



## Research Paper

# The Effect of Orange Blossom Aromatherapy on the Physiological Parameters and Anxiety of Patients Undergoing Angiography



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## ABSTRACT

**Background:** Invasive diagnostic tests such as angiography cause stress and anxiety in patient and most of them experience relatively high levels of anxiety.

**Objectives:** The aim of this study was to evaluate the effect of aromatherapy on anxiety and physiologic parameters of patients undergoing angiography.

**Materials & Methods:** This clinical trial was performed in the angiography department of Heshmat hospital in north of Iran. Eighty patients with anxiety score of above 43 were randomly assigned into two groups of aromatherapy and placebo groups. Fifteen minutes Before and then angiography, the physiologic parameter and anxiety of the patients were measured, and the intervention group sniffed three drops of essential oil of orange blossom for three minutes.

**Results:** In the intervention group, there was no significant difference between the mean score of the manifest and hidden anxiety and the physiological indices before and after the intervention. The adjusted post-intervention values showed that systolic and diastolic blood pressure in the control group were significantly lower than intervention group ( $P < 0.001$ ). The mean reduction of systolic blood pressure in the intervention and control group was 3% and 13%, respectively. The mean diastolic blood pressure reduction was 2% vs 7% in the intervention and control group, respectively.

**Conclusion:** This study revealed no significant effect of aromatherapy on anxiety of the patients undergoing angiography. Among physiologic parameter, systolic and diastolic blood pressure significantly reduced after intervention.

**Keywords:** Aromatherapy, Vital signs, Anxiety, Angiography, Patients-citrus

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## 1. Introduction

**C**oronary artery angiography is an invasive way which is used in the diagnosis of the Coronary Artery Disease (CAD) to determine the severity of constrictions and obstructions as well as the selection of the treatment method [1]. In most cases, invasive diagnostic tests such as angiography cause stress and anxiety in the patients, and most patients experience relatively high levels of anxiety [2].

Anxiety, as a factor which increases cardiovascular responses to physiological reactions, affects myocardial oxygen consumption and plasma concentrations of epinephrine and norepinephrine. It also causes irregularities in the heart rate, increases the heart rate, increases blood pressure and leads to arrhythmia [3]. Nurses play a key role in creating a welcoming environment for patients, maximizing physiological and psychological health and helping the patient to adapt to the conditions of anxiety during invasive procedures [4, 5]. The nurses have a very important role to control the patients' anxiety and boost their physiological and psychological health.

There are generally two approaches including medical and non-medical to reduce anxiety in the patients undergoing invasive test [6]. Many of the non-medical methods are in the category of complementary therapies, and in most cases, they have few side effects and risks; therefore, they can be used alone or in combination with other methods [7]. Aromatherapy, as a non-medical treatment method, is widely used and recently has received a lot of attention. It has been proved to be a comprehensive intervention and a relaxation mediator which is in the scope of nursing duties and is not costly or hazardous. Aromatherapy, which is commonly used in Switzerland, Germany, Canada and the United States, considers biological, psychological and social dimensions of a human and gives priority to the psychological aspects of human life [8].

There is a wide range of aromatherapies in which herbal essential oils are used. They are taken directly from the roots, flowers, the outer bark or trunk of trees and the skin of fruits, leaves and fruits of various plants. Meanwhile, the efficiency of aromatherapy in reducing pain has been reported to be as high as diazepam [9].

One of the essential oils used in aromatherapy is orange blossom [9]. The essence of the orange blossom, known scientifically as Citrus aurantium, stimulates central nervous system, has anti-spasm and anti-inflammatory effects, contributes to digestion and lowers blood pressure.

The results of previous studies have shown controversial effects of aromatherapy on psychological aspect of patients undergoing angiography. For example, in some studies it has been reported that aromatherapy has positive effects on the vital signs of ischemic stroke patients, reduces anxiety [10] or improves sleep quality [7]. However, in another study no significant change was observed in the blood pressure and pulse of the patients in the control and intervention group [11].

