

# The Effects of Inhalation of Aromatherapy with Lavender on Anxiety Amongst Patients Undergoing Colonoscopy

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## Abstract

**Background:** Colonoscopy-associated anxiety can cause different complications and therefore, anesthesia, opioids or tranquilizers should manage it.

**Objectives:** The aim of this study was to evaluate the effects of inhalation of aromatherapy with lavender on anxiety amongst patients undergoing a colonoscopy.

**Methods:** This randomized controlled clinical trial was conducted on patients referred to the colonoscopy center of Qaem (PBUH) Hospital, Mashhad, Iran. Fifty patients were randomly allocated to either a control group or an aromatherapy group, 25 patients in each one. Once admitted to the hospital, the patients completed a demographic questionnaire and Spielberger's State Anxiety Inventory. Afterward, for ten minutes, the patients in the aromatherapy group inhaled three drops of pure lavender essential oil, which was sprayed, by using a nebulizer, while patients in the control group inhaled five milliliters of distilled water in the same way as the patients in the experimental group. Finally, the patients in both groups were asked to recomplete the Spielberger's State Anxiety Inventory both before and after undergoing a colonoscopy. The SPSS software (v. 19.0) was used to analyze data by the Chi-square, the Fisher's exact test and the independent sample t-tests as well as the repeated measures analysis of variance at a significant level of less than 0.05.

**Results:** The mean anxiety scores in the aromatherapy group at the three measurement time points were  $52.3 \pm 6.4$ ,  $44.8 \pm 7.1$  and  $47.5 \pm 6.6$  while these values in the control group were  $52.4 \pm 7.2$ ,  $50.1 \pm 5.9$  and  $49.1 \pm 5.2$ , respectively. After the intervention and before the colonoscopy procedure, there was a significant difference between the groups regarding the mean anxiety score ( $P = 0.002$ ). Moreover, the amount of decrease in the mean anxiety scores at different time points was significantly greater in the aromatherapy group than in the control group ( $P < 0.05$ ).

**Conclusions:** Inhalation of aromatherapy with lavender significantly reduces state anxiety amongst patients who are going to undergo a colonoscopy. Therefore, lavender aromatherapy can be used to reduce patients' anxiety in clinical settings.

**Keywords:** Anxiety, Colonoscopy, Inhalation Aromatherapy, Lavender

## 1. Background

Colonoscopy is a diagnostic-therapeutic and screening technique, which is currently used as a reference technique for secondary prevention, diagnosis and treatment of some sorts of colorectal cancers (1). It is one of the endoscopic procedures for the lower gastrointestinal tract. In October 2002, colonoscopy screening for people who were asymptomatic and were the age of 55 and above was integrated into the national program of colorectal cancer prevention in Germany (2). Colonoscopy is the best and most thorough evaluation technique for all patients above the age of 40 who have colorectal symptoms (3). Annually, more than half a million colonoscopies are performed in the United States. Colonoscopies have been approved as a useful and confident procedure for assessing the colon (4).

Colonoscopy is associated with different complications such as colon perforation with an incidence rate of 0.2 - 0.4. Moreover, intraprocedural deaths have been reported in 0.02% - 0.06% of cases, the cause of more than 50% being cardiovascular accidents (5). Anxiety is the most important complication of the technique (4). It prevents obtaining the desired outcomes and reduces patients' tolerance and collaboration. Higher levels of anxiety and restlessness will result in a lengthier, incomplete, painful and difficult colonoscopy (6).

Anxiety is managed pharmacologically and non-pharmacologically. For the colonoscopy procedure, benzodiazepines are usually used to manage procedural anxiety and induce forgetfulness (7). Currently, 8% of all colonoscopies in France are performed under general anesthesia, while in Germany and Finland; most colono-

scopies are done without administering any tranquilizers (8). Medications usually exert different side effects. The most commonly used anxiolytic agent is midazolam. The results of a study done at Finland University on 1,008 patients who were candidates for a colonoscopy showed that midazolam can stimulate the sympathetic nervous system and thus, can cause cardiovascular accidents during a colonoscopy (9).

