

ORIGINAL RESEARCH

The Effect of Aromatherapy Application on the Vital Signs of Intensive Care Patients

Zeliha Buyukbayram¹ , Leyla Zengin Aydin² , Esref Arac³ 

¹Department of Nursing, Siirt School of Health, Siirt University, Siirt, Turkey

²Department of Nursing, Atatürk School of Health, Dicle University, Diyarbakır, Turkey

³Diyarbakır Gazi Yaşargil Education Research Hospital, Diyarbakır, Turkey

* Corresponding Author: Leyla Zengin Aydin, e-mail: leyla_zen@hotmail.com

Received: 03.11.2021

Accepted: 14.12.2021

Abstract

Objective: This study aims to examine the effect of aromatherapy application on vital signs in intensive care patients.

Material-Method: This study was carried out as a nonrandomized controlled experimental trial. The population consisted of inpatients in the internal medicine intensive care unit of a research and training hospital located in southeastern Turkey. The sample of the study consisted of 100 patients. The data were collected between July 2018 and February 2019 using patient identification and monitoring forms. Descriptive statistics, t-test, chi-squared test, analysis of variance and post-hoc test were used in the analysis of the data.

Results: The mean age of the experimental group patients was 66.84±20.53, 54.0% of them were female, 92.0% were married, 28.0% were literate, 78.0% were unemployed, and 74.0% had not been subjected to aromatherapy before; The mean age of the control group patients was 61.30±22.67, 52.0% of them were female, 82.0% were married, 30.0% were high-school graduates, 66.0% were unemployed, and 64.0% had not been subjected to aromatherapy before. It was found that the mean respiratory rate of the patients in the experimental group decreased significantly ($p<0.05$).

Conclusion: It was determined that aromatherapy applied on the intensive care patients was not effective on their pulse rate, systolic blood pressure, diastolic blood pressure or partial oxygen pressure, but it was effective in reducing their respiratory rate.

Keywords: Aromatherapy, Intensive Care, Nursing, Patient, Vital Signs

INTRODUCTION

Intensive care units are the places where the life functions of patients with serious physical conditions are supported, special treatment methods are applied and at the same time, patients' vital signs are monitored throughout 24 hours¹⁻⁴. When their life functions are severely impaired, patients need to be treated in intensive care units (ICUs) to receive the special treatment they require⁵⁻⁹. For this reason, complementary treatment should be provided as well as medical treatment to control the impaired vital functions of patients in the ICU. The purpose of these treatments is to support the care of patients in addition to their medical treatment^{10, 11}. The complementary treatment creates a relaxant effect in intensive care patients and may be effective in

improving patients' impaired physiological signs and preventing complications related to intensive care¹⁰⁻¹².

In aromatherapy, which is a complementary treatment method, elements of essential oils that are available in the stems, roots and flowers of natural plants are used^{12, 13}. Aromatherapy may be applied in various forms such as massage, inhalation, and compression. Aromatherapy is used to calm the mind, body and spirit the patients¹³⁻¹⁵. The use of aromatherapy has been increasing lately around the world and in Turkey¹⁶⁻²¹. Patients admitted to the ICU require higher levels of nursing care. Aromatherapy is used in nursing as a holistic intervention to improve patient care and quality of

life. The focus of holistic treatments is symptom control rather than treatment¹⁷⁻¹⁹. Nurses apply aromatherapy to increase quality of sleep¹⁷, reduce stress¹¹, anxiety^{10,16}, reduce pain²², promote relaxation²³ and improve the well-being of patients²⁴. Aromatherapy applications, therefore, have an effective role in healing patients in the physical, psychological, social, emotional and spiritual sense^{24, 25}. Therefore, it is important to combine aromatherapy with pharmacological methods in symptom management in intensive care patients. Clinicians and nurses should be aware of potential drug interactions when applying essential oils together with medication. In the literature, many studies conducted in intensive care units have revealed that aromatherapy application positively affects vital signs^{12, 14}. In their nonrandomized and controlled experimental study carried out in adult ICU patients, Cho et al. (2017) found that aromatherapy application led to a decrease in the patients' pulse and blood pressure values¹¹. In the randomized controlled study by Ltyle et al., it was determined that aromatherapy application was effective in reducing blood pressure values¹². This study was carried out to examine the effect of aromatherapy application on the vital signs of intensive care patients. In line with the results obtained, information will be provided to healthcare professionals and nurses in ICU about complementary treatments to be used to improve the holistic wellbeing of patients.

