ORIGINAL ARTICLE

A Eucalyptus and Lemon Essential Oils as an Alternative for Symptoms Management of COVID-19: A Single-blinded Randomized Controlled Trial

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ABSTRACT

Introduction: Patients with COVID-19 without underlying medical issues are asked to self-manage symptoms with minimal medicines and lifestyle changes. However, the majority of current guidelines make no particular recommendations for treating COVID-19 symptoms, which, in addition to being extremely debilitating, contribute to the virus's transmissionPatients with COVID-19 were given eucalyptus and lemon essential oils as part of this study to see if they could reduce their symptoms. **Methods:** This study was conducted using two-group single-blind randomized controlled trial. A total of 100 participants were randomly assigned to one of two groups: the aromatherapy group (n =50) or the control group (n=50). The intervention group inhaled three drops of eucalyptus and lemon were combined in a 1:1 ratio for 20 minutes in 7 days. Each participant was asked to indicate whether or not they had experienced any of the 13 Major COVID-19 symptoms. **Results:** Eucalyptus and lemon essential oils improved outcomes relative to the control at T1 across two outcomes: 1) total number of symptoms decreased 2.39 (1.11 to 7.39), 2) body temperature score saw a modest decreased 2.17 points (95% CI 1.12 to 6.48). At T2, improved outcomes relative to the control were observed in family total number of symptoms (DID coefficient 3.41 (95% CI (1.12 to 6.75), body temperature (DID coefficient 2.39, 95% CI 1.18 to 6.63). **Conclusion:** Eucalyptus and lemon essentials oils (applied together) could be used as an alternative therapy for COVID-19 symptoms management.

Keywords: Eucalyptus, Lemon essential oils, Symptoms, COVID-19

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INTRODUCTION

More than half a million people have died worldwide as a result of the Coronavirus SARS-Cov-2 epidemic outbreak in Wuhan, China, in late 2019. The majority of COVID-19 virus infections cause mild to moderate respiratory illness and resolve on their own, without the need for additional treatment. For those with preexisting medical conditions such as heart disease, diabetes, lung disease, or cancer, the risk of death is higher for those over the age of 65 than for the rest of the population (1). Patients without underlying medical issues are asked to self-manage symptoms with minimal medicines (paracetamol for fever) and lifestyle changes (increased rest and hydration). However, the majority of current guidelines make no particular recommendations for treating COVID-19 symptoms, which, in addition to being extremely debilitating, contribute to the virus's transmission.

Fever, cough, and dyspnea are early COVID-19 symptoms, which are comparable to other viral respiratory infections like the flu (2). Thus, anamnesis-based COVID-19 diagnosis remains challenging. The incubation period is typically 15 days, but can range from 0 to 24 days (3). COVID-19 has high transmission capacity (4). There are up to 60% of people who are asymptomatic and thus unknowingly spread the disease (5,6). With a range of symptoms that include respiratory failure and shock as well as multiple organ failure, it is known as "severe acute obstructive airway disease." (3,7); and may be followed by fatigue, headache, diarrhea, and lymphopenia (2), as well as a high prevalence of cardiovascular symptoms (4). However, a systemic pro-inflammatory response appears to be involved, leading to hemodynamic alterations and a propensity to ischemia and thrombosis (4,7,8). A large release of cytokines and chemokines as a result of an unchecked immune system dysregulation causes numerous organ dysfunction as well (9).

The word concerning "alternative therapies against COVID" has been disseminated around the world as part of the worldwide effort for a response to the COVID-19 epidemic (10). Ayurvedic remedies, especially essential oils and Chinese herbs, have historically been used to prevent and treat epidemics and pandemics. The volatile phytochemicals in aromatic essential oils come from a variety of classes, including monoterpenes and sesquiterpenes. Innumerable research projects have looked into essential oils' antimicrobial, antifungal, antioxidant, and antiviral properties. Antiviral properties of essential oil constituents have been demonstrated in clinical studies, and a wide range of essential oil formulations are available (11,12).

