE patients more than in RA" [45,48].

The results of present study support the findings of those other studies [26,27,28,48]; they mentioned that "pain and stiffness of the joints was reduced and general functioning abilities was improved with each passing day of using the flexibility ROM exercise program by different degrees for both SLE and RA patients".

Dassouki et al., (2016) agreed with this study results as they assertained that "doing stretching and flexibility exercises as important for a well-rounded fitness routine as taking medications. Incorporating some stretching exercises into arthritis and systemic lupus patient's workout schedule will help to improve flexibility, reduce tightness, and ultimately make patient's workouts more efficient and safe" [49].

Golder et al. (2017) who studied "the effectiveness of a multi-dimentional exercise program on Frequency and predictors joint pain and stiffness of the lupus low disease activity state found similar results suggesting that regular flexibility and stretching exercises helps to overcome stiffness and can delay any loss of flexibility" [50].

on contrary ***Nordemar et al., (2006)*** who studied "the Changes in muscle fibre size and physical performance in patients with rheumatoid arthritis after 7 months physical training suggested that Long-term effects of aerobic exercise may include little or no difference in pain, physical function, and stiffness, and there are uncertain results about long-term effects" [51].

On the other hand [52,53,54] confirmed our study results as they stated that "levels of joint pain and stiffness were reduced within six to twelve weeks of exercise intervention and physical function also improved".

VI. Conclusion

Our study results suggested that

1. There was a negative correlation between flexibility exercises and joints' pain, stiffness and physical dysfunction as the daily application of flexibility exercises resulted in decreased joints' pain, stiffness and physical dysfunction.
2. Flexibility exercises was effective and had an influence to decrease joints' pain, stiffness and physical dysfunction among SLE group more than among RA group.

VII. Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

1. Flexibility exercises are simple and inexpensive therapy and must be included in the daily treatment regimen for all RA and SLE patients to decrease joints' pain, stifnss, and improving physical dysfunction.
2. RA and SLE patients' education about flexibility exercises should be implemented to help in promoting patient's comfort and enhancing their quality of life.
3. Training program should be implemented for all rheumatology and rehabilitation nurses as they are in a great need to know about the importance of the inclusion of proper daily application of flexibility exercises training in the treatment of those patients.
4. Replication of the current study with a large probability sample from a broad geographical area with an extnded follow-up period to allow greater generalization of the results.

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