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Research Article

The effect of Swedish massage on quality of sleep in rheumatoid arthritis patients: A randomized controlled trial

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Abstract

Background: Sleep disorders can negatively influence patients' general health and increase complications and symptoms associated with rheumatoid arthritis patients.

Aim: The purpose of this study was to determine the effects of Swedish massage on quality of sleep in rheumatoid arthritis patients.

Methods: This study was a Randomized controlled clinical trial. We enrolled 60 Patients with rheumatoid arthritis. Participants were assigned to the intervention and control groups. Participants in the intervention group received 30 min of Swedish massage on the joints involved, for 8 weeks. Participants in the control group received only the routine care. The Pittsburgh Sleep Quality Index was completed by all participants at the beginning of the trial, immediately after, and a month after the intervention.

Results: In the intervention group, the mean scores of five subscales, including use of sleeping medication, sleep disturbances, sleep duration, sleep latency, and day time dysfunction, were also improved immediately after and one month after the intervention ($p< 0.05$). Furthermore, the results of Repeated Measure ANOVA indicated that in the intervention group, the mean scores of quality of sleep and these subscales improved over time ($p <0.05$). These differences in terms of two other subscales of the PSQI, including habitual sleep efficiency and subjective sleep quality, were not significant ($p> 0.05$).

INTRODUCTION

Rheumatoid arthritis (RA) is a systemic and chronic disease that commonly affects flexible joints and their surrounding soft tissues. RA is the most common underlying cause of inflammation and deformity in the joints (1). The worldwide prevalence of the disease is about 0.4-1.2% of adult populations (2). In Iran, the prevalence of this disease is greater compared to the worldwide prevalence, and this prevalence is 37% in urban communities in Iran (3). The frequency of this disease is three times higher among women compared to men (2). However, this disease affects individuals with different sociodemographic characteristics, including residents of different geographical regions, adults with a wide range of age, and individuals of different races. The prevalence of RA increases with age with the lifetime risk of RA being greater between age of 35 and 60 years old (3). Systemic symptoms associated with this disease include chronic muscle pain and stiffness, anorexia, sleep disorders, weight loss, fatigue, impaired physical mobility, and joint deformity. Inflammation of the joints may be transient; however, more commonly, inflammation becomes chronic and leads to permanent joint damages over months and years (1,3).

Sleep disorders are one of the most common symptoms associated with RA (1, 4). Patients' sleep disorders are mostly due to their psychological conditions, such as anxiety and depression, and physiological conditions, such as pain. Frequent sleep disorders among RA patients includeobstructive sleep apnea, primary insomnia, and poor sleep due to pain (4). Sleep disorders can negatively influence patients' general health and increase complications and symptoms associated with RA (4). Taylor et al. (2011) studied the quality of sleep among RA patients in Canada (5). Their findings indicated a poor quality of sleep among their participants. Their findings also showed that poor sleep quality was strongly associated with the severity of RA disease (5).

RA patients commonly use sedative medications and sleep aids to improve the quality of their sleep. However, these medications have frequent side effects, such as nausea and vomiting, constipation, itching, and respiratory depression (6-7). In general, due to these side effects and financial costs, pharmacological interventions related to sleep and pain cause burdens for patients, their families, and the community (6). Therefore, research teams suggested a variety of complementary and alternative interventions for improvement of sleep among patients with RA. These interventions included a warm shower or bath before bed, sleeping in a warm bed, and the use of ice packs on the joints (6-7). However, patients did not report significant improvements in their sleep quality after these interventions (6-

7). There are advances in knowledge and technology related to chronic diseases' conventional treatments. However, there is still a need to improve the knowledge base regarding management of chronic symptoms and diseases, such as sleep disorders, using complementary and alternative interventions. Accordingly, several innovative and complementary interventions, such as massage therapy, music therapy, relaxation, hypnosis, herbal medicines, and touch therapy, have been recommended by different research teams for the management of sleep disorders (7-9).