MATERIALS AND METHODS

Research type

This study was carried out as a nonrandomized controlled experimental study.

Place and time of research

The study was conducted between the dates of July 2018 and February 2019 in an internal medicine ICU of a research and training hospital located in southeastern Turkey.

Research population and sample

The population consisted of inpatients in the internal medicine ICU of a research and training hospital located in southeastern Turkey. The sample was composed of a total of 100 patients based on power analysis, in a 95% confidence interval and with 80% power (50 in the experimental and 50 in the control group). Patients included in the study were among the ones who received the same treatment and patients with the same settings in the

ICU. Systolic blood pressure (SBP), diastolic blood pressure (DBP), partial oxygen pressure (SPO₂), pulse and respiratory rate measurements were taken every hour in same intervals.

Inclusion criteria: (1) Patients aged over 18, (2) patients who were conscious, (3) patients who were able to verbally communicate, (4) patients who had no allergy to lavender oil, (5) patients staying in the ICU for more than 5 nights, (6) patients whose general condition was stable (Figure 1).

Exclusion criteria: (1) Having a mental illness, (2) have side effects or allergies to essential oils (Figure 1).

Data collection forms

Patient identification form: The patient identification form was created from questions prepared by the researcher containing demographic information such as the age, sex, educational status and marital status of the patients¹⁰⁻¹⁶.

Patient monitoring form: In the pretest-posttest data collection processes of the patients in both groups this form was used to collect information about the patients' SBP, DBP, SPO₂, pulse and respiratory rate.

Nursing interventions: Standard treatment and care protocols were followed for all patients, and these protocols did not affect the outcome measures. Aromatherapy was applied to the experimental group patients. Stimuli such as noise arising from the physical environment of the ICU and interventions applied to patients during this process could affect the physiological parameters of the patients. For this reason, aromatherapy application hours were chosen as the hours when patients did not have intervention procedures in the ICU. Data were collected first from the control group and then from the experimental group in order to prevent contamination between the groups.

Application of aromatherapy: The intervention was applied 1 hour after the routine drug treatment of the patients. SBP, DBP, SPO₂, pulse and respiratory rates were measured before applying aromatherapy intervention on the experimental group patients. In the literature, it has been stated that, when lavender oil is administered by inhalation, it acts quickly, with an inhaled application of 10-15 minutes. Thus, it shows its effect in a short time by the respiratory tract^{14-16,25,26}. Since the patients hospitalized in the ICU were mostly given a supine position, in this study, 5 drops of lavender oil were dropped on a sterile gauze cloth

and the patients were asked to inhale the lavender oil for 15 minutes. Then, five drops of lavender oil were dropped onto a gauze patch and placed onto the patients' chest. After the application, the measurements were repeated for a total of 4 times at

30-min intervals. Lavender oil was applied on the patients only once. No intervention was made on the control group, only the measurements were taken and recorded before applying the nursing intervention of the patients.