It has long been used to treat a wide range of respiratory ailments, including pharyngitis, bronchitis, and sinusitis. Eucalyptus essential oils have been used for this purpose for centuries. Studies have shown that 1,8-cineole, an active ingredient in eucalyptus oil, relaxes smooth muscle in the airways, reducing the spasms brought on by various drugs (13,14). The anti-inflammatory (by inhibiting cytokine production) and analgesic properties of inhaling cineole (extracted from eucalyptus) have also been demonstrated in clinical studies; thus, it can be utilized effectively in chronic obstructive pulmonary disease and asthmatic patients (15). Eucalyptus oil has been shown to exhibit antiviral activity in vitro against a variety of virus types, including enveloped mumps viruses (MV) and herpes simplex viruses (HSV-1 and HSV-2) (16). Eucalyptuss essesntial oil and its active ingredient have been recommended as ways to inactivate free influenza A viruses and damage virus envelope structures (17). Natural antibacterial and antioxidant properties of lemon essential oils can be found in the leaves of citrus plants. These oils are used in food industries, aromatherapy and pharmaceutical companies (18). Several studies on lemon essential oil have been conducted to determine its antibacterial and antiviral activity, and the results have been overwhelmingly positive (12,19,20). Lemon essential oils have traditionally been used to treat a variety of physiological and psychological conditions, including respiratory problems, sleeplessness, and psychosocial distress (21,22). Lemon essential oils are a strong immunological stimulant, stimulating and cleansing the lymphatic system (23). However, their impact on COVID-19 symptoms, on the other hand, have received little attention. The essential oils of eucalyptus and lemon have been shown to be effective in the treatment of COVID-19 patients' symptoms.

MATERIALS AND METHODS

Study design

In order to conduct this research, we used two-group single-blind randomized controlled trial. Data were collected from March 1 to July 10, 2021.

Sample

The inclusion criteria were the ability to communicate verbally, age over 18 years old, having confirmed COVID-19, requiring at least three days of hospitalization, having no allergic to eucalyptus and lemon, not having a history of substance abuse, not requiring oxigent therapy, and having no serious complication. The sample size was determined to be 0.05 with a power of 0.80 and an effect size of 0.40 (24). According to the G * Power program version 3.1.7, the minimum number of participants needed for each group is 27.

Randomization and blinding

A research assistant who was not involved in the study used computer to randomize the participants. In order to ensure that the subjects were not aware of which group they had been assigned to, a single-blind procedure was used enrollment was open to all 100 participants who met the eligibility criteria (Figure 1). Afterwards, participants were randomly assigned to the aromatherapy (n = 50) or the control group (n = 50). In total, 100 participants were surveyed for this study's findings.

Intervention

Eucalyptus and lemon essential oils were chosen as potential COVID-19 inhibitors after conducting a thorough assessment of the literature and consulting with experts (25). In the past, studies have shown that combining two to three different essential oils is more effective than using just one type of essential oil for a variety of symptoms (26), Diffusing three drops of eucalyptus and one drop of lemon in a 1:1 ratio allowed subjects to inhale the aromatic oils. It took around 20 minutes for the essential oil to reach its highest concentration after being diffused (26,27). This study used aromatherapy for 20 minutes every day for a week.

Measure

The sociodemographic data questionnaire asks about gender, age, marital status, educational attainment, financial standing, employment, smoking habits, medical conditions, and length of hospital stay. Participants answered this questionnaire at the start of the trial.

Each participant was asked to indicate whether or not they had experienced any of the following symptoms. Fever, cough, exhaustion, loss of taste or smell and sore throat are among the 13 COVID-19 symptoms. Red or itchy eyes; difficulty breathing or shortness of breath; loss of speech and mobility; disorientation. COVID-19 symptoms include chest pain as well (28–30). The total score was counted to continue analysis.

Procedure

Participants who met the inclusion criteria were included in the study, which was approved by the affiliated university's Institutional Review Board (KE/E.108/III/2021). Before they agreed to participate in the study, participants were provided with a detailed description of the study's objectives and methods via a well-structured guide. Each subject provided written informed permission. The participants were assured of their privacy, confidentiality, and data erasure following the study. The researchers also honored the participants' free will and advised them that they might leave the study at any time. Three Two research assistants were assigned to each intervention location and trained beforehand. They were responsible for preparing the questionnaire, making sure it was in the right place and the right time, and notifying participants that the test was about to begin. For aromatherapy, a researcher combined several types of fragrance oils based on the advice of an aromatherapy professional. Researchers assigned to aromatherapy groups verified the distribution of aroma oil into the atmosphere. When the lamp's water supply ran low, they replaced it with fresh water and refilled the scent oil mixture. Each participant was asked to rate their own post-intervention symptoms immediately after intervention and one week after intervention. Each subject needed 5 to 7 minutes to complete the test. To prevent COVID-19 transmission, researchers and research assistant's adherence to the personal protection's equipment protocol.

All adverse events (AEs) were recorded during the study. The researcher documented the duration and severity of each occurrence, its relationship to the research product, and its consequence and seriousness. Safety data were obtained from all patients up to 14 days. During the treatment period, no serious AE was recorded.