Therefore, this study aimed to investigate the effect of orange blossom aromatherapy on the physiological and anxiety indicators of cardiac patients undergoing angiography using a placebo- control randomized clinical trial.

## 2. Materials and Methods

### Design and participants

This was a parallel design, single-blind, randomized controlled Clinical trial on patients admitted to the angiography department of Heshmat referral center Heart hospital in the city of Rasht, the capital of Guilan Province, Iran from 21 March to 19 May 2017.

The inclusion criteria were age between 20 and 60 years, willingness to participate in the study, undergoing angiography for the first time, no previous experience of angiography or other invasive methods such as transesophageal echocardiogram, having a positive olfactory test (the ability to identify the smell of the aromatherapy solution), not taking nitrates or analgesics in the past 6 hours, not having a history of allergies, allergic rhinitis, eczema and respiratory problems, not having headache before the intervention, history of using perfume before or during the intervention, not having experienced an acute stressful event over the past 6 months, or having been hospitalized for the treatment of mental health problems and not having a history of drug addiction. Having an olfactory disorder, a cold and nasal congestion affecting smelling, and patients undergoing emergency angiography during the sampling period were excluded. The researchers explained the purposes of the study to the participants and invited them to take part in the study. They were informed that participation in the study is voluntary and no change will be made to their treatment procedure if they decline to take part in the study. They were also told that they could withdraw from the study any time they decide. Oral and written consent was obtained from the participants. The sample size was estimated based on the findings of a former study in which the Mean±SD anxiety levels in the intervention and control group was 0.36±0.73 and 3.11±2.31 respectively [7]. considering a

type I error of ( $\alpha=0.05$ ), a type II error of ( $\beta=0.2$ ), and 10% attrition rate the sample size was estimated to be 23 patients in each group.

### Instruments and data collection

Three questionnaires were used to collect the data. A demographic questionnaire about patients' age, sex, marital status, history of smoking, education, underlying illness and type of the heart disease. The two other questionnaires were used to investigate the effect of Citrus aurantium on the physiological parameters and anxiety of the cardiac patients before and after the angiography. The standard anxiety questionnaire, the State-Trait Anxiety Inventory (STAI), developed by Spielberger was used to assess the anxiety level of the patients. The questionnaire was developed by Spielberger (1970) and contained 40 items: 20 items measured manifest anxiety and 20 items measured the hidden anxiety [10]. This questionnaire is based on a 4-point Likert Scale ranging from very low (1) to very high (4). Ten items of the questionnaire were scored in the reverse order. The range of score was between 20 and 80 in these two types of anxiety; scores above 43 represent anxiety in the group. In Iran, the reliability of this questionnaire has been estimated at %93 using the Cronbach's alpha test. Additionally, the concurrent validity of the questionnaire has been confirmed by clinical interviews and anxiety scales [11].

Physiologic parameters including systolic and diastolic blood pressure, pulse rate, respiration rate and body temperature were assessed at the patients' bed before transferring to angiography. The patient's systolic and diastolic blood pressure was measured using a valid sphygmomanometer (ALPK2, made in Japan). The patient's temperature was measured by an axillary thermometer (Citizen, made in Switzerland), the number of breaths was measured by observing the patient's chest movements and the number of pulses was recorded through radial pulse.

### Intervention

To achieve the goals of the study, first, the patients with an overt anxiety level of above 43 were identified. Then, the patients were randomly assigned to the two groups of intervention and placebo. The intervention was performed by dripping two drops of spring orange essential oil on a cotton ball in the experimental group and placing it at a distance from myopia. He was asked to breathe normally. In the control group, two drops of distilled water were dropped on a cotton ball and placed at a distance between myopia and the patient was asked

to breathe normally. The essential oil was manufactured by the Ministry of Health with a code: 162,103 and a production series: 5027. Its ingredients included Linalyl acetate, propylene glycol, geraniol, petit green oil and phenylethyl alcohol.

Before transferring to the angiography unit, the patient's demographic questionnaire was completed by the researcher, the patient's level of anxiety was assessed and his vital signs (blood pressure, pulse, respiration and temperature) were assessed by the nurse and the researcher. All questions were asked orally from the patients and the answers were written in the questionnaire. Fifteen minutes before entering the angiography unit, three drops of 10 cc of orange blossom ink were poured on cotton balls into a bowl using a dropper. It is recommended to keep cotton balls 5 cm away from the patient's nose for 5 minutes while the patient is sitting. Vital signs and anxiety levels of patients were assessed and recorded by the nurse and researcher after 30 minutes and then the patient was transferred to the angiography room. In the case of the control group, vital signs were measured and recorded at the same time as the intervention group.

### Statistical analysis

Data were described using Mean $\pm$ SD, frequency, and percent. The normal distribution of variables in the aromatherapy and control groups was assessed using skewness index. Categorical variables in the two group were compared using Chi-Square test. Independent t-test was used to compare the difference between Mean $\pm$ SD anxiety in the aromatherapy and control groups. Analysis of covariance was used to compare adjusted scores of anxiety and physiological parameters in the two groups. The data were analyzed using SPSS software v. 16. A P-value less than 0.05 was considered as significant.

## 3. Results

There were forty patients in each group who participated in the study. In the intervention group, 24 (60%) were men and 16 (40%) were female. In the control group, 16 (40%) were males and 24 (60%) were female. All participants in the study were married, 77 (96.2%) were living with their spouse and children and three (3.75%) were living with their spouse. There was no significant difference in terms of baseline characteristics in the two groups (Table 1).

Table 2 shows the mean value of anxiety and physiologic parameters before and after the intervention in

**Table 1.** Baseline characteristics of study participants in the two group

Characteristics	Mean±SD/No.(%)		P	
	Intervention	Control		
Age (y)	52.18±5.8	50.22±5.6	0.11	
Gender	Male	24(60)	16(40)	0.074
	Female	16(40)	24(60)	
Education	Primary	15(37.5)	16(40)	0.89
	Under diploma	20(50)	18(45)	
	Diploma	5(12.5)	6(15)	
Family history	Yes	16(40)	14(35)	0.64
	No	24(60)	26(65)	
HTN	Yes	24(60)	19(47.5)	0.26
	No	16(40)	21(52.5)	
Other disease	Yes	14(35)	18(45)	0.36
	No	26(65)	22(55)	
Settlement	City	24(60)	18(45)	0.17
	Village	16(40)	22(55)	
DM	Yes	11(27.5)	14(35)	0.47
	No	29(72.5)	26(65)	
Job	Retired	3(7.5)	1(2.5)	0.06
	Laborer	1(2.5)	5(12.5)	
	Free lancer	17(42.5)	18(20)	
	House wife	16(40)	24(60)	
	Other	3(7.5)	2(5)	
Income (IRR)	11500±6200.58	16030±7980.45	0.002	
Body Mass Index (BMI)	26.1±3.6	25.7±2.7	0.58	



the two groups. There was no significant difference in the two groups in terms of baseline values of anxiety and physiologic parameters. The adjusted post-intervention values show that systolic and diastolic blood pressure in the control group were significantly lower than intervention group ( $P<0.001$ ). The Mean±SD pre-post difference of systolic blood pressure in the intervention and control group was  $24.5\pm3.8$  mmHg and  $14.2\pm13.02$  mmHg, respectively. Similar values

for diastolic blood pressure was  $12.2\pm1.7$  mmHg and  $13.4\pm5.2$  for intervention and control group, respectively.

#### 4. Discussion

The finding of current study revealed no considerable effect of aromatherapy on anxiety of patients in post-angiography. Among physiologic parameters, systolic and diastolic blood pressure was significantly reduced after intervention in both groups. A remarkable point was that

**Table 2.** Mean value of anxiety and physiologic parameters before and after the intervention in the two groups

Variables	Baseline		P	Post-intervention		P
	Mean±SD			Mean (95% Confidence Interval)*		
	Intervention	Control		Intervention	Control	
Manifest anxiety	41.75±4.45	42.08±5.2	0.76	41.9 (40.8, 43)	41.5 (40.4, 42.6)	0.66
Hidden anxiety	42.75±5.63	45.4±5.11	0.03	43.9 (42.9, 44.8)	43.7 (42.7, 44.7)	0.96
Systolic blood pressure (mmHg)	126.05±21.85	118.42±17.1	0.086	125.5 (116.2, 134.7)	109.04 (99.6, 118.5)	0.006
Diastolic blood pressure (mmHg)	75.58±12.98	72.25±13.52	0.265	77.9 (73, 82.9)	64.7 (59.6, 69.7)	0.002
Respiration	19.05±1.15	19.73±8.97	0.651	19.4 (14.7, 24.2)	18.6 (13.6, 23.6)	0.57
Pulse	71.98±8.24	69.58±11.95	0.299	73.4 (68.3, 78.5)	71.4 (66, 76.8)	0.53

\*Adjusted for sex, job, and income level.



the significant difference in the mean diastolic and systolic blood pressure before and after the intervention was in the control group, which received no aromatherapy. The reason for this finding could be the constant presence of the researcher in the ward, which could affect the patients' confidence and relation.

Aromatherapy, however, had no effect on the mean diastolic and systolic blood pressure before and after the intervention in the experimental group. Similarly, Nategh et al. reported no significant difference in the mean diastolic and systolic blood pressure before and after the intervention in the experimental and control group [8]. Tahmasebi et al. also conducted a study entitled "effects of aromatherapy on the anxiety, vital signs, and sleep quality of percutaneous coronary intervention patients in intensive care units", reporting no significant effect of aromatherapy on the patients' blood pressure [7]. In a study by Zeighami et al. [9], which investigated the effect of peppermint aromas on vital signs and cardiac dysrhythmias in patients with acute myocardial infarction, the results showed no significant difference in the vital signs of the patients in the control and experimental group.

In another study evaluating the effect of lavender aromatherapy on the anxiety and vital signs of patients with ischemic heart disease, significant difference in the blood pressure, pulse and respiration rate among the patients in the experimental and control group was found [8].

Tahmasebi et al. carried out a study entitled "the impact of aromatherapy on the anxiety of patients experiencing coronary angiography", noting the effect of aromatherapy [7, 11]. Rashidi et al. conducted a study entitled "effect of inhalation of aroma of geranium essence on

anxiety and physiological parameters during first stage of labor in nulliparous women", indicating that there was a significant reduction in the diastolic blood pressure after inhaling the essence [12].

The difference in the results of the study can be due to the different types of aromatherapies and essences used and the difference between the participants in the studies. It may also be related to the method of use and the composition and non-standard concentration of essential oil consumed in the volume of different samples, and in some studies the number of times and duration of intervention to evaluate aromatherapy is effective. Moreover, the relationship between the aromas and the previous feelings and experiences of these aromas among the patients could have influenced the results. One of the limitations of this research is the small number of research samples. One of the advantages of aromatherapy method is that it does not have the unwanted side effects of chemical drugs. Other advantages are low safety cost and simplicity and complementary nursing action to reduce anxiety.

The second issue investigated in the present study was the effect of orange blossom aromatherapy on the patients' anxiety before undergoing angiography. Research has shown that most patients suffer degrees of anxiety; one of the most common types of anxiety is the anxiety before coronary artery angiography; aromatherapy is one of the non-drug therapies which can reduce stress and anxiety [8].

The results of the study with regard to the effect of orange blossom aromatherapy on the patients' anxiety before undergoing angiography showed that the difference between

the mean score of the overt and covert anxiety before and after the intervention is not significant in the two groups.

The results of the present study corresponds with the findings of a study by Babaei et al. which compared the effect of two methods of Quranic sound and aromatherapy on patients' anxiety before angiography; they reported that aromatherapy had no effect on the overt, covert, and total anxiety of the patients [13]. Like the findings in the present study, the findings of a study by Tayebi et al. showed that aromatherapy with lavender essential oil effected only the depression and stress in hemodialysis patients and did not influence their anxiety [14].