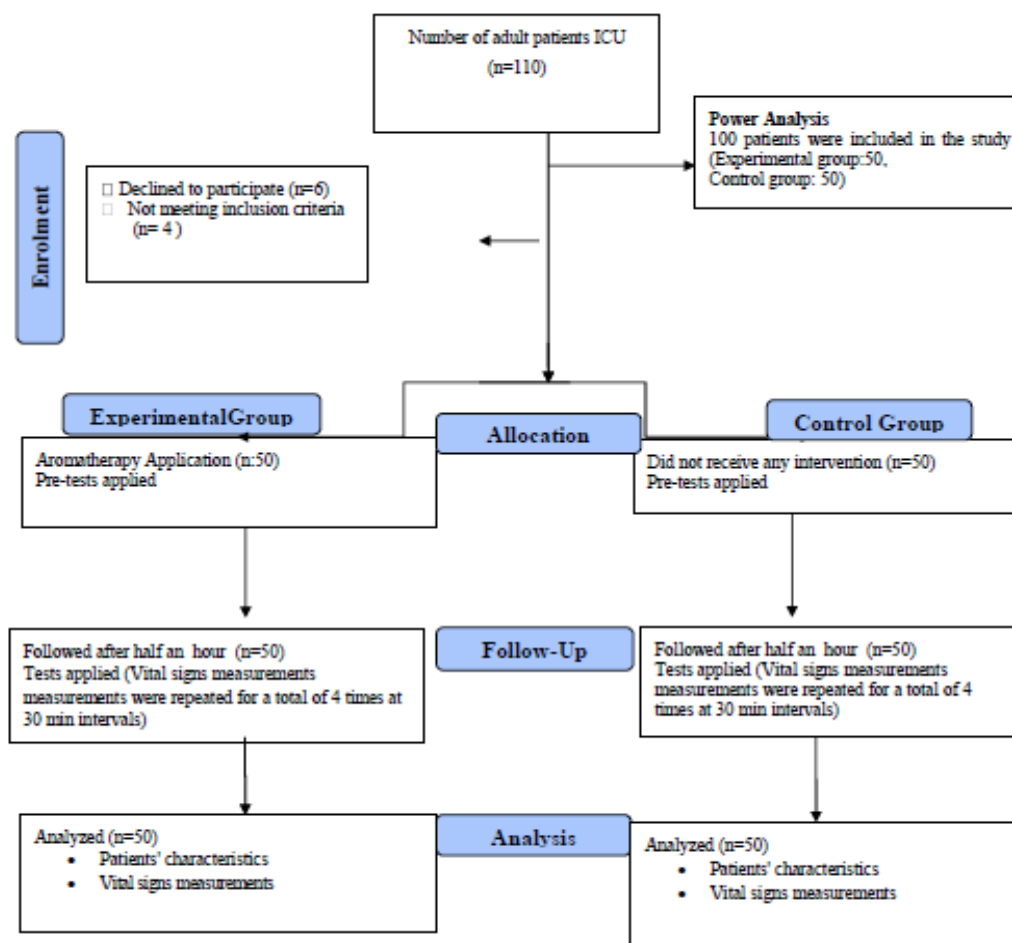


Figure 1. Flowchart of the study participants

Data analysis

For the analysis of the data, the SPSS 22.0 package program was used. In the analysis of the demographic data, descriptive statistics were used. Kolmogorov-Smirnov test, t test, Anova, post hoc test analysis were used to evaluate the data. All findings were tested on the significance level of 0.05. Before starting the study, no statistically significant difference was found between the patients' groups in terms of their introductory characteristics ($p>0.05$) (Table 1).

Ethical aspect of research

Prior to the study, written approval was obtained from the Non Invasive Clinical Research Ethics

Committee of a University on 06.07.2018 (Decision Number: 128). Written permission was obtained from the University, and the patients who participated in the study.

RESULTS

The distribution of the patients included in the study based on their descriptive characteristics is given in Table 1. The mean age of the experimental group patients was 66.84 ± 20.53 and the mean age of the control group patients was 61.30 ± 22.67 . When the other descriptive characteristics of the patients were examined, it was determined that, among the



patients in the experimental group, 54.0% were female, 92.0% were married, 28.0% were literate, 78.0% were unemployed and 74.0% had not previously received aromatherapy. It was found that, of the patients in the control group, 52.0% were female, 82.0% were married, 30.0% were high

school graduates, 66.0% were unemployed, and 64.0% had not previously received aromatherapy (Table 1). The difference between the control group and the experimental group in terms of the control variables was not statistically significant ($p>0.05$) (Table 1).