Data Analysis

Kolmogorov-Smirnov tests were used to see if the assumption of normality was valid. The experimental and control groups' demographics were compared using independent sample t-tests and chi-square tests. Eucalyptus and lemon essential oils were tested for their ability to alleviate COVID-19 symptoms using intention-to-treat analyses. The difference between paired proportions was assessed using the Cochran's Q test. For continuous data, repeated measure ANOVA was utilized to analyze the difference between paired measurements. Different-in-differences analysis was used to determine the variances in the data of total number of symptoms and temperature between T0 and T1 (DID). A value of less than or equal to 0.05 was considered statistically significant. IBM SPSS Statistics 21.0 was used to examine the data.

RESULTS

Table I shows the study's intervention and control groups' demographics. It was found that the sociodemographic characteristics of the intervention and control groups were not significantly different.

At baseline, respondents in the intervention group showed the average of total number of symptoms of 7.35 (SD=2.75) (Table II). While, in the control group showed the average of total number of symptoms of 6.17 (SD=1.01). At T2, a total number of symptoms were decreased significantly 4.29 point (SD=1.53) ($p<0.05$) in the intervention groups, and respondents in the control arm scored 5.02 (SD=1.54) (p=0.113). Body temperature decreased significantly from 39.15 ± 9.12 to 36.7 ± 11.32 in the intervention groups ($p<0.05$). While, respondents in the control group scored 36.44 ± 8.32 at T2 measurement (p=0.087). Shortness of breath decreased significantly over time in the intervention groups, and 18% respondents in the control group at Round T2. In the intervention group, loss of taste or smell decreased significantly over time from 68% in baseline to 16% in T2 (p-value=0.001). While, in the control group, loss of taste or smell decreased from 74% in baseline to 58% in T2 (p-value=0.045). Headache decreased significantly over time from 72% at baseline to 28% (p-value=0.001) at T2 in the intervention group. While, in control group, no significant degreased for the proportion of pariticipants who experienced headache. Tiredness decreased significantly over time from 76% at baseline to 20% (p-value=0.001) at T2 in the intervention group. While, in control group, no significant decreased for the proportion of pariticipants who experienced tiredness.

Intent-to-treat (ITT) difference-in-differences (DID) are estimated in Table III using linear regressions. It was found that eucalyptus and lemon essential oils had a positive effect on two of the two outcome measures at T1: 1) total number of symptoms decreased 2.39 (1.11 to 7.39), 2) body temperature score saw a modest decreased 2.17 points (95% CI 1.12 to 6.48). At T2, improved outcomes relative to the control were observed in total number of symptoms (DID coefficient 3.41 (95% CI (1.12 to 6.75), body temperature (DID coefficient 2.39, 95% CI 1.18 to 6.63).

DISCUSSION

Eucalyptus and lemon essensial oils (applied together) have been shown to improve COVID-19 symptoms, including the overall number of symptoms, body temperature, shortness of breath, loss of taste or smell, headache, and tirednessEssential oils have been used

Table I : Comparison of selected baseline characteristics of intervention and control participants (n = 100)

Variables	Experimental, (n=50) %	Control, (n=50) %	p-value
Age in year (Mean ± SD)	36.56 ± 0.37	34.08 ± 0.82	0.17
Gender			
Male	24 (48)	23(46)	0.38
Female	26 (52)	26 (54)	
Marital status			
Yes	22 (44)	20 (40)	0.42
No	28 (56)	30 (60)	
Working status			
Yes	30 (60)	27 (54)	0.07
No	20 (40)	23 (46)	
Education level			
Below senior high school	24 (48)	22 (44)	0.13
Above senior high school	26 (52)	28 (56)	
Household income			
Below regional minimum salary	14 (28)	20 (40)	0.052
Above regional minimum salary	36 (72)	30 (60)	
Days of hospitalization	3.76 ± 0.81	4.21 ± 0.39	0.100
Smoking			
Yes	22 (44)	20 (40)	0.10
No	28 (56)	30 (60)	
Comorbidities			
Yes	14 (28)	16 (32)	0.11
No	36 (72)	34 (68)	

Table II : Outcomes among analytical sample, by intervention and control group and by survey

