The effect of eucalyptus inhalation on pain and the quality of life in rheumatoid arthritis

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ABSTRACT

Problem considered: Pain is one of the most significant symptoms of rheumatoid arthritis that reduce the quality of life. The purpose of the study was to determine the effect of eucalyptus on pain and the quality of life in patients with rheumatoid arthritis.

Methods: In this randomized clinical trial, 70 patients with rheumatoid arthritis were selected by random sampling. In the eucalyptus group, 1 mL of eucalyptus oil was inhaled for 5 min, 3 times a day, for one month. The control group received placebo inhalation. Both groups used routine treatments. Data were collected using a questionnaire of demographics, the numerical pain rating scale (NRS), and Quality of Life (SF-12). Statistical analysis was done using 19th edition SPSS software and applied on paired t-test, chi-square, Fisher’s exact test, and analysis of covariance.

Results: The mean score of pain severity in the eucalyptus group significantly decreased in comparison with the control group (P < 0.001). The severity of pain there was no statistical difference in both groups before the first, and the second weeks after the intervention, (p > 0.05); however, in the third and fourth weeks after the intervention, the mean severity of pain in the eucalyptus group was lower than in the control group, and these differences were statistically significant between the two groups (P < 0.05). Also, the patients’ quality of life in the eucalyptus group was increased significantly (P < 0.001).

Conclusion: The eucalyptus leads to pain reduction, and consequently, improves the quality of life of patients with rheumatoid arthritis.

Trial registration: IRCT20160110025929N15 Registration date: 2018-10-07; https://en.irct.ir/trial/33573.

1. Introduction

Rheumatoid arthritis is a chronic and inflammatory joint disease [1, 2], the most common musculoskeletal disorder [2], and the most debilitating autoimmune disease with unknown origin [3,4]. In the 2010 study, the universal prevalence of RA was 0.24. The disease occurs in women more than men [5]. Factors involved in this disease are smoking, gender, bacteria, and viruses [6]. This disease has articular and non-articular symptoms [7,8]. Pain is the main symptom of rheumatoid arthritis [5]. Pain reduces people’s life quality [8], therefore pain control is one of the most important healthcare services in patients [9]. The quality of life is a multidimensional concept that has an impact on the physical, mental, social, and personal beliefs of individuals. Measuring the quality of life helps nurses to take care of people, whose life quality degraded significantly [10]. The study of Kim showed the significant impact of aromatherapy on pain and depression reduction but didn’t lead to a higher quality of life [9]. Treatment of patients with RA...
requires a multidisciplinary approach [11]. Various therapeutic interventions such as pharmaceutical, non-pharmaceutical, and surgical interventions have been used for pain reduction in rheumatoid arthritis [12]. Pharmaceutical interventions may have undesirable complications such as severe cardiovascular and gastrointestinal problems, nephrotoxicity, and systemic infections [13]. The American College of Rheumatology has recommended guidelines for using disease-modifying anti-rheumatic drugs (DMARDs) to improve symptoms and restore joint function [14]. These drugs have countless predictable side effects [14]. Surgery is not always necessary and can lead to serious complications such as infection and bleeding [15]. Complementary medicine can also be used with DMARDs [5]. The patients have turned their attention to complementary medicine because of the side effects of pharmaceutical interventions [16]. Aromatherapy is one of the methods of complementary medicine [17]. Today, aromatherapy is accepted as holistic nursing care and part of professional nursing [10]. Eucalyptus is one of the herbal medicines used for rheumatoid arthritis patients. Different species of the plant are distributed all over the world [17] Eucalyptus has anti-inflammatory, anti-nociceptive and, anti-microbial properties. Eucalyptus, as analgesic, can be used topically or inhaled. It stimulates neurotransmitters and endorphin secretion inside the brain [18,19]. Eucalyptus inhalation is effective for relieving knee pain [20]. Due to limited studies about an analgesic and anti-inflammatory impacts of eucalyptus, researchers decided to perform a study about this topic. The goal of the current study is to identify the impact of eucalyptus inhalation on the pain and the quality of life of patients with RA.

2. Method and methods

The study was a randomized clinical trial. The project was conducted on patients with RA, referred to the clinic (Fig. 1). In this randomized clinical trial, 70 patients with rheumatoid arthritis were selected by random sampling and were randomly divided into two groups. Subjects were selected by simple sampling method using R software version 3.5.1 and in the form of permutable blocks ABC-ACB-BCA-BAC-CAB-CAB is randomly assigned to two (eucalyptus and control). A sequence of blocks was randomly generated using R software and a list was created. Patients were randomly assigned to one of three groups based on the list. The patients did not know their assigned group, the eucalyptus’ aroma could impact on the patients in control group. So, the patients were excluded if they were in the same room.

Based on the following formula, the number of patients in each group was estimated at 29 patients, however, considering of 15% of the sample attrition, 35 patients were invited in each group.

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\frac{(1.96 + 0.84)^2 \times 2 \times 2^2}{1.5^2} = 29
\]

The inclusion criteria were age 18–60 years, no use of aromatherapy in the past month, absence of a history of allergy, allergic rhinitis, asthma, and chronic pulmonary disease, having at least one year of the definitive diagnosis of articular rheumatism. Exclusion criteria included allergy to eucalyptus, changing the disease process, death, and the patient migrates to another place. The primary and secondary outcomes were pain and quality of life.

The research tools were:

![Fig. 1. CONSORT 2010 flow diagram.](image-url)
Demographic and clinical questionnaires include age, gender, job, education, marital status [21], duration of disease, location, smoking, time of diagnosis of rheumatoid arthritis, having Family history of rheumatoid arthritis, criterion DSA28, movement limitation, and BMI.

The numerical pain rating scale (NRS), the numerical pain scale with the values of 0 (no pain) to 10 (severe pain) was also used to record the pain severity. The patients recorded the pain before and after the intervention [15,22].

The Quality of Life (SF-12), the SF-12 questionnaire consisting of 8 subscales, the general perception of personal health, physical performance, physical health, emotional disorders, physical pain, social performance, joy, having energy for life, and mental health was used to measure the reliability of this scale has been previously calculated based on the “test-retest” Cronbach’s alphas were respectively 0.86 and 0.76, for physical and mental dimensions, respectively [15,23]. In this study, the internal consistency of physical and mental dimensions of QOL was achieved equal 0.79 and 0.75 correspondingly. They were finally answered based on the Likert scale. For each sub-scale, a score of 0–100 was obtained. A higher score is indicative of better performance or well-being [24]. Their life quality was measured by the SF-12 questionnaire at first and at the end of the study.

In this study, the validity of the tools was confirmed by 10 nursing faculty members.

Interventions: After obtaining informed consent for data collection, patients were randomly divided into control and eucalyptus groups.

Eucalyptus oil was prepared by a reputable pharmaceutical company in 2019. The essential oil used in the present study is from the species of Myrtassa which was prepared from the leaves of the plant. In the eucalyptus group, eucalyptus essential oil was placed on a 2 * 4-inch gas pad that attached to the patient’s clothing with pins and was incubated for 5 min, 3 times a day. Pain score was measured 2 min later.

In the control group was used distilled water instead of eucalyptus. Both groups received medication as prednisolone (once a day), indomethacin (twice a day), celecoxib (twice a day), methotrexate (three numbers a week), and acetaminophen (once a day). Also, the eucalyptus group used eucalyptus as complementary medicine.

Data were analyzed using 19th edition SPSS software and paired t-test, chi-square, Fisher’s exact test, and analysis of covariance. The study protocol was approved by the Ethics Committee with the number of IRUMSHA.REC.1397.408. The IRCT code was IRCT20160110025929N15.

### Table 1
Demographic data in Eucalyptus and control groups.

| Variables                     | Control group n = 35 | Eucalyptus group n = 35 | p-value |
|-------------------------------|----------------------|-------------------------|---------|
| Gender, n (%)                 | Female 29(82.86)     | 29(82.86)               | X² = 1.47, p = 0.256 |
|                              | Male 6(17.14)        | 6(17.1)                 |         |
| Age, M ± SD                   | 47.40 ± 18.57        | 52.91 ± 16.73           | X² = 1.31, p = 0.256 |
| Marital status, n (%)         | Unmarried 6(17.14)   | 3(8.57)                 | X² = 2.91, p = 0.086 |
|                              | Married 27(77.14)    | 29(82.86)               |         |
| Education, n (%)              | Illiterate 15(42.86) | 16(45.71)               | X² = 0.364, p = 0.864 |
|                              | High 12(34.28)       | 12(34.29)               |         |
|                              | school Diploma 1(2.86)| 6(17.14)                |         |
|                              | Academic 1(2.86)      | 1(2.86)                 |         |
| Location, n (%)               | Urban 24(68.57)      | 27(77.14)               | X² = 0.65, p = 0.42 |
|                              | Village 1(31.43)     | 11(31.43)               |         |
| HAVING SMOKING, n (%)         | Cigarette 0(0.00)    | 2(5.72)                 | X² = 1.93, p = 0.167 |
|                              | Narcotics 1(2.86)    | 1(2.86)                 |         |
|                              | None 34(97.14)       | 34(97.14)               |         |
| Criterion DSA28, n (%)        | 1–2 9(25.71)         | 7(20.0)                 | X² = 2.91, p = 0.086 |
|                              | 3–4 1(3.47)         | 17(48.57)               |         |
|                              | 5–6 13(37.14)       | 19(54.29)               |         |
| Movement limitation, n (%)    | ≤4 year 5(14.29)     | 16(45.71)               | X² = 3.86, p = 0.045 |
|                              | >4 years 6(17.14)    | 19(54.29)               |         |
| BMI, M ± SD                   | 22.63 ± 4.56        | 25.11 ± 5.18            | X² = 2.13, p = 0.037 |

\* Chi-square.  
\b Fisher’s Exact Test.

### Table 2
Comparison of severity of pain before and after the intervention in Eucalyptus and control groups.

| Groups                      | Control n=35 | Eucalyptus n=33 | Tests | p-value |
|-----------------------------|--------------|-----------------|-------|---------|
| Intervention time           |              |                 |       |         |
| Before the intervention, M ± | 6.26 ± 1.63  | 6.46 ± 1.72     | X² = 0.508, p = 0.056 |
| SD                          | 1.63         | 1.64            |       |
| First week after the        | 6.14 ± 1.63  | 6.40 ± 1.72     | X² = 0.530, p = 0.056 |
| intervention, M ± SD        | 1.65         | 1.64            |       |
| Second week after the       | 5.68 ± 1.63  | 6.31 ± 1.65     | X² = 0.458, p = 0.056 |
| intervention, M ± SD        | 1.53         | 1.72            |       |
| Third week after the        | 5.83 ± 1.63  | 6.45 ± 1.65     | X² = 0.003, p = 0.056 |
| intervention, M ± SD        | 1.56         | 1.72            |       |
| Fourth week after the       | 6.00 ± 1.63  | 4.40 ± 1.58     | X² = 0.001, p = 0.056 |
| intervention, M ± SD        | 1.50         | 1.64            |       |

\* Chi-square.

### 3. Results

The findings of this research showed that most of patients were women, married, illiterate, urban, non-smoking, having more than 4 years RA, having 3–4 joints involved based on criterion DSA28, and movement limitation. The two groups were similar in terms of the time of diagnosis, Family history of rheumatoid arthritis, and movement limitation (Table 1).

The result showed that there was no statistical difference between the mean scores of the severity of pain in both groups before the study, (P = 0.580); also the first (P = 0.530), and the second weeks after the intervention (P = 0.458); however, at the third weeks (P = 0.003) and the fourth weeks after the intervention (P = 0.001) there was a statistical difference in both groups (Table 2).

Also, the results showed that there was no statistical difference between the quality of life in both groups before the study (P = 0.5); however, after the intervention, there was a statistical difference between the quality of life in both groups (p < 0.001), so that total quality of life to increase from 28.26 ± 3.23 to 37.51 ± 4.57 in eucalyptus group (Table 3).

### 4. Discussion

According to the results of the current study, it can be argued that the pain of patients who used eucalyptus oil inhalation was significantly improved.
Consent for publication
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