Table 1. Comparison of control variables between experimental and control groups

| Descriptive characteristics | Experimental group | | Control group | | Test and Significance |
|---|---------------------------------|------|---------------------------------|------|-----------------------------|
| | S | % | S | % | |
| Sex | | | | | |
| Female | 27 | 54.0 | 26 | 52.0 | $\chi^2 = 0.040$ |
| Male | 23 | 46.0 | 24 | 48.0 | $p = 0.841$ |
| Marital Status | | | | | |
| Married | 46 | 92.0 | 41 | 82.0 | $\chi^2 = 2.210$ |
| Single | 4 | 8.0 | 9 | 18.0 | $p = 0.137$ |
| Education Status | | | | | |
| Illiterate | 11 | 22.0 | 10 | 20.0 | |
| Literate | 14 | 28.0 | 12 | 24.0 | |
| Primary School | 12 | 24.0 | 6 | 12.0 | $\chi^2 = 4.665$ |
| High School | 8 | 16.0 | 15 | 30.0 | $p = 0.323$ |
| Undergraduate-Postgraduate | 5 | 10.0 | 7 | 14.0 | |
| Working Status | | | | | |
| Employed | 11 | 22.0 | 17 | 34.0 | $\chi^2 = 1.786$ |
| Unemployed | 39 | 78.0 | 33 | 66.0 | $p = 0.181$ |
| Have You Ever Received Aromatherapy? | | | | | |
| Yes | 13 | 26.0 | 18 | 36.0 | $\chi^2 = 1.169$ |
| No | 37 | 74.0 | 32 | 64.0 | $p = 0.280$ |
| Age | <i>mean ± sd</i> 66.84±20.53 | | <i>mean ± sd</i> 61.30±22.67 | | $t = -1.281$ $p = 0.203$ |

The pretest-posttest vital sign mean scores of the experimental group are given in Table 2. It was found that there was no significant change in the mean respiration over time ($p=0.040$). The mean

60th-minute respiratory rate was 20.20 ± 3.60 and the mean 120th-minute respiration rate was 18.40 ± 4.02 . This difference was found to be statistically significant ($p<0.05$) (Table 2).

Table 2. Comparison between pre-test and post-test mean vital sign scores in the experimental group

| Vital Signs | Pre-test $\bar{x} \pm sd$ | Post-test | | | | Test and Significance |
|-----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------|
| | | 30th min $\bar{x} \pm sd$ | 60th min $\bar{x} \pm sd$ | 90th min $\bar{x} \pm sd$ | 120th min $\bar{x} \pm sd$ | |
| Pulse rate (per min) | 92.54±15.96 | 93.30±16.43 | 92.28±17.21 | 93.00±15.42 | 89.72±14.60 | F=2.315 $p = 0.091$ |
| SBP | 121.30±24.51 | 121.18±23.60 | 121.56±24.41 | 118.54±24.76 | 120.82±22.42 | F=0.921 $p = 0.437$ |
| DBP | 69.96±11.77 | 72.64±14.00 | 71.38±12.78 | 70.26±12.82 | 71.94±12.16 | F=1.033 $p = 0.387$ |
| SPO₂ | 94.98±2.71 | 94.80±2.67 | 94.76±2.53 | 95.08±2.77 | 94.70±2.96 | F=0.733 $p = 0.550$ |
| Respiration | 19.60±4.44 | 19.28±4.26 | 20.20±3.60* | 18.76±3.89 | 18.40±4.02* | F=2.777 $p = 0.040$ |

The pretest-posttest vital sign mean scores of the control group are given in Table 3. It was found that there was a significant change in the mean SPO₂ values over time ($p=0.006$). The mean 30th-minute

SPO₂ value was 95.66 ± 3.25 and the mean 30th-minute SPO₂ value was 94.40 ± 4.25 . This difference was statistically significant ($p<0.05$) (Table 3).



Table 3. Comparison between pre-test and post-test mean vital sign scores in the control group

| Vital Signs | Pre-test $\bar{x} \pm sd$ | Post-test | | | | Test and Significance |
|----------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|-----------------------|
| | | 30th min $\bar{x} \pm sd$ | 60th min $\bar{x} \pm sd$ | 90th min $\bar{x} \pm sd$ | 120th min $\bar{x} \pm sd$ | |
| Pulse rate (per min) | 92.36±22.08 | 92.02±21.79 | 90.08±22.18 | 89.42±21.54 | 89.76±20.79 | F=1.999 p=0.120 |
| SBP | 129.76±30.10 | 130.42±27.87 | 129.32±29.35 | 127.76±25.71 | 126.26±25.97 | F=1.642 p=0.176 |
| DBP | 74.74±15.64 | 76.70±14.52 | 74.46±15.91 | 73.46±16.08 | 72.90±14.29 | F=1.890 p=0.133 |
| SPO ₂ | 95.66±2.72 | 95.66±3.25* | 95.30±3.24 | 95.16±3.33 | 94.40±4.25* | F=4.607 p=0.006 |
| Respiration | 21.16±4.80 | 21.34±4.68 | 21.44±4.97 | 21.32±6.26 | 20.26±5.54 | F=0.607 p=0.602 |

*indicates the difference.

Table 4. Comparison of pretest mean vital signs between experimental and control groups

| Groups | Vital Signs (Mean±SD) | | | | |
|-----------------------|-----------------------|--------------------|--------------------|--------------------|--------------------|
| | Pulse Rate | SBP | DBP | SPO ₂ | Respiration Rate |
| Experimental Group | 92.54±15.96 | 121.30±24.51 | 69.96±11.77 | 94.98±2.71 | 19.60±4.44 |
| Control Group | 92.36±22.08 | 129.76±30.10 | 74.74±15.64 | 95.66±2.72 | 21.16±4.80 |
| Test and Significance | t=-0.047 p=0.963 | t=1.541 p=0.127 | t=1.727 p=0.088 | t=1.254 p=0.213 | t=1.688 p=0.095 |

As seen in Table 4, the intergroup difference in the pretest vital signs was not statistically significant (p>0.05) (Table 4).

As seen in Table 5, the intergroup differences in the

30th-minute and 90th-minute respiration rates were found to be statistically significant (p=0.016). The intergroup differences in the other vital signs were not statistically significant (p>0.05) (Table 5).

Table 5. Comparison of posttest mean vital signs between experimental and control groups

| Vital Signs | Groups | Min | | | |
|-----------------------|--------------|------------------------------|------------------------------|------------------------------|-------------------------------|
| | | 30th min $\bar{x} \pm sd$ | 60th min $\bar{x} \pm sd$ | 90th min $\bar{x} \pm sd$ | 120th min $\bar{x} \pm sd$ |
| Pulse rate (per min) | Experimental | 93.30±16.43 | 92.28±17.21 | 93.00±15.42 | 89.72±14.60 |
| | Control | 92.02±21.79 | 90.08±22.18 | 89.42±21.54 | 89.76±20.79 |
| Test and Significance | | t=-0.332 p=0.741 | t=-0.554 p=0.581 | t=-0.956 p=0.342 | t=-0.011 p=0.991 |
| SBP | Experimental | 121.18±23.60 | 121.56±24.41 | 118.54±24.76 | 120.82±22.42 |
| | Control | 130.42±27.87 | 129.32±29.35 | 127.76±25.71 | 126.26±25.97 |
| Test and Significance | | t=1.789 p=0.077 | t=1.437 p=0.154 | t=1.826 p=0.071 | t=1.121 p=0.265 |
| DBP | Experimental | 72.64±14.00 | 71.38±12.78 | 70.26±12.82 | 71.94±12.16 |
| | Control | 76.70±14.52 | 74.46±15.91 | 73.46±16.08 | 72.90±14.29 |
| Test and Significance | | t=1.423 p=0.158 | t=1.067 p=0.289 | t=1.100 p=0.274 | t=0.362 p=0.718 |
| SPO ₂ | Experimental | 94.80±2.67 | 94.76±2.53 | 95.08±2.77 | 94.70±2.96 |
| | Control | 95.66±3.25 | 95.30±3.24 | 95.16±3.33 | 94.40±4.25 |
| Test and Significance | | t=1.447 p=0.151 | t=0.929 p=0.355 | t=0.131 p=0.896 | t=-0.410 p=0.683 |
| Respiration | Experimental | 19.28±4.26 | 20.20±3.60 | 18.76±3.89 | 18.40±4.02 |
| | Control | 21.34±4.68 | 21.44±4.97 | 21.32±6.26 | 20.26±5.54 |
| Test and Significance | | t=2.302 p=0.023* | t=1.428 p=0.157 | t=2.457 p=0.016* | t=1.922 p=0.058 |

* indicates the difference.

DISCUSSION

In this study, it was found that the aromatherapy intervention had a statistically significant effect on the mean respiratory rate scores of the patients. In the study by Goepfert et al., aromatherapy application was found to be effective on respiratory parameters²⁷. Karaman Özlü and Bilican determined, that aromatherapy changed the respiratory rate of patients¹⁹.

In this study investigating the effect of aromatherapy application on vital signs in intensive care patients, it was determined that aromatherapy applied on the experimental group had a significant effect on the patients' mean respiratory rates, whereas the mean SPO₂ of the control group patients significantly decreased in time, on the other hand, the differences between the experimental and control groups were not significant in terms of their pulse, SBP and DBP values. In line with the findings of this study, in the study by Cho et al. (2013) examining the effect of lavender essential oil and aromatherapy application in intensive care patients, it was found that there was no significant difference in the systolic and diastolic blood pressure values of the patients¹⁰. Unlike the findings of this study, in their studies investigating the effect of aromatherapy applied on patients treated in intensive care units after open-heart surgery on these patients' vital signs, Salamati et al. determined that aromatherapy had an impact on pulse rate and blood pressure values and brought these values to a normal level²⁶. Ltyle et al. reported, that aromatherapy application was effective on blood pressure values and brought these values to a normal level¹². In their inhalation aromatherapy study with lavender essential oil, Bikmoradi et al. found that aromatherapy had no effect on patients' vital signs, other than their systolic blood pressure¹⁴. In other studies, aromatherapy application was found to be effective in lowering patients' systolic and diastolic blood pressure values^{12,21,26-30}.

In contrast to this study, in the study by Goepfert et al., administration of lavender oil was found to reduce the heart rate of patients²⁷. Other studies have shown that application of lavender oil reduces the heart rate of patients^{11,28-30}.

As opposed to the case in this study, the study by İltter et al. found that inhaler aromatherapy administration during port catheter insertion in patients diagnosed with cancer resulted in an increase in the oxygen saturation levels in

patients³⁰. Another study found similar results²⁷.

It was found that the results of this study regarding vital signs were similar to those reported in some studies, but they differed with those in other studies. This situation may have been caused by the descriptive characteristics of the patient groups or differences in variables such as the duration, frequency, type and method of aromatherapy.

In terms of the posttest vital signs of the groups, the difference between the groups in terms of their mean 30th-minute and 90th-minute respiratory rates was statistically significant; however, in other vital signs, the difference between the groups was not statistically significant. According to the comparison of the posttest mean scores between the groups, the application of aromatherapy positively affected the respiratory rates of the patients.

CONCLUSION

In this nonrandomized controlled trial, it was determined that the aromatherapy intervention applied on the ICU patients was not effective on these patients' pulse, SBP, DBP and SPO₂ values, but it was effective in reducing their respiratory rates. The results showed differences in the respiratory rates between the experimental group that received the aromatherapy treatment and the control group that did not. Therefore, aromatherapy may be used as an independent nursing intervention. However, regarding the long-term effects of aromatherapy applications, more studies are recommended to be carried out.

Limitations of the study

Since this study included only inpatients in an intensive care unit, the results may only be generalized to this group. The data were collected in the intensive care unit of a research and training hospital affiliated to the Ministry of Health of Turkey. Its generalizability, therefore, is limited. Another limitation was, on the other hand, that only one aromatherapy method was used in the study. Additionally, a limitation of this study was that it was performed only in the internal medicine intensive care unit and the patients were not separated based on their medical diagnoses.