Massage therapy is the use of different manual techniques on body's soft tissues that help reduce stress, muscle strain, and pain from injuries while improving the quality of sleep (9). However, there is a lack of knowledge in terms of the effects of massage therapy on pain management among patients with RA. Researchers indicated that effects of massage therapy, such as pain relief and improved sleep quality, can be associated with an increase of serotonin secretion in the brain, which is a natural pain inhibitor in the body (8-9). Evidence suggests a Swedish massage be used for the management of symptoms in patients with RA (10-11). In particular, a Swedish massage helps improve blood circulation as well as lymphatic flow and, thus, helps enhance oxygenation, delivery of nutrients to the body tissues, and remove toxins from the tissues (9). Additionally, a proper massage can convey a feeling of comfort and relaxation. Massages can stimulate nerve fibers and the spinal cord to close pain control valves. Massages also can reduce the secretion of stress hormones, such as epinephrine, norepinephrine, and cortisol while improving a feeling of comfort and relaxation. Another mechanism associated with massages is an increase in endorphins secretion. Endorphins are morphine-like substances that help activate the body's opiate receptors and close pain valves; therefore, they help reduce pain and improve quality of sleep (12).

Shetty et al., (2015) studied the combined effects of Swedish massage, sauna, and applying heat to joints on quality of sleep among RA patients. They found that this combined intervention could improve the quality of sleep among their participants (13). Another research team investigated the effect of a foot massage on quality of sleep in RA patients and found that this intervention improved their participants' quality of sleep (8). Eichler and Atkins (2013) showed that a knee massage in patients with knee arthritis could reduce joint pain and stiffness. However, this intervention could not significantly improve the quality of sleep and the physical function of the joint in the participants (14). Perlman et al. (2012) indicated that a daily massage of the knee joint for eight weeks was effective in reducing knee pain among RA patients; however, they did not find significant effects related to range of motion in the join, quality of sleep, and quality of life (15). Perlman et al. (2012) also evaluated the participants 24 weeks after the end of the intervention and found that the participants' pain was increased compared to the end of the intervention (15). In general, findings related to effects of massage on quality of sleep among patients with RA are contradictory.

Due to a lack of knowledge related to effects of massage, research teams reported that massage is not commonly used for the management of symptoms in patients with RA (16-18). The contradictory results related to the effects of massage therapy on patients' quality of sleep designate a need for further research in this field. The present study was conducted based on the high prevalence of RA disease in Iran, the importance of using complementary and alternative therapies in management of chronic diseases, and the contradictory results related to the effects of massage. So, the purpose of this study was to determine the effect of Swedish massage on quality of sleep in patients with rheumatoid arthritis (RA).

METHOD

A randomized clinical trial was performed on 60 RA patients who were referred to the Rheumatology center in Kashan, Iran, from December 2019 to march 2020. The sample size was calculated based on Bakir et al. (8). The participants were categorized into control and intervention groups. In each group, the sample size was estimated to be 24 based on the following assumptions: β=0.20, α= 0.05, $S1$=2.65, $S2$=4.29, μ=1.45, and μ=2.4. To yield reliable results, a probable attrition rate of 20% was considered, and each group's sample size was calculated to be 30. At the beginning of the study, 84 RA patients were assessed for eligibility. Of the 84 patients, 3 RA patients no accept to participate and 21 RA patients hadn't the inclusion criteria. Then 60 RA patients were randomly assigned into two groups: intervention group (n= 30) and control group (n= 30) using the block randomization method by https:// www. sealedenvelope. com/simple-randomiser/v1/ lists (Figure 1).

To evaluate the quality of sleep, the Pittsburgh Sleep Quality Index (PSQI) was used. The PSQI is a standardized self-report questionnaire that includes 19 items. Each item is scored 0 to 3. The total score of the PSQI is ranged from 0 to 21. Lower scores indicate a better quality of sleep. Scores of 5 or more indicate a poor quality of sleep. The PSQI measures different aspects of sleep and consists of seven subscales; these subscales include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and day time dysfunction. Validity and reliability of the PSQI were confirmed in different studies (19-20). Farrahi et al. (2012) reported the sensitivity of 93% for the Persian version of the PSQI. (21) The internal consistency of the Persian version of the instrument was reported at 0.89 (21).