Variables	Experimental, (n=50)	Control, (n=50)
	Mean ± SD	Mean ± SD
Total number of symptoms		
Baseline	7.35 ± 2.75	6.17 ± 1.01
T1	6.72 ± 1.16	6.98 ± 1.33
T2	4.29 ± 1.53	5.02 ± 1.54
p-value[a]	0.021	0.113
Body temperature, °C		
Baseline	39.15 ± 9.12	37.72 ± 7.15
T1	37.63 ± 9.57	37.58 ± 7.43
T2	36.7 ± 11.32	36.44 ± 8.32
p-value[a]	0.033	0.087
Shortness of breath (yes), n(%)		
Baseline	14 (28)	12 (24)
T1	9 (18)	10 (20)
T2	7 (14)	9 (18)
p-value[b]	0.001	0.216
Loss of taste or smell (yes), n (%)		
Baseline	34 (68)	37 (74)
T1	20 (40)	33 (66)
T2	8 (16)	29 (58)
p-value[b]	0.001	0.045
Headache		
Baseline	36 (72)	34 (68)
T1	30 (60)	28 (56)
T2	14 (28)	20 (40)
p-value[b]	0.001	0.179
Tiredness		
Baseline	38 (76)	34 (68)
T1	27 (54)	29 (58)
T2	10 (20)	20 (40)
p-value[b]	0.001	0.069

Note: [a]p-value from repeated measure ANOVA; [b] p-value from Cochran's Q test.

Table III : Difference-in-differences between intervention and control groups

Variables	T1	T2
	DID coefficient (95% CI)	DID coefficient (95% CI)
Total number of symptoms	2.39* (1.11 to 7.39)	3.41* (1.12 to 6.75)
Body temperature	2.17** (1.12 to 6.48)	2.39** (1.18 to 6.63)

Note: p<0.05*, p<0.01** and p<0.001***

in aromatherapy and psychotherapy for thousands of years. There is a lot of evidence from modern preclinical research that shows that essential oils can have a wide range of pharmacological effects. They can be used to treat everything from bacterial infections to hypertension to cancer (31). Essential oils have shown promise as antiviral medicines in in vitro and clinical trials, especially against SARS coronaviruses (31,32). The majority of these therapeutically effective antiviral medicines are chemicals that impede specific processes of viral biosynthesis, specifically viral replication, thus might reduce the symptoms manifestation (33).

In the current study, the overall number of COVID-19 symptoms decreased with time in both groups. However, in the intervention group, this decrease was more pronounced than in the control group at time points 2 and 3. Additionally, the pattern of COVID-19 symptom changes was similar between time points 1 and 2. This finding demonstrates that the eucalyptus and lemon essential oils had an effect on COVID-19 symptoms only within the first seven days following intervention. This effect remains constant throughout time. COVID-19 symptoms have a short effect, so eucalyptus and lemon essential oils aromatherapy should be performed continually or with shorter repetition durations. Lotfi et al. recommended aromatherapy twice daily for three executive days to patients with acute coronary syndrome in the cardiac center unit (34). Aromatic essential oils have a variety of hemodynamic effects when inhaled. There is evidence that inhaling rose essential oil reduces sympathetic nerve activity, blood pressure, and plasma adrenaline by 30% (35–37) Aromatherapy may reduce stress and regulate the cardiovascular response concurrently by balancing the autonomic nervous system in tissues such as the heart and kidneys and altering the blood level of noradrenaline (38).

The aromatherapy techniques used in this study were established from prior research (11,12). For the desired effect, the essential oil was diffused, inhaled, and applied all over the body through various methods. An effective strategy for reducing bias was devised using this method. Within 20 minutes of inhalation, essential oils reach their bloodstream concentration and have a direct effect on the brain (11,12). As a result, it was determined that providing aromatherapy for 20 minutes was appropriate. To lessen the impact of environmental factors on the combined therapeutic environment, the intervention room's temperature and lighting were adjusted in this study. It is thought that efficient usage of these therapies requires a physically acceptable location comfortably. This implies that the outcomes of this study can be implemented in real-life settings, assuming nurses can devote the time required. If such a space cannot be prepared, it may be better to manipulate the environment in other ways because the surrounding environment will affect external variables. Nursing care can benefit from this intervention approach and duration because it is not burdensome to the person receiving it.

Limitation

It is important to point out a few significant study limitations. In future studies, researchers should take into account test-affecting personal and social factors rather than making broad generalizations based on the findings of this study. Eucalyptus and lemon essensial oils may have a significant impact on COVID-19 symptoms if future studies have a longer follow-up period. However, future research may also use objective measures, such as the COVID-19 questionnaires used in this study, to enhance the objectivity and validity of the study results.

CONCLUSION

Eucalyptus and lemon essentials oils (applied together) could be used as an alternative therapy for COVID-19 symptoms management. However, the benefit is achieved without safety and tolerability concerns. Further studies should identify the ideal treatment periods. This could help consumers make better-informed decisions about the management of COVID-19 symptoms by providing high-quality evidence of essential oils and aromatherapy's effectiveness. For aromatherapy, which has a limited evidence base, the findings from this research will be of great benefit to the academic community.

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