Complementary therapies usually have limited side effects and complications. As a complementary therapy, aromatherapy has achieved a great status in stress management (10). Aromatherapy stimulates olfactory organs through aromas. It is believed that aromas activate olfactory nerve cells and thus, stimulate the limbic system. Depending on the type of aromas, nerve cells produce different types of neurotransmitters such as enkephalins, endorphins, noradrenalin, and serotonin. These neurotransmitters can alleviate anxiety and its manifestations (11). Complementary therapies are considered as nursing interventions and are used in nursing care plans (12).

As a nursing intervention, aromatherapy has been used in different countries such as Switzerland, Germany, England, Canada and the United States. Undeniably, it employs the vapor of aromatic herbs that have anti-inflammatory, antibacterial, sedative and anti-stress effects (13). Lavender is a herb that its anxiolytic and tranquilizing effects have been assessed in different populations. It contains compounds such as linalool, linalyl acetate and ketones and can therefore exert the same effects as tranquilizers (14). Some studies showed that inhaling lavender essence could alleviate inflammation, reduce cortisol and increase serotonin in blood. Probably, lavender aroma reduces the blood level of cortisol through inhibiting the activity of the hypothalamic-pituitary-adrenocortical axis. Kanany et al. (2011) and Mirzaei et al. (2009) found that lavender aromatherapy significantly alleviated anxiety amongst patients undergoing hemodialysis (15) as well as nulliparous women (16). However, Muzzarelli et al. (2006) reported that lavender aromatherapy had no significant effect on anxiety amongst patients who experienced a colonoscopy (17).

As mentioned above, colonoscopies are a useful diagnostic-therapeutic and screening technique. However, it is not well accepted by patients due to its different complications such as anxiety. On the other hand, chemical medications are costly and produce many adverse side effects.

## 2. Objectives

The present study was done to evaluate the effects of inhalation aromatherapy with lavender on anxiety amongst

patients undergoing a colonoscopy.

## 3. Methods

The present study was a randomized controlled clinical trial, which was conducted on patients who were referred to the colonoscopy center of Qaem (PBUH) hospital, Mashhad, Iran. Eligible patients were selected through convenient sampling and were randomly allocated to either a control group or an aromatherapy group. Based on the findings reported in 2009 by Park and Kim (18) and with a power of 80% and a Type I error of 0.05, the study sample size was determined to be 20 patients for each group. Nonetheless, given the likelihood of some patients' withdrawal from the study, 25 patients were recruited to each group. The eligibility criteria was between the age of 18 - 65, orientation to place and time, a healthy smelling ability, no active acute or chronic respiratory problem, no history of heart problems, hypertension, endocrine disorders, a previous colonoscopy, no history of stressful life events (such as loss) during the past six months prior to the study and no history of hospitalization or medication therapy for psychiatric disorders. The exclusion criteria included any medication administration or any hypersensitivity manifestation during the colonoscopy or any request for voluntarily withdrawing from the study.

A two-part instrument was used for data collection. The first part was a demographic questionnaire containing items such as age, gender, reason for colonoscopy, as well as employment, educational and marital status. This questionnaire was developed based on the results of a brief literature review. The content validity of this questionnaire was assessed through seeking experts' comments. The second part of the data collection instrument was the 20-item Spielberger's State Anxiety Inventory, the items of which are responded and scored on a four-point scale as follows: Very much: 4; Moderate: 3; Somewhat: 2; Not at all: 1. Consequently, the score of each item can range from 1 to 4 (19). The State Anxiety Inventory is a standardized valid and reliable questionnaire. The results of a study in Iran illustrated that the Cronbach's alpha values of the inventory for the norm and the criterion groups (600 and 130 individuals) were 0.9084 and 0.9418, respectively (20).

In order to assess the health status of the eligible participants' olfactory nerve, they were asked to smell two black glasses, one of which contained lime juice and the other rosewater. Then, they were asked to blindly and randomly select one of the two cards, which were labeled A (the aromatherapy group) and B (the control group). After that, they completed the study questionnaires.

Before undergoing a colonoscopy, patients in the aromatