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Effects of aromatherapy on sleep quality and anxiety of patients

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ABSTRACT

Background: In intensive care units (ICUs), patients cannot sleep well. Aromatherapy is used for depression, anxiety, relaxation and disorders related with sleep and stress.

Aim: This study aimed to investigate the effect of lavender essential oil on the sleep quality and anxiety level of patients in coronary ICU.

Participants: A total of 60 patients in coronary ICU participated in this study.

Design: A randomized controlled study was conducted with 60 patients in a province located in the southeast of Turkey.

Methods: After informing the patients in both groups about the study, they were administered a questionnaire, Pittsburgh Sleep Quality Index (PSQI) and the Beck Anxiety Inventory (BAI) scale. The patients in the intervention group were given 2% lavender essential oil via inhalation for 15 days after which they were administered the same scales again to evaluate the sleep quality and anxiety. As for the control group, they were administered the same scales again after 15 days without the inhalation of lavender essential oil.

Results: Comparison of the PSQI and BAI scores of the patients in the control and intervention groups before and after the intervention showed statistically significant differences in the change in favour of the intervention group ($p < 0{\cdot}05$).

Conclusion: Lavender essential oil increased quality of sleep and reduced level of anxiety in patients with coronary artery disease.

Relevance to clinical practice: As a non-invasive, cheap, easily applicable, cost-effective, independent nursing intervention and appropriate for cardiac patients, lavender essential oil could be applied in ICUs.

Key words: Anxiety • Coronary artery disease • Lavender oil • Nursing • Sleep quality

BACKGROUND

Coronary artery disease (CAD) is the most common cardiovascular system disease (World Health Organization (WHO), 2015). Because of its high mortality and morbidity rate, prevalence in the productive age group, highs costs of treatment and potential to cause severe complications, it is a major public health problem (Badır and Demir Korkmaz, 2010).

According to WHO reports, coronary heart diseases have the highest mortality rates. Among the clinical symptoms of CAD are angina pectoris, which is caused by an atherosclerotic process affecting the arteries feeding the heart, acute myocardial infarction and sudden death. Every year, 16·7 million people lose their lives because of cardiovascular diseases (WHO, 2015). This figure is expected to rise up to 25 million in the year 2020. Not only worldwide, but CAD also draws attention in Turkey as a major cause of mortality and morbidity with increasing prevalence. It is estimated that there are 2 million patients with CAD in Turkey and 160 000 people die because of CAD (Turkish Society of Cardiology (TSC), 2013; İnangil and Şendir, 2014). According to the latest statistical data, CAD mortality rate has been determined to be 7·5 per thousand for men and 3·7 per thousand for women in the 45–74 years age group (Onat *et al.*, 2014).

Sleep, which is one of the vital necessities, is crucial in sustaining the physiological and psychological welfare of individuals (Akça Ay, 2012). Patients hospitalized in intensive care units, especially those in coronary intensive care units, frequently experience sleep disorders for many reasons such as pain, physical condition, medication, fear of death, light, environmental noise, unpleasant odours, foreign instruments, nursing interventions, invasive procedures, complications of disease, loss of privacy and staying away from family (Dedeli and Durmaz Akyol, 2008; Wenham and Pittard, 2009; Kurt and Enç, 2013; Hajibagheri *et al.*, 2014). Research has shown that the sleep quality and

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duration of patients hospitalized in intensive care units are inversely related (Mui So and Chan, 2004; Tunçay and Uçar, 2010). As these patients stay awake for a significant amount of time, they cannot benefit from the therapeutic effects of sleep. Inadequate and unsatisfactory sleep precludes healing by having negative effects on the immune system, wound healing process and cognitive functions of individuals as well as increasing their level of stress and anxiety (Mui So and Chan, 2004; Kurt and Enç, 2013; Lytle *et al.*, 2014). The anxiety level of patients who experience sleep disorders increases, or patients suffer from sleep deprivation because of anxiety; in other words, sleep disorder and anxiety mutually affect each other (Cho *et al.*, 2013).

Wenham and Pittard (2009) reported that in intensive care units, patients cannot sleep well and may stay awake for about 30–40% of their sleep time. Sleep disorders can be associated with increased sympathetic activity and subsequent increased blood pressure and heart rate, raising the risk for developing cardiovascular problems among patients hospitalized in coronary care units (Hajibagheri *et al.*, 2014). Thus, avoiding sleep disorder in patients with cardiac diseases is also crucial in terms of reducing anxiety (Hajibagheri *et al.*, 2014; Lytle *et al.*, 2014).

In coronary intensive care units, sleep disoders are treated using both pharmacological and non-pharmacological methods. Sedative-hypnotic agents used in pharmacological treatments can increase the quality of sleep significantly; however, it is stated that these drugs have side effects, cause addiction and do not provide adequate sleep (Kurt and Enç, 2013; Hajibagheri *et al.*, 2014). Therefore, it is essential to employ and implement non-pharmacological methods that are safer and have fewer side effects than the pharmacological methods.

One of the non-pharmacological approaches used for sleep disorders is aromatherapy, which is practised with essential oils from plants via both direct intervention to the skin and inhalation, which is a more effective method (Moeini *et al.*, 2010; Özdemir and Öztunç, 2013; Bikmoradi *et al.*, 2014). Aromatherapy is used for pain, depression, anxiety, relaxation and disorders related with sleep and stress (Abuhamdah and Chazot, 2008; Lytle *et al.*, 2014). Among the claims made for lavender essential oil, which is commonly used in aromatherapy, are its impact on amygdala and its relaxing, sedative effects and carminative (smooth muscle relaxing) qualities, thus affecting sleep quality, as well as its antibacterial, antifungal, antidepressive and stress-reducing qualities. It is also claimed to be the least toxic and allergenic among essential oils (Gedney *et al.*, 2004; Lemon, 2004; Jimbo *et al.*, 2009; van der Ploeg *et al.*, 2010; Cho *et al.*, 2013; Bikmoradi *et al.*, 2014). Studies on the benefits of lavender's aroma showed that linalool and linalyl acetate present in this plant can stimulate parasympathetic system. In addition, linalyl acetate has narcotic effects and linalool acts as a sedative. This herb improves the heart function and as a circulatory stimulant, it has beneficial effects on coronary blood flow (Fayazi *et al.*, 2011; Bikmoradi *et al.*, 2014).

Essential oils from plants are used with three methods; via inhalation, massage and orally. In the study conducted by Gedney *et al.* (2004), five drops of lavender essential oil to be inhaled was applied to a cotton gauze and placed in front of the patients. In this way, its effect was observed in a short time via inhalation (Gedney *et al.*, 2004). Moeini *et al.* (2010) applied aromatherapy with lavender essential oil to ischaemic heart disease patients in intensive care units via inhalation and found that the quality of sleep after the intervention was significantly different. In the study conducted by Cho *et al.* (2013) with patients diagnosed with CAD, it was determined that lavender essential oil had a positive effect on the quality of sleep and anxiety. Lytle *et al.* (2014) found that lavender essential oil increased the quality of sleep.

Intensive care nurses have major roles and responsibilities such as early diagnosis, assessment of sleep disorders and anxiety as well as reducing present stressors and arranging a therapeutic environment. It is seen that nurses, especially in Turkey, do not pay enough attention to non-pharmacological approaches although they have competence in using them for promoting and maintaining health. As health care team members who spend most of the time with patients, it is crucial for nurses to be aware of their problems and generate evidence-based solutions. Therefore, this study aimed to produce evidence-based data for nurses in Turkey to practise their independent nursing interventions. Furthermore, it is of significance that no other study was conducted to investigate the effects of lavender essential oil on sleep quality and anxiety in Turkey, which indicates the necessity of such a research.

Aim and hypotheses

In this study, the aim was to investigate the effect of lavender essential oil on the sleep quality and anxiety level of patients hospitalized in coronary intensive care unit.

Hypothesis 1: There is a significant difference between the Pittsburgh Sleep Quality Scale pretest and post-test mean scores of patients who received an aromatherapy of lavender essential oil.

Hypothesis 2: There is a significant difference between the Beck Anxiety Inventory pretest and post-test mean scores of patients who received an aromatherapy of lavender essential oil.

DESIGN AND METHODS

This study was designed as a randomized controlled study.

Setting and sampling

The study population consisted of patients hospitalized in the Coronary Intensive Care Unit of Şahinbey Research Hospital, Gaziantep Universty. The sample size for this study was calculated using G*Power analysis. Using a significance level (α) of 0·05, a statistical power (1-β) of 0·80 and effect size of 0·74, as calculated from previous studies, 30 aromatherapy and 30 control subjects were needed for this study (Cho *et al.*, 2013; Lytle *et al.*, 2014). Of those who were receiving treatment in the coronary intensive care unit and who were eligible for the study, 60 patients were included within the scope of the research.

The inclusion criteria were as follows: (a) 65 years of age or below, (b) diagnosed with CAD and passed the first stage of disease (the first 24–48 h of the disease), (c) no risk of heart failure and cardiogenic shock (class III and IV), (d) no history of asthma, eczema and allergies to flowers and plants, (e) not allergic to lavender, (f) communicative, no severe hearing or speech impairment, (g) no use of antidepressants, antihistamines, diuretics, hypnotics, benzodiazepines and narcotic derivatives that affect the quality of sleep and (h) willingness to participate in the research.

Data collection

Before applying lavender oil, pretest data of the intervention group were collected using a questionnaire on sociodemographic and disease characteristics, the BAI and PSQI. At the end of the intervention (day 15), the BAI and PSQI scales were completed for all the patients again. The control group patients were administered only the questionnaire for sociodemographic and disease characteristics, and the BAI and PSQI scales without administering any lavender oil. The same scales were repeated for each patient after 15 days.

Intervention and intervention protocol

The patients were evaluated according to the eligibility criteria for the sample and were informed about the written consents. Of the patients who agreed to participate in the research, the first patient was included in the intervention group while the second was included in the control group randomly (Figure 1). The same procedure continued with the following patients until 30 patients were obtained in each group. In order not to allow an interaction of lavender inhalation between patients in the intervention and control groups, patients from different rooms were included within the scope of the study. There was no interaction between the researcher who implemented the randomization and the researcher who conducted the intervention; the blinding method was used. The patients in the intervention group were applied lavender essential oil while no intervention was conducted on the control group patients.

Drawing on the facts regarding lavender essential oil in the literature that it is the least toxic and allergenic among other essential oils and that it provides effective relaxation as well as positive impacts on sleep and anxiety, lavender essential oil was preferred to be used in the study (Lemon, 2004; Jimbo *et al.*, 2009; Bikmoradi *et al.*, 2014). Relevant literature was analysed to decide on the intervention method (inhalation) (Chien *et al.*, 2012; Seifi *et al.*, 2014) concentration 2 cc lavender essential oil + 100 cc water (2%) (Chien *et al.*, 2012) intervention time (20 min) number of drops (two drops) (Moeini *et al.*, 2010; Chien *et al.*, 2012; Cho *et al.*, 2013; Seifi *et al.*, 2014). The intervention group were applied lavender essential oil for 15 days in total, which was determined based on the average intensive care duration of patients hospitalized in the unit where the study was conducted, 5–15 days in average).

Intervention protocol

(A) Intervention Group: On the first day, the patients were asked to fill in a questionnaire form regarding their sociodemographic characteristics and diseases, PSQI and BAI. For a period of 15 days, the patients were asked to inhale 2% lavender essential oil every night before they went to sleep (21·00–24·00). Treatment consisted of application of two drops of lavender essential oil to a 2 × 2 cm cotton gauze, attached to the front of the patients' scrubs, approximately 12 inches below their nose. Patients were directed to breathe normally while they waited for 20 min (Gedney *et al.*, 2004). At the end of the 15th day, they were asked to fill in the PSQI and BAI again and their sleep quality and anxiety were evaluated.

(B) Control Group: On the first day, the patients were asked to fill in a questionnaire form regarding their sociodemographic characteristics and diseases, PSQI and BAI. The patients in this group were not applied lavender aromatherapy and at the end of the 15th day, they were asked to fill in the PSQI and BAI again for the evaluation of their sleep quality and anxiety.

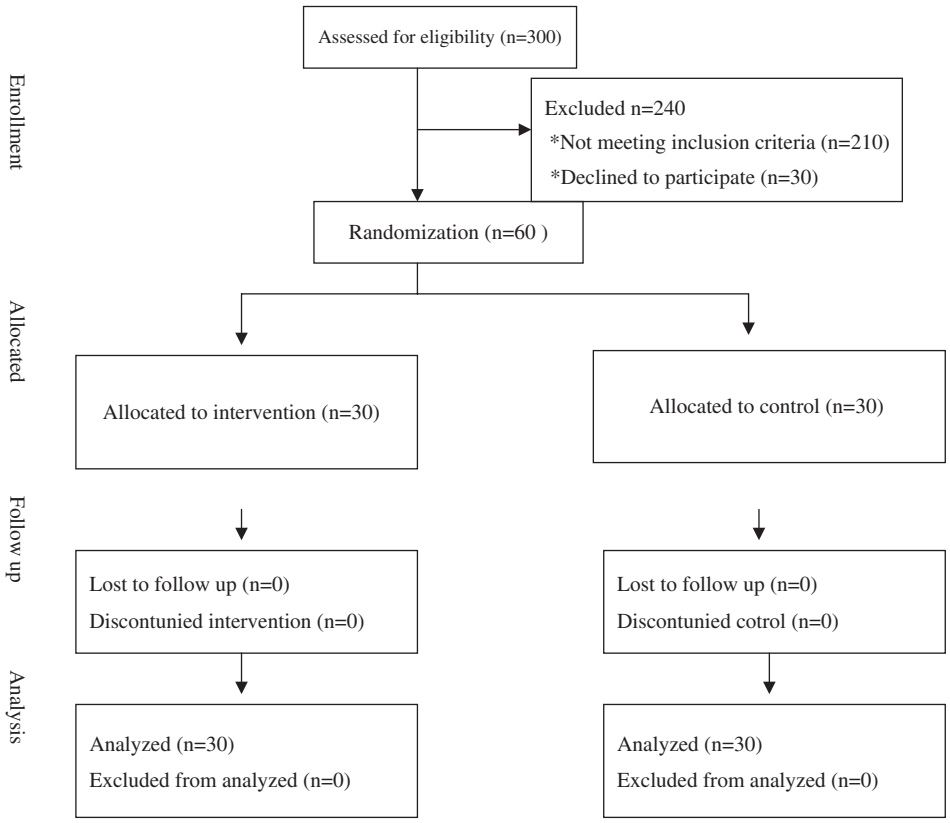

Figure 1 Consort flow diagram.

Instruments for evaluation

Questionnaire for sociodemographic and disease characteristics

This form was prepared by the researchers in accordance with the literature (Chien *et al.*, 2012; Cho *et al.*, 2013; Seifi *et al.*, 2014). While the sociodemographic data were collected using questions on age, sex, marital status, educational level and social security, data regarding health condition were collected using questions on blood pressure, heart rate, use of alcohol and cigarette, daily activities, presence of chronic diseases, evaluation of health condition and sleep disorder.

Pittsburgh Sleep Quality Index (PSQI)

Developed by Buysse *et al.* (1989), PSQI is an instrument that provides information on the type and severity of sleep disorders and sleep quality over a 1-month period. The instrument consists of a total of 24 questions; 19 of which are self-rated while 5 are rated by the bed partner or roommate. While the self-rated questions are included in the assessment, the other five questions are not tabulated in the scoring. The 19 self-rated questions assess subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications and daytime dysfunction, and are grouped into seven components. Each item received a value ranging from 0 (no difficulty) to 3 (severe difficulty) and the score of each component ranged between 0 and 3. The seven component scores are then summed to yield a global PSQI score, which has a range of 0–21. Those receiving a total score ≤ 5 are considered to have a 'good' sleep quality (Buysse *et al.*, 1989). PSQI has forms assessing the past month and week (In the forms, all the expressions are the same except for the words 'week' and 'month'.). As we evaluated the sleep quality of the individual in the past week, we used the weekly form of the PSQI. Therefore, 15-day use of the tool is appropriate. Previous studies have also shown that PSQI could be used for assessing sleep quality for a 1-week period or more (Lewith *et al.*, 2005; Barbosa Neto *et al.*, 2014).

The validity and reliability of the instrument with regard to Turkish patients were assessed by Ağargün (1996), who reported the internal consistency coefficient to be 0·80 (Ağargün, 1996). In this study, the Cronbach's α was found to be 0·94.

Beck Anxiety Inventory (BAI): It is a self-report instrument developed by Beck *et al.* (1988) that measures the frequency of anxiety individuals experience using

Table 1 Baseline characteristics at pretest between intervention and control groups

Variable	Total sample ($n = 60$) *N* (%)	Groups *n* (%)				Significance test (*p*)
		Intervention group ($n = 30$)		Control group ($n = 30$)		
Age (mean ± SD)	50·33 ± 12·44	53·30 ± 11·92		47·36 ± 11·82		1·936; 0·058*
Time for diagnosis of CAD (years) (mean ± SD)	2·55 ± 1·24	2·80 ± 1·21		2·30 ± 1·23		1·580; 0·119*
Sex						
Female	20 (33·3)	10	33·3	10	33·3	3·333; 0·068†
Male	40 (66·7)	20	66·7	20	66·7	
Educational level						
Illiterate	9 (15·0)	7	23·3	2	6·7	9·500; 0·050†
Literate	10 (16·7)	5	16·7	5	16·7	
Primary education	16 (26·7)	10	33·3	6	20·0	
Secondary education	19 (31·7)	4	13·3	15	50·0	
University	6 (10·0)	4	13·3	2	6·7	
Presence of other chronic diseases						
Yes	26 (43·3)	14	46·7	12	40·0	1·067; 0·302†
No	34 (56·7)	16	53·3	18	60·0	
The presence of sleep problems						
Yes	28 (46·7)	14 (46·7)	14 (46·7)	0·267; 0·606†		
No	32 (53·3)	16 (53·3)	16 (53·3)			

CAD, coronary artery disease.

*Independent *t*-test.

† χ^2 analyses.

a 4-point Likert-type scale. The validity and reliability of the Turkish version was conducted by Ulusoy *et al*. (1998) and the Cronbach's α coefficient was found to be 0·93. The score obtained from the instrument ranges between 0 and 63. As for the items, 13 of them measure physiological symptoms while 5 measure cognition and 3 refer to both somatic and cognitive symptoms. In this study, the Cronbach's α was found to be 0·98.

Data analysis

Data were evaluated using SPSS software (SPSS, Chicago, IL, USA) using numbers or percentages. The χ^2 test and independent Student's *t*-test were used when comparing whether there was any difference between the intervention and control groups in terms of basic characteristics. Differences between the PSQI and BAI scores obtained from the intervention and control groups were analysed by using the independent student's *t*-test. Paired sample student's *t*-test was used to assess the differences before and after intervention within the same group.

Ethical consideration

Written consent was received from the ethics committee (No: 24.03.2014/105) of Gaziantep University, Faculty of Medicine. Additionally, informed consents were obtained from all patients in line with the Declaration of Helsinki.

RESULTS

Sample characteristics

A total of 60 patients, 30 for intervention and 30 for control group, were included in this study. Of the study patients, 66·7% were males and 33·3% were females, with a mean age of 50·33 ± 12·14 years. Primary school graduates comprised 26·7%, and 43·3% had no accompanying chronic diseases other than CAD. The average time for diagnosis of CAD was 2·55 ± 1·24 years and 31·7% of the patients had sleep problems (Table 1). Although not shown in the table, all the patients were married and 86·7% had social security.

There were no statistically significant differences between the intervention and control groups in terms of age, gender, educational level, presence of accompanying disease and sleep disorder ($p > 0·05$) (Table 1). These findings gave homogeneity to the groups.

Difference of the PSQI and BAI scores between intervention and control group

When the PSQI and BAI scores of the patients in the control and intervention groups before and after the intervention were compared, the differences in the change were found to be statistically significant in favour of the intervention group ($p < 0·05$; Table 2).

Table 2 Difference of PSQI and BAI scores between intervention and control group at pretest and post-test

Variable	Intervention group Mean (SD)	Control group Mean (SD)	Significance test (*p*)
PSQI			
Pretest	8·68 ± 2·96	9·44 ± 2·75	t^* = −1·009 (0·318)
Post-test	7·60 ± 2·83	9·38 ± 2·60	t^* = −2·420 (0·019)
Significance test (*p*)	$t^\dagger$ = 2·962, p = 0·006	$t^\dagger$ = 0·694, p = 0·493	
BAI			
Pretest	16·00 ± 9·48	12·23 ± 6·12	t^* = 1·827 (0·074)
Post-test	12·93 ± 7·70	13·00 ± 6·54	t^* = −0·036 (0·971)
Significance test (*p*)	$t^\dagger$ = 4·850, p = 0·001	$t^\dagger$ = −1·588, p = 0·123	

BAI, Beck Anxiety Inventory; PSQI, Pittsburgh Sleep Quality Index.

*The score difference between intervention and control groups has been evaluated using independent sample *t*-test.

†The score difference between the pretest and post-test of the same group was evaluated using the paired sample *t*-test.

In the intervention group, a significant difference was found between the pretest and post-test scores of PSQI (t = 2·962, p = 0·006) and BAI (t = 4·850, p = 0·001). Following the aromatherapy intervention, the PSQI and BAI mean scores decreased significantly; in other words, the anxiety level decreased (Table 2).

In the control group, no significant difference was found between the pretest and post-test scores of PSQI (t = 0·694, p = 0·493) and BAI (t = −1·588, p = 0·123) (Table 2).

DISCUSSION

The essential oils used in aromatherapy are extracted from aromatic plants (lavender, rose, jasemine, etc.) generally by steam distillation method (Köse *et al.*, 2007; Özdemir and Öztunç, 2013). The vapourized essential oils are inhaled that result in various effects by connecting to many centres from the hypothalamus and hippocampus to the lymbic system through the olfactory bulb (Köse *et al.*, 2007). Sleep is an essential component of health and is related to physical and psychological well-being. Inadequate quality and quantity of sleep in hospitalized patients are common problems, particularly in intensive care or intermediate care units (IMCUs), and they may have serious detrimental effects on health and recovery from illness (Lytle *et al.*, 2014).

In this study, which aimed to investigate the effect of aromatherapy on the the sleep quality and anxiety level of patients in coronary intensive care unit, it was found that the quality of sleep increased in patients who received aromatherapy. In parallel with our finding, Moeini *et al.* (2010) also stated that the quality of sleep increased in cardiac patients after aromatherapy. Similarly, Goel *et al.* (2005), Lewith *et al.* (2005) and Kasper *et al.* (2010) found that aromatherapy conducted with lavender essential oil was effective in preventing sleep disorders. By acting on the lymbic system, lavender essential oil induces sleep by producing γ-aminobutyric acid effect especially in the amygdala. Furthermore, lavender essential oil facilitates sleep by producing a sedative effect and inhibiting the release of acetylcholine (Peng *et al.*, 2009). Cho *et al.* (2013) found that lavender essential oil increased the quality of sleep in their study conducted in a coronary intensive care unit. Chien *et al.* (2012) also found that lavender aromatherapy led to a significant improvement in sleep quality when women had a 20-min exposure twice a week during a 12-week period. Moeini *et al.* (2010) found that the sleep quality of cardiac patients in the intervention group increased after the application of lavender essential oil. Hajibagheri *et al.* (2014) investigated the effect of Rosa damascene aromatherapy on the sleep quality of cardiac patients and found that the intervention significantly reduced sleep latency and sleep disturbances while it significantly improved the efficiency, the subjective quality and the duration of sleep. The positive effect of aromatherapy on improving sleep quality in haemodialysis patients has also been reported (Najafi *et al.*, 2014). These findings support the results of our study.

Anxiety is a complex phenomenon experienced very frequently by patients hospitalized in intensive care units (Mui So and Chan, 2004; Wenham and Pittard, 2009). Aromatherapy is a therapy to promote physical, mental and psychological health, to maintain health and to enhance vitality with therapeutic components of refined essential oil extracted from various plants. Inhalation aromatherapy is a technique in which essential oils are used in inhalation, which can decrease pain, anxiety and depression and improve the vital signs (Seifi *et al.*, 2014). In this study, it was observed that the anxiety level of patients decreased significantly in the intervention group, whereas it increased in the

control group. These results are consistent with the anxiety-decreasing effects of aromatherapy in patients before surgery (Oh and Jung, 2002), before percutaneous coronary intervention (Cho *et al.*, 2013), during menstruation (Kim *et al.*, 2011), in haemodialysis patients (Kim *et al.*, 2007) and during colonoscopy (Lee and Ahn, 2010). In the study conducted by Woelk and Schläfke (2010), the impacts of medical treatment and lavender essential oil inhalation on anxiety were compared and it was found that lavender oil was as effective as medical treatment in reducing anxiety. On the other hand, Seifi *et al.* (2014) and Bikmoradi *et al.* (2014) stated that lavender essential oil application by way of inhalation was not effective on mental stress and anxiety of patients who had undergone coronary bypass surgery.

LIMITATIONS

In this study, the short-term effect of lavender essential oil has been evaluated. Therefore, the findings obtained are valid for the short-term effect of lavender essential oil on sleep quality and anxiety.

IMPLICATIONS AND RECOMMENDATIONS FOR PRACTICE

Drawing on the fact that the effects of lavender essential oil have not been researched in Turkey, it is essential that lavender aromatherapy be experimented with different and larger samples and that the evidence data be transferred to nursing practices. For this reason, there is a need for a greater number of research studies to be conducted in this field.

CONCLUSION

This study found that lavender essential oil increased the quality of sleep and reduced the level of anxiety in patients with CAD. In coronary care units, sleep disorders and anxiety are important factors influencing the well-being of patients. Nurses have major responsibilities because they spend long time with patients. As a non-invasive, inexpensive, easily applicable, cost-effective, independent nursing intervention and appropriate for cardiac patients, lavender essential oil could be applied in intensive care units.

WHAT IS KNOWN ABOUT THIS TOPIC

- Intensive care unit patients cannot sleep well and may stay awake for about 30–40% of their sleep time.
- Aromatherapy is used for pain, depression, anxiety, relaxation and disorders related with sleep and stress.

WHAT THIS PAPER ADDS

- Lavender essential oil increased the quality of sleep and reduced the level of anxiety in patients with coronary artery disease.
- As a non-invasive, inexpensive, easily applicable, cost-effective, independent nursing intervention and appropriate for cardiac patients, lavender essential oil could be applied in intensive care units.

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