ACKNOWLEDGEMENTS

The authors would like to thank the intensive care unit patients for their participation and cooperation. The authors would like to thank the administration of the hospital for their support in conducting this research. The first three authors (Z. Büyükbayram,



L. Zengin Aydın, E. Araç) contributed equally.

Financial support

The authors received no financial support while conducting this study.

Declaration of conflicting interests

The authors declare no potential conflicts of interest regarding the research, authorship and/or publication of this article.

REFERENCES

1. Smith CD, Grami P, Haseeb C, Ababio Y, Exercise Physiologists: Key to Providing Early Mobilization in the Intensive Care Unit. *Am. J. Crit. Care* 2019; 28(5): 385–392.
2. Louis M. Patient-related factors may influence nursing perception of sleep in the Intensive Care Unit. *PLOS ONE* 2020; 15(1):e0226323.
3. Payen JF, Bosson JL, Chanques G, Mantz J, Labarere J. Investigators, Pain assessment is associated with decreased duration of mechanical ventilation in the intensive care unit: a post Hoc analysis of the DOLOREA study. *Anesthesiology* 2009; 111(6):1308–1316.
4. Bertakis KD and Azari R. Patient-Centered Care is Associated with Decreased Health Care Utilization. *J Am Board Fam Med* 2011; 24(3):229–239.
5. De Jonghe B. Physical restraint in mechanically ventilated ICU patients: a survey of French practice. *Intensive Care Med.* 2013; 39(1):31–37.
6. Meriläinen M, Kyngäs H, Ala-Kokko T. Patients' interactions in an intensive care unit and their memories of intensive care: A mixed method study. *Intensive Crit. Care Nurs.* 2013; 29 (2): 78–87.
7. Benbenbishty J, Adam S, and Endacott R. Physical restraint use in intensive care units across Europe: The Price study. *Intensive Crit. Care Nurs.* 2010; 26(5):241–245.
8. Robleda G. Evaluation of pain during mobilization and endotracheal aspiration in critical patients. *Med. Intensiva Engl. Ed.* 2016; 40(2):96–104.
9. Strøm T, Martinussen T, Toft P. A protocol of no sedation for critically ill patients receiving mechanical ventilation: a randomised trial. *The Lancet* 2010; 375(9713): 475–480.
10. Cho MY, Min ES, Hur MH, and Lee MS. Effects of Aromatherapy on the Anxiety, Vital Signs, and Sleep Quality of Percutaneous Coronary Intervention Patients in Intensive Care Units. *Evid. Based Complement. Alternat. Med.* 2013; 1–6.
11. Cho EH, Lee MY, and Hur MH. The Effects of Aromatherapy on Intensive Care Unit Patients' Stress and Sleep Quality: A Nonrandomised Controlled Trial. *Evid.-Based Complement. Altern. Med. ECAM* 2017.
12. Lytle J, Mwatha C, and Davis KK. Effect of Lavender Aromatherapy on Vital Signs and Perceived Quality of Sleep in the Intermediate Care Unit: A Pilot Study,” *Am. J. Crit. Care* 2014; 23(1):24–29.
13. Ahmad R, Naqvi AA, Al-Bukhaytan HM, Al-Nasser AH, and Baqer Al-Ebrahim AH. Evaluation of aromatherapy with lavender oil on academic stress: A randomized placebo controlled clinical trial. *Contemp. Clin. Trials Commun.* 2019; 14:100346.
14. Bikmoradi A, Seifi Z, Poorolajal J, Araghchian M, Safiaryan R, and Oshvandi K. Effect of inhalation aromatherapy with lavender essential oil on stress and vital signs in patients undergoing coronary artery bypass surgery: A single-blinded randomized clinical trial. *Complement. Ther. Med.* 2015; 23(3):331–338.
15. Bakkali F, Averbeck S, Averbeck D, and Idaomar M. Biological effects of essential oils – A review. *Food Chem. Toxicol* 2008; 46(2):446–475.
16. Seifi Z, Beikmoradi A, Oshvandi K, Poorolajal J, Araghchian M, and Safiaryan R. The effect of lavender essential oil on anxiety level in patients undergoing coronary artery bypass graft surgery: A double-blinded randomized clinical trial.” *Iran. J. Nurs. Midwifery Res.* 2014; 19(6):574–580.
17. Karadag E, Samancioglu S, Ozden D, and Bakir E. Effects of aromatherapy on sleep quality and anxiety of patients. *Nurs. Crit. Care* 2017; 22(2):105–112.
18. Halm MA. Essential Oils for Management of Symptoms in Critically Ill Patients. *Am. J. Crit. Care* 2008; 17 (2):160–163.
19. Karaman Ozlu Z and Biliacn P. Effects Of Aromatherapy Massage On The Sleep Quality And Physiological Parameters Of Patients In A Surgical Intensive Care Unit,” *Afr. J. Tradit. Complement. Altern. Med.* 2017; 14(3):83–88.
20. Lee CH, Lai CL, Sung YH, Lai MY, Lin CY, and Lin LY. Comparing effects between music intervention and aromatherapy on anxiety of patients undergoing mechanical ventilation in the intensive care unit: a randomized controlled trial. *Qual. Life Res. Int. J. Qual. Life Asp. Treat. Care Rehabil.* 2017; 26(7):1819–1829.
21. Hur MH, Lee MS, Kim C, and Ernst E. Aromatherapy for treatment of hypertension: a systematic review. *J. Eval. Clin. Pract.* 2021; 18(1):37–41.