There are, however, a number of studies whose findings disagree with the findings in the present study [15-17]. For example, Najafi et al. studied the effects of inhalation aromatherapy with lavender essence on the anxiety level of the patients with myocardial infarction [18], Kamrani et al. investigated the effect of aromatherapy with lemon essential oil on anxiety after orthopedic surgery [17], Mirmohammad et al. investigated the effect of lavender on the anxiety caused by the use of IUD at the health center of [Tehran University of Medical Sciences](#) [19], Vahaby et al. researched the effect of aromatherapy with rose water on pain severity of labor in nulliparous women [20], and Vaezi et al. investigated the effect of inhalation of peppermint oil on depression and anxiety in patients with myocardial infarction who were hospitalized in intensive care units of Sirjan, reporting that aromatherapy was significant in reducing the anxiety level of the patients [21].

The reason for the difference in the findings of the recent studies could be the difference in the type of the aroma [21-23], difference in the patients or disease [23], difference in the population of the study [24] or difference in the experiences of the patients with different aromas. Although there is disagreement on the effects of aromatherapy on reducing anxiety, researchers believe that through activating olfactory neural cells, aroma stimulates limbic system so that neurotransmitter like noradrenaline, serotonin and endorphin are released [22]. It could be also argued that anxiety is a subjective and mental phenomenon and different factors like the personality of the individuals, family and community support and different treatment methods can have different effects on anxiety.

In another study conducted by Kalani et al. In 1994 to evaluate the effectiveness of spring orange and oxazepam tablets on preoperative anxiety, the results showed

that spring orange extract and oxazepam tablets both have a similar effect on reducing patients' anxiety [23].

In a study conducted by Hashemi et al. in 1995 with the aim of investigating the antidepressant effects of spring orange. The results showed that the orange plant has antidepressant effects [24, 25].

According to the research of Shahinfar et al. conducted in 1996, many plants with anti-anxiety and sedative properties have been named. Studies on spring orange, this plant has anti-anxiety effects. However, due to the fact that not enough studies have been done on this plant, it is not possible to determine the exact extent of its effect on anxiety [26].

Given the above-mentioned contradictory results, despite the role of orange blossom in reducing anxiety in cardiac patients and the complications that anxiety can cause in the patient's course of recovery, and in spite of the effect of the reduction of anxiety and stress is part of nursing care, the effect of orange blossom on the vital signs and anxiety of the patients undergoing angiography has not been investigated.

## 5. Conclusion

The results of the present study showed that aromatherapy had no significant effect on the patients' physiological parameters and anxiety. However, as the tranquilizing effects of aromas have been noted in many resources about medicinal herbs, further research in this area may help the discovery of the significant effects of aromatherapy as a non-invasive, safe and inexpensive alternative in the treatment of different diseases.

One of the limitations of the present study is that it was performed only in Guilan Province. Moreover, as anxiety is a conceptual phenomenon, the participants' answers' could be subjective and conceptual. There were some environmental variables like the atmosphere of the hospital and the ward, the odors in the hospital, fear from cardiac diseases and their consequences and accompanying treatments, hospital facilities, angiography concerns, personal and familial problems and insurance coverage, which could affect the findings. Moreover, the patients' inner anxiety could affect the efficiency of aromatherapy, which was out of the control of the researchers.

## Ethical Considerations

### Compliance with ethical guidelines

This study was conducted based on the clinical trial method and was registered with the Iranian Registry of Clinical Trials (IRCT) (IR.IR.GUMS.REC.2017.348) and the clinical examination (Code: IRCT2017051133808N1).

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### Authors' contributions

Conceptualization: Parand Pourghane, Fatemeh Zaersabet and Arsalan Salari; Methodology: Investigation, Writing-original draft: Parand Pourghane and Fatemeh Zaersabet; Data collection: Fatemeh Zaersabet; Data analysis: Bahareh Gholami Chabok; Writing-review & editing: Iman Alizadeh and Arsalan Salari; Supervision: Parand Pourghane.

### Conflict of interest

There are no conflict of interests.

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