Inclusion criteria for the participants included: age of 18 to 60 years, a diagnosis of RA that affects one or more joints of the hand, the shoulder, elbow, wrist, and fingers, the PSQI score of 5 or greater, and no history of surgery in the affected joints. Exclusion criteria included: absence in more than two intervention sessions, impaired skin integrity, fractures or injuries in the upper extremities, substance consumption (such as cigarette, alcohol, or psychotropic substance consumption), mental disorders or other chronic diseases (such as cancer), exacerbation of the patient's symptoms according to the opinion of a rheumatologist, as well as a simultaneous use of other complementary therapies, such as laser therapy, music therapy, motion therapy, and hydrotherapy. Twenty three out of 94 patients did not meet the inclusion criteria, and 11 patients declined to participate. A total of 60 patients with RA were randomly assigned into intervention (n= 30) and control (n= 30) groups using the block randomization method (Figure 1).

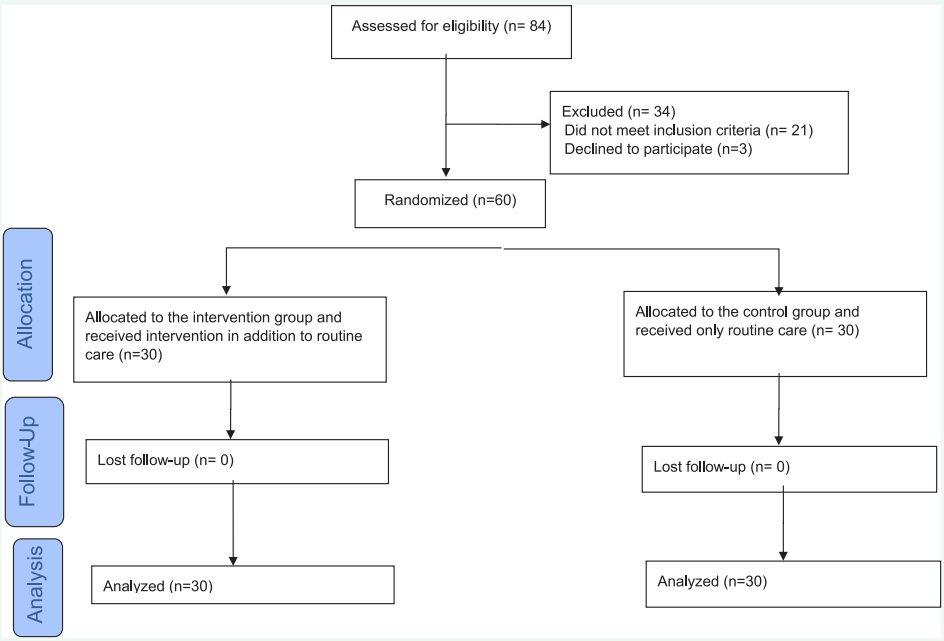

Figure 1 Sampling flow diagram.

At the beginning of the study, the two groups' participants completed a socio-demographic questionnaire. This questionnaire included questions about gender, age, marital status, job, level of education, history of disease, and duration of rheumatoid arthritis. The two groups also completed the PSQI before, immediately after, and a month after the intervention. All the participants had the ability to complete the questionnaires.

The first author, who has certification for giving professional Swedish massages, performed the intervention. A 30-minute Swedish massage was performed for a total of 8 weeks in the intervention group. For the first 4 weeks, the massage was performed twice a week, and for the second 4 weeks, the massage was performed three times a week. If both participants' hands were affected with RA, massage was performed on both hands. Based on the participants' request and convenience, the massage was performed in morning or evening. All participants in the intervention and control groups received RA disease routine care and treatments.

A private room at the Rheumatology Clinic was used for the intervention sessions. The room temperature was set between 22 and 24°C, and the humidity was between 40 and 60%. The participant was positioned in a supine position with a 30-degree elevation of the head. Swedish massage was applied to the joints of each hand, including the shoulder, elbow, wrist, and fingers (Figure 1). Field et al.'s protocol was used to perform the massage in five steps in the intervention group:

Step 1. **Effleurage** for 10 minutes. This step includes backward and forward movements of the therapist's hands with a medium pressure in patients' joints, including fingers, palms, wrists, forearms, elbows, and shoulders. This movement helps improve venous and lymphatic flow from a limb toward the heart.

Step 2. Petrissage for 5 minutes. This step consists of rolling, pressing, and squeezing motions on the hand's joints, including fingers, palms, wrists, forearms, elbows, and shoulders. Compared to effleurage, petrissage is a deeper manual movement and is applied on soft tissues. Petrissage can enhance muscles relaxation and increase blood circulation in the limb.

Step 3. Vibration for 5 minutes. In this step, tissues are pressed and released in upward and downward movements. These movements can stimulate soft tissues and nerves, relieve muscular tension, and decrease stress.

Step 4. Tapotement for 5 minutes. Tapotement is a rhythmic percussion and is applied using the edge of the hand, a cupped hand, or the tips of the fingers. There are five forms of tapotement movement, including "beating (closed fist lightly hitting area), slapping (use of fingers to gently slap), hacking (use the edge of hand on pinky finger side), tapping (use just fingertips) and cupping (make your hand look like a cup and gently tap area)". (14) These forms of movement can stimulate the nervous system and also can improve the lymph flow from the limb toward the heart (22).

Step 5. Friction for 5 minutes. Friction is a rapid pressure of the patient's hand from fingers to shoulders with circular movements by the therapist's **ball of the thumb or using a pointed object**. Friction can help release the muscle nodes (17).

The study's purposes, methods, and voluntary nature were explained for the participants. The participants were ensured about confidentiality of data and the right to withdraw from the study at any time without any penalty. The participants completed written informed consents.

Data was analyzed using the Statistical Package for Social Sciences 16.0 software (SPSSFW, SPSS Inc., Chicago, IL, USA SPSS). Kolmogrov Simirnov test was used to determine whether the data had a normal distribution. Nonparametric tests were conducted

when the data did not demonstrate a normal distribution. Mean scores and standard deviations were calculated. Chi-square tests were used to compare the two groups in terms of nominal variables. The independent t-tests were used to compare the two groups' mean scores. The repeated measures ANOVA test was used to perform within- and between-group comparisons regarding quality of sleep before, immediately after, and one month after the intervention. Level of significance was set at .05.

RESULTS

The mean age of the intervention and control groups was 50.82±6.23 and 51.36±6.37 years, respectively. Most participants in the intervention (90%) and control (86.66%) groups were female. Moreover, 93.33 % of the intervention group and 96.7% of the control group were married. The results of the chi-square test showed that there was no significant difference between the two groups in terms of the sociodemographic characteristics, including age, gender, marital status, education, occupation, and duration of rheumatoid arthritis (p> .05) (Table 1). In the intervention group, the mean scores of sleep quality before, immediately after, and one month after the intervention were 9.50±3.76, 7.36±3.74, and 7.46±3.55, respectively. In the control group, these scores were 9.30±2.98, 9.50±2.78, and 10.00±3.06, respectively. There was no significant difference found in the mean scores concerning the quality of sleep between the two groups at the beginning of the study (p> .05) (Table 2).

We also compared the mean scores of the PSQI subscales over the course of the study. In the intervention group, the mean scores of five subscales, including use of sleeping medication, sleep disturbances, sleep duration, sleep latency, and day time dysfunction, were also improved immediately after and one month after the intervention (p< .05). The result independent t-test in two group showed that there is the significant difference in mean scores of all the subscales except habitual sleep efficiency and subjective sleep quality subscales after and one month after the intervention. Furthermore, the results of Repeated Measure ANOVA indicated that in the intervention group, the mean scores of quality of sleep and these subscales improved over time (p <.05). Also, the effects of time and group and their interaction were significant (p <.05). These differences in terms of two other subscales of the PSQI, including habitual sleep efficiency and subjective sleep quality, were not significant (p> .05) (Table 2).

In the control group, there was no significant difference between the scores of the sleep quality and its dimensions over the course of the study and one month after the intervention (Table 2). There were significant differences between the control and intervention groups in terms of quality of sleep and its dimensions immediately after and one month after the intervention (p> .05) (Table 2).