22. Dimitriou V, Mavridou P, Manataki A, Damigos D. The use of aromatherapy for postoperative pain management: A systematic review of randomized controlled trials. *Journal of PeriAnesthesia Nursing* 2017; 32(6):530-541.
23. Asazawa K, Kato Y, Koinuma R, Takemoto N, Tsutsui S. Effectiveness of Aromatherapy treatment in alleviating fatigue and promoting relaxation of mothers during the early postpartum period. *Open Journal of Nursing* 2018; 8(03): 196.
24. Bagheri-Nesami M, Shorofi SA, Nikkhah A, Roohi Moghaddam, H, Mahdavi, A. The effect of lavender aromatherapy on well-being in hemodialysis patients: A randomized clinical trial. *Pharmaceutical and Biomedical Research* 2018; 4(2): 18-22.
25. Cheraghbeigi N, Modarresi M, Rezaei M and Khatony A. Comparing the effects of massage and aromatherapy massage with lavender oil on sleep quality of cardiac patients: A randomized controlled trial. *Complement. Ther. Clin. Pract.* 2019; 35:253–258.
26. Salamati A, Mashouf S and Mojab F. Effect of Inhalation of Lavender Essential Oil on Vital Signs in Open Heart Surgery ICU. 2017; 6.
27. Goepfert M, Liebl P, Herth N, Ciarlo G, Buentzel J, Huebner J. Aroma oil therapy in palliative care: a pilot study with physiological parameters in conscious as well as unconscious patients. *J Cancer Res Clin Oncol.* 2017; 143:2123–2129.
28. Premkumar KS, Aafaque S, S.Sumalatha NN. Effect of aromatherapy on dental anxiety among orthodontic patients: a randomized controlled trial. *Cureus.* 2019; 11(8):e5306.
29. Ahmad R, Naqvib AA, Al-Bukhaytanc HM, Al-Nasserc AH, Al-Ebrahim AHB. Evaluation of aromatherapy with lavender oil on academic stress: a randomized placebo controlled clinical trial. *Contemp Clin Trials Commun.* 2019; 14: 100346.
30. Iltter SM, Ovayolu O, Ovayolu N. The effect of inhaler aromatherapy on invasive pain, procedure adherence, vital signs, and saturation during port catheterization in oncology patients. *Holist Nurs Pract.* 2019; 33(3):146–154.