



# The Effect of Foot Massage Using Lemongrass Oil on Reducing the Intensity of Rheumatoid Arthritis Pain in the Elderly at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency

Siti Aisyah<sup>(✉)</sup>, Musrifatul Uliyah, and Mila Ulfaiza<sup>(✉)</sup>

Muhammadiyah University of Surabaya, Surabaya 60113, Indonesia  
sitiaisyah@um-surabaya.ac.id

**Abstract.** Rheumatoid Arthritis is an autoimmune chronic inflammatory disorder that attacks the joints causing damage to the joints and being a source of morbidity that can cause considerable death. Foot massage using lemongrass oil is a non-pharmacological therapy that can reduce pain and provide a relaxing effect. Objective: This study aims to determine the effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly. Method: This is a pre-experimental study with a pre-test post-test one group design. The population was 135 people, and a sample of 38 people was taken using the purposive sampling technique based on inclusion criteria. The dependent and independent variables in this study were rheumatoid arthritis pain and foot massage using lemongrass oil. Data collection used a scale of Bourbonnais pain and SOP foot massage. The data analysis used in this study was the Kolmogorov-Smirnov for normality test and the paired t-test ( $P < 0.05$ ). Results: The results showed that most (63%), as many as 24 respondents experienced moderate pain (scale 4–6) before being given therapy, and most (66%), as many as 25 respondents, had no pain (scale 0) after being given therapy. The results of the normality test are normally distributed, and the results of the paired t-test test are  $P = 0.000$  or  $P < 0.05$ , which showed the effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly. Conclusion: There is an effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly. For this reason, foot massage using lemongrass oil can be an alternative to overcome rheumatoid arthritis pain.

**Keywords:** Rheumatoid Arthritis · Foot Massage · Lemongrass Oil · Elderly

## 1 Introduction

Individually, the aging process can cause changes at the physical, biological, economic, social, and psychological levels. All organs and tissues of the elderly body will undergo some changes. This state is also observed in the musculoskeletal system and other body tissues related to susceptibility to rheumatoid arthritis disease[1]. Rheumatoid arthritis that does not immediately get treatment will have an impact on patient mobility, such as

difficulty walking and reduced functional capacity to perform daily tasks [2]. The poor condition can cause paralysis, inflammation of the blood vessels, eyes, lungs, and heart, and can cause carpal tunnel syndrome, organ failure, and can even cause death [3].

According to WHO, in 2021, the results of the latest analysis from the Global Burden of Disease show that around 1.71 billion people worldwide have joint problems, with the prevalence of rheumatoid arthritis sufferers as many as 14 million people. According to Riskesdas (2018), in Indonesia, 7.30% of people suffer from rheumatoid arthritis. Meanwhile, in East Java Province, the prevalence of rheumatoid arthritis incidence was 6.72% (Riskesdas, 2018).

Based on visit data at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency, in 2021, there were around 460 men and 684 women, with a total of 1,144 people. Of these, 32% or as many as 367 elderly people suffer from rheumatoid arthritis. The results of a preliminary study on March 28, 2022, obtained the results of interviews with ten elderly people suffering from rheumatoid arthritis experiencing pain. The results of the interview also found that the elderly who experienced pain only took medications to relieve the pain felt.

The treatment of rheumatoid arthritis pain can indeed be alleviated by using drugs, but the use of drugs in the long term can cause dependence and damage to the kidneys. Some safe non-pharmacological therapies can be used to relieve pain, one of which is foot massage using lemongrass oil. Foot massage is one of the non-pharmacological methods applied through massage so that it can arouse the release of endorphins and make the body more comfortable due to a decrease in sympathetic nerve activity [4, 5] While citronella (*Cymbopogon nardus*) is a type of plant that produces essential oils and is developed from the distillation of leaves from the lemongrass plant. Lemongrass plant is often used as a fragrant ingredient, cooking pe, insect repellent, and medicine [6, 7]. According to [6], the lemongrass plant contains essential oils that provide a warm effect as an anti-inflammatory and analgesic. It can improve blood circulation to reduce complaints of muscle pain and joint pain in patients with rheumatoid arthritis.

Based on these conditions, researchers were interested in conducting research on the effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency.

## 2 Methods

The design in this study was pre-experimental, using the pretest-posttest one-group design. This study was conducted at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency, in June-July 2022, with a total population of 135 people and a sample of 38 people taken using purposive sampling techniques.

Data collection in this study used an observation sheet on the Bourbonnais pain scale and SOPs for foot massage. Measurement of the pain scale was carried out before and after therapy with a duration of 20 min for three consecutive days. The statistical test used is a data normality test using the Kolmogorov-Smirnov test and the paired t-test with a P value of  $0.000 < 0.05$ , which means that there is an effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly.

### 3 Result

Table 1 shows that the majority (24%) were aged 61–63 years and 64–66 years, as many as nine respondents, and a small part (11%) were aged 76–78 years, as many as four respondents.

Based on Table 2, it can be interpreted that most respondents are women, as many as 27 respondents (71%), and a small percentage of men, as many as 11 respondents (29%).

Table 3 shows that the majority (37%) had an elementary education background of 14 respondents and the smallest high school education (16%), as many as six respondents.

Based on Table 4, it can be interpreted that most respondents work as housewives (47%), as many as 18 respondents, and the smallest work as laborers and merchants (11%), as many as four respondents.

Based on Table 5, it can be interpreted that respondents are Muslim (100%), as many as 38 respondents.

Table 6 shows that most respondents suffered from rheumatoid arthritis for six years (21%), as many as eight respondents, and a small part suffered from rheumatoid arthritis for three years (13%), as many as five respondents.

**Table 1.** Distribution of respondents by age on June 29 - July 07, 2022, at Aisiyah Clinic, Ambulu Su-district, Jember Regency

No.	Age	Frequency	Percentage
1	61–63	9	24%
2	64–66	9	24%
3	67–69	6	16%
4	70–72	5	13%
5	73–75	5	13%
6	76–78	4	11%
	Total	38	100%

Source: Research data 2022

**Table 2.** Distribution of respondents by sex on June 29 - July 07, 2022, at Aisiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Sex	Frequency	Percentage
1	Man	11	29%
2	Woman	27	71%
	Total	38	100%

Source: Research data 2022

**Table 3.** Distribution of respondents based on the last education on June 29 - July 07, 2022, at the Aisiyiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Education	Frequency	Percentage
1	No School	9	24%
2	SD (Elementary School)	14	37%
3	SMP (Junior High School)	9	24%
4	SMA (Senior High School)	6	16%
	Total	38	100%

Source: Research data 2022

**Table 4.** Distribution of respondents by occupation on June 29 - July 07, 2022, at Aisiyiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Work	Frequency	Percentage
1	IRT	18	47%
2	Farmer	12	32%
3	Laborer	4	11%
4	Merchant	4	11%
	Total	38	100%

Source: Research data 2022

**Table 5.** Distribution of respondents by religion on June 29 - July 07, 2022, at the Aisiyiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Religion	Frequency	Percentage
1	Islam	38	100%
	Total	38	100%

Source: Research data 2022

Table 7 shows that the intensity of pain before being given therapy shows that most respondents experience moderate pain (63%), as many as 24 respondents, and a small percentage experience mild pain (14%), as many as 14 respondents.

Based on Table 8, it can be interpreted that the intensity of pain after being given therapy shows that most respondents did not experience pain (66%), as many as 25 respondents, and a small part experienced mild pain (13%), as many as 13 respondents.

Based on Table 9, it can be interpreted that the results of the paired t-test statistical test show that the average value before being given therapy is 4.11 (1.085), and after therapy is 0.39 (0.595), so there is a decrease of 3.72. When viewed from the effect of therapy administration shows a value of 0.000 (P value <  $\alpha$  0.05), which means that there is a difference in the scale of pain before and after being given therapy.

**Table 6.** Distribution of respondents based on the length of suffering from RA disease on June 29 – July 07, 2022, at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Duration of Disease	Frequency	Percentage
1	2 years	7	18%
2	3 years	5	13%
3	4 years	7	18%
4	5 years	5	13%
5	6 years	8	21%
6	7 years	6	16%
	Total	38	100%

Source: Research data 2022

**Table 7.** Distribution of the frequency of pain intensity before being given therapy on June 29 - July 07, 2022, at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Category	Pre-Test Frequency	Percentage
1	No pain	0	0%
2	Mild pain	14	37%
3	Moderate pain	24	63%
	Total	38	100%

Source: Research data 2022

**Table 8.** Frequency distribution of pain intensity after being given therapy on June 29 - July 07, 2022, at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency

No.	Category	Post-Test Frequency	Percentage
1	No pain	25	66%
2	Mild pain	13	34%
3	Moderate pain	0	0%
	Total	38	100%

Source: Research data 2022

**Table 9.** Frequency distribution of influences before and after therapy given on June 29 - July 07, 2022, at Aisiyiah Clinic, Ambulu Sub-district, Jember Regency

Variable	Mean	Std. Deviation	Sig.(2-tailed)	Mean difference
Pre-test	4.11	1.085	0.000	3.72
Post-test	0.39	0.595		

Source: Paired t-test SPSS 21.0

## 4 Discussion

### 4.1 Identification of Rheumatoid Arthritis Pain Intensity in the Elderly Before Giving Foot Massage Using Lemongrass Oil at Aisiyiah Clinic, Ambulu Sub-district, Jember Regency

Based on the results of the study, it was found that before being given foot massage therapy using lemongrass oil, most of the elderly experienced moderate pain (63%), as many as 24 respondents. Pain is one of the symptoms of rheumatoid arthritis. Pain in rheumatoid arthritis is caused by joint damage experienced by sufferers due to the presence of autoimmune precipitating factors. A normal immune system can make antibodies that can attack viruses and bacteria, but the immune system in people with rheumatoid arthritis actually sends antibodies to the joint layer to attack the tissues around the joint so that the joints experience inflammation and cause pain in the joint area [3, 4, 8]. Some other factors that affect rheumatoid arthritis pain include age, gender, occupation, and length of suffering from RA [5, 9]. The first factor is age. In this study, the most data based on age were 61–63 years and 64–66 years, with a percentage of 24%. This is because when we are old, the metabolic system begins to be disturbed, and body functions decrease. In old age, the protective layer of the joints begins to thin, and the fluid in the bones begins to thicken so that the body becomes painful when moved and increasing the risk of rheumatoid arthritis pain. According to [1, 8], as one gets older, a person will experience various changes at the physical and biological level resulting from the aging process.

The second factor that allows causing pain in rheumatoid arthritis patients is sex. In this study, the most data were from female respondents, as many as 71%, and from men, 29%. This is because men have lower sensitivity than women, so when experiencing pain, men do not express pain excessively compared to women. The involvement of the estrogen hormone also has an effect on the pain felt by women. According to [10], the function of the estrogen hormone is to maintain bone mass. When bone mass loses, its flexibility can lead to a decrease in the area of motion of the joints. This condition can also occur in men, but the way of perceiving pain between women and men is certainly different.

The third factor is work. In this study, the most data were from housewives (47%). Housewives generally do a lot of work at home, such as washing, sweeping, gardening, and other jobs that can result in a lot of joint movement. Almost all respondents do not have a household assistant, so the homework was done by themselves, so it can be known that too heavy work can cause a recurrence of rheumatoid arthritis pain. According to

[9, 11] pain usually appears when a person is too excessive in activities. Heavy work such as going up and down stairs, cleaning the house, or work that uses hands for a long period of time will affect the recurrence of rheumatoid arthritis pain.

The fourth factor is the length of suffering from the disease. In this study, the most data was six years (21%). This is because the musculoskeletal function is decreasing, causing degenerative changes and causing relapse pain at any time. Inflammation of the joints of rheumatoid arthritis can last annually. If this inflammation continues, it can cause damage to the joint cartilage and ligament muscle bones in the joint, resulting in pain that can experience recurrence [3, 4].

According to the researchers' assumptions, the results of the study obtained at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency, there were still many rheumatoid arthritis sufferers who complained of pain, and most respondents complained of moderate pain. This was due to several factors such as age, gender, occupation, and length of time suffering from RA pain. Some elderly people also complain of pain in the early morning, so when the pretest was done on the second day, the results of an increase in pain intensity were obtained. This is because, at night, the whole body is rested from activities. Moreover, this is supported by changes in the temperature of the environment, which gets colder at night so that when waking up in the morning, the pain can recur.

#### **4.2 Identification of Rheumatoid Arthritis Pain Intensity in the Elderly After Giving Foot Massage Using Lemongrass Oil at Aisyiyah Clinic, Ambulu District, Jember Regency**

Based on the results of the study, it was found that after giving foot massage therapy using lemongrass oil to reduce the intensity of rheumatoid arthritis pain, most of the elderly experienced mild pain (34%), as many as 13 respondents and no pain (66%) as many as 25 respondents. According to [4], foot massage improves blood circulation in the muscles so as to reduce pain. Foot massage can block the transmission of pain and activate endorphins and relax muscles to reduce pain. In addition, doing a foot massage can help restore balance in the body, also help facilitate blood circulation, lower cholesterol, and blood pressure, and can reduce pain. According to [9, 12], foot massage is done by applying manual pressure to soft tissues such as muscles, tendons, and ligaments without causing changes in the position of the joints with the aim of relieving pain, producing, and increasing relaxation.

In this study, the results showed that after being given foot massage therapy using lemongrass oil, most of the elderly experienced a change in the scale of pain. In line with the research of Marlina F (2019), which showed that there was a decrease in the scale of pain in the elderly after being given foot mass therapy (foot massage). Also, in line with [3, 4], which showed that after being given foot mass therapy, most respondents said that the pain was reduced, and they felt more comfortable.

According to the researcher's assumptions, foot massage therapy using lemongrass oil at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency, for three consecutive days can reduce the intensity of pain in the elderly. As evidenced by the results of the post-test using the Bourbonnais scale, as many as 25 respondents (66%) had no pain. The results of the evaluation stated that the elderly were more comfortable with massage, and the pain was reduced. This is because giving a foot massage using lemongrass oil can

stimulate the circulatory system so that vasodilation occurs, which affects blood flow increases, and blood circulation becomes smooth.

#### **4.3 Analyzing the Effect of Foot Massage Using Lemongrass Oil on Reducing the Intensity of Rheumatoid Arthritis Pain in the Elderly at the Aisiyah Clinic, Ambulu Sub-district, Jember Regency**

Based on the paired t-test that has been carried out, the average value results before therapy were 4.11 with Std. Deviation of 1.085 and the average value after therapy was 0.39 with Std. Deviation of 0.595. There was a decrease in the average value of 3.72. The result of the significance of P-Value  $0.000 < \alpha 0.05$ , then the hypothesis in this study was accepted. This means that there is an effect of giving foot massages using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly at the Aisiyah Clinic, Ambulu Sub-district, Jember Regency. Based on the Gate Control Theory proposed by Milzack and Wall in 1959, which states that the scale of pain can change due to the extension of the endogenous ability to increase and reduce the degree of pain through modulation of impulses that enter the kornu dorsalis through the gate. The integration of inputs from sensory neurons at the level of the corresponding spinal medulla will be the determinant of whether the gate will close or open. This theory accommodates psychological variables in pain perception, including the motivation to be free from pain and the role of thoughts, emotions, and stress reactions in increasing or decreasing pain sensations. Through this model, it is understandable that pain can be controlled by pharmacological manipulation as well as psychological interventions [11, 12].

Foot massage activates parasympathetic activity and then sends neurotransmitter signals to the brain, internal organs, and bioelectric throughout the body. The signals sent to the brain will send alpha waves into the brain. The nerve impulses generated during foot massage are transmitted to the hypothalamus to produce corticotrophin-releasing factor (CRF). CRF stimulates the pituitary gland to increase the production of pro-opioid melanocortin (POMC) so that the adrenal medulla produces endorphins. Endorphins secreted into the bloodstream can exert a natural analgesic effect on inflamed tissues ([4, 6].

Lemongrass oil can help relax and tone muscles, as well as relieve muscle pain, rheumatism. The main compounds of lemongrass oil are geranyl acetate, myrcene, neroli, citronellal, terpineol, methyl heptanone, pentane, geraniol, neral, farnesol, limonene, and citral. Another beneficial compound in lemongrass is limonene, which helps reduce inflammation and kill bacteria [10, 13, 14].

Lemongrass oil spreads can penetrate the skin and easily spread to other parts of the body, such as lymph ducts and blood vessels, nerves, collagen, fibroblasts, mast cells, and others. Molecules circulate is transported through the circulatory system, both blood and lymphatic circulation through capillary vessels. Furthermore, the capillary vessels carry them to the central nervous system quickly, and the brain will send a message in the form of a message from an organ of the body that is experiencing a disorder or imbalance. Molecules that reach brain cells can act with the release of neurochemicals in the form of feelings of pleasure, relaxation, and calm. Lemongrass oil applied with massage will further stimulate the circulatory system to work more actively ([9, 13].



In this study, the results were obtained that there was an effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly. This is in line with [4] with the results of the Wilcoxon test showing a p-value of 0.000 ( $P < 0.05$ ) so that it can be concluded that there is an influence of cutaneous stimulation (foot massage) on the scale of pain in the elderly with rheumatoid arthritis. In line with [2] with the results of the Wilcoxon test, p-value results ( $0.000 < 0.05$ ), which means that there is an influence of leg masses on reducing pain in rheumatoid arthritis patients. In another study by Feny and Rita (2019), the results of the researchers' analysis obtained that there was a decrease in the scale of pain in the elderly suffering from rheumatoid arthritis after massage with the results of the t-dependent test obtained a P-value of 0.000 ( $p < 0.05$ ).

According to the researchers' assumptions, based on research data that has been obtained at the Aisyiyah Clinic, Ambulu Sub-district, Jember Regency, giving foot massage using lemongrass oil has an influence in reducing the intensity of rheumatoid arthritis pain in the elderly. Where many respondents experienced a decrease in pain intensity after being given therapy for three consecutive days, but the decrease in pain intensity felt by each respondent varied greatly. Most likely, this is influenced by several factors because the nature of the feeling of pain is the perception and subjective of everyone. The compounds in lemongrass oil are proven to have analgesic and anti-inflammatory activities that can help reduce pain.

## 5 Conclusion

Based on the results of the research and discussion above, it can be concluded that the effect of giving foot massage using lemongrass oil on reducing the intensity of rheumatoid arthritis pain in the elderly at the Nasiriyah Clinic, Ambulu Sub-district, Jember Regency by p-value = 0.000 ( $P < 0.05$ ).

## 6 Suggestion

Based on the results of the research and discussion, the researchers want to provide advice to several related parties, including:

1. For Aisyiyah Clinic agencies, Ambulu Sub-district, Jember Regency.

It is hoped that clinic staff can advise rheumatoid arthritis sufferers to do foot massage therapy using lemongrass oil to help reduce the intensity of pain.

2. For educational institutions.

It is hoped that educational institutions, especially in the faculty of health sciences, can participate in applying or promoting foot massage therapy using lemongrass oil as a way to reduce the intensity of rheumatoid arthritis pain through community service activities.

3. For subsequent researchers.

It is hoped that further researchers can conduct research using quasi-experimental research designs using a comparison group (control group) so that it is known that the decrease in pain intensity is really an influence of therapy.

4. For respondents and families.

It is hoped that families and respondents with rheumatoid arthritis can make foot massages using lemongrass oil as an alternative to non-pharmacological management in pain management.

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