DISCUSSION

The results of the present study indicated that, in the intervention group and through Swedish massage, the quality of participants' sleep was improved immediately after and one month after the intervention. These findings indicated the effectiveness of Swedish massage in improving quality of sleep and its dimensions (including use of sleeping medication, sleep disturbances, sleep duration, sleep latency, and daytime dysfunction, among our participants). However, the findings indicated that Swedish massage was not effective on other dimensions of quality of sleep; this includes the habitual sleep efficiency and subjective sleep quality.

Multiple studies addressed the effects of massage on quality of sleep among different patients; however, a few research groups studied the effects of Swedish massage on patients' quality of sleep. Shetty et al. (2015) showed that Swedish massage and applying heat on joints, within eighteen 30-minute sessions, were both effective for improving RA patients' quality of sleep and related dimensions (13). Bakir et al. (2018) reported that weekly 60-minute foot massage for six weeks was effective for improving RA patients' quality of sleep (8). Shetty et al. (2015) and Bakir et al. (2018) used the Pittsburgh Sleep Quality Index (PSQI) for measuring quality of sleep, and their results showed that massage was effective for improving their participants' quality of sleep and all related dimensions (8, 13). Similarly, in our study, the PSQI was used to measure quality of sleep before and after Swedish massage, and quality of sleep and some dimensions were improved. However, the results related to two dimensions, habitual sleep efficiency and subjective sleep quality, indicated no significant improvement in these dimensions of quality of sleep.

In general, despite differences amongst the studies in terms of research designs and methods, such as time and length of the intervention sessions, the results of these studies suggest that massages can be effective for improving quality of sleep in patients with RA. Several research teams stated that massages can help improve muscle relaxation and one's joint flexibility and manage muscle pain; therefore, sleep disorders and other problems associated with sleep quality can be reduced (10-12). Another research team addressed the effectiveness of massages on releasing neurotransmitters and neurohormones, which can reduce fatigue and improve quality of sleep (23).

Researchers studied effects of massages on the quality of sleep in patients with different health conditions. Castro-Sanchez et al. (2011) investigated the effect of massages on the quality of sleep in patients with fibromyalgia. They found that a Swedish massage-90 minutes once a week for 20 weeks-was effective for improving participants' quality of sleep (24). In another study, Hsu et al. (2019) reported that 10 minute daily back massage before bed for three consecutive days improved quality of sleep in intensive-care-unit (ICU) patients (25).

Our findings were in agreement with other studies in terms of effectiveness of massage on improving quality of sleep as well as most dimensions of quality of sleep in our participants. However, we found that massage could not improve two dimensions of sleep quality, including habitual sleep efficiency and subjective sleep quality. Nerbass et al. (2010) studies the effects of massage therapy on sleep quality after coronary artery bypass graft surgery. After providing body massages for three consecutive days, they did not find significant changes in patients' quality of sleep (26). These discrepancies can be related to the differences between the studies' designs and methods and research populations. For instance, we performed massages for eight weeks during the daytime on patients with RA. However,

Table 1: Demographic Characteristics of the Intervention and Control Groups.

Variable		Groups		*p* value
		Intervention Group (*n*= 30)	Control Group (*n*= 30)	
		Mean ± SD *n* (%)	Mean ± SD *n* (%)	
Age (year)		50.82±6.23	51.23±6.28	*p = 0.41
Duration of illness (month)		8.79±6.31	7.95±5.97	*p = 0.24
Gender	Female	27 (90%)	26 (86.66%)	**p =0.60
	Male	3 (10%)	4 (13.34%)	
Education level	Elementary	21 (70%)	19 (63.3%)	**p = 0.58
	Higher than elementary	9 (30%)	11 (36.7%)	
Marital status	Single	2 (6.67%)	1 (3.3%)	**p =0.18
	Married	28 (93.33%)	29 (96.7%)	
Occupational status	Employed	7 (23.34%)	8 (26.66%)	**p = 0.77
	Retired	13 (43.33%)	11(36.67%)	
	Unemployed	10 (33.33%)	11 (36.67%)	

* Independent t-test, ** Chi-Square test

Table 2. Comparing mean scores of the two groups in the sleep quality before, immediately, and one month after the end of the intervention

Sleep Quality		Before	Immediately after	One month after	**p Value		
		Mean ± SD	Mean ± SD	Mean ± SD	Time	Time × group	Group
Subjective Sleep Quality	Intervention Group	1.36±0.61	1.13±0.50	1.37±0.63	P=0.29	P=0.27	P=0.97
	Control Group	1.20±0.48	1.23±0.43	1.20±0.48			
	P Value*	P=0.24	P=0.41	P=0.24			
Sleep Latency	Intervention Group	2.00±0.94	1.60±1.00	1.66±0.99	P<0.04	P<0.002	P<0.01
	Control Group	2.26±0.82	2.30±0.83	2.53±1.10			
	P Value*	P=0.25	P=0.005	P=0.002			
Sleep Duration	Intervention Group	1.50±1.13	1.06±0.94	1.26±1.012	P<0.03	P<0.009	P<0.02
	Control Group	1.36±0.88	1.56±0.89	1.66±0.95			
	P Value*	P=0.61	P=0.04	P=0.04			
Habitual Sleep Efficiency	Intervention Group	0.93±1.22	0.66±0.99	0.83±1.08	P=0.20	P=0.78	P=0.83
	Control Group	0.96±0.88	0.80±0.80	0.80±0.88			
	P Value*	P=0.90	P=0.57	P=0.89			
Sleep Disturbances	Intervention Group	1.23±0.63	1.53±0.57	1.23±0.67	P<0.04	P<0.05	P<0.03
	Control Group	1.26±0.44	1.26±0.42	1.30±0.75			
	P Value*	P=0.20	P=0.045	P=0.03			
Use Of Sleeping Medication	Intervention Group	0.66±0.84	0.46±0.68	0.45±0.81	P<0.03	P<0.01	P<0.01
	Control Group	0.83±0.87	0.83±0.83	0.86±1			
	P Value*	P=0.45	P=0.04	P=0.04			
Day Time Dysfunction	Intervention Group	1.30±1.05	0.96±0.88	0.63±0.66	P<0.04	P<0.002	P<0.01
	Control Group	1.40±0.96	1.53±0.86	1.53±1			
	P Value*	P=0.20	P=0.02	P=0.000			
Total Score Sleep Quality	Intervention Group	9.50±3.76	7.36±3.74	7.46±3.55	P<0.005	P<0.00	P<0.05
	Control Group	9.30±2.98	9.50±2.78	10.00±3.06			
	P Value*	P=0.82	P=0.015	P=0.005			

*Independent t- test, ** Repeated Measures ANOVA

Hsu et al. (2019) performed daily back massage before bedtime for three consecutive days in ICU patients (26).

There is a need for further research to verify the results of our study and to propose effective designs of massage therapy to improve chronic patients' quality of sleep. Innovative strategies as well as complementary and alternative therapies can help patients with chronic conditions cope with their long-term chronic complications and health issues. Research in this field can help healthcare professionals and innovators recognize unmet needs of patients when designing care for patients with chronic diseases (27).

There were limitations in this clinical trial. Due to a small sample size, the generalizability of our findings is limited. We recommend future studies with larger sample sizes to help generalize the findings for a larger population. Furthermore, RA patients use different medications, especially pain medications. There was no directive or control regarding the use of medications in the participants. In the intervention group, the presence of the therapist (the first author) for massage can be another limitation of the study. The presence of another person could be a confounding variable when measuring concepts such as discomfort and pain. Taking these limitations and the contradictory results related to different designs of massage into account, further studies are recommended to develop effective designs of massage for patients with chronic diseases and complications. In this study, no injuries occurred in the participants during the intervention.

Implications for Practice

Due to the chronic disease burdens and complications associated with pharmacological treatments, it is essential to introduce innovative strategies for management of chronic and long-term health conditions. Our finding indicated that the Swedish massage was effective for improving the participants' quality of sleep. We recommend Swedish massage therapy as a safe and effective intervention for managing complications related to sleep in RA patients. To integrate the findings into the knowledge base for evidence-based practice, the authors recommend further research to confirm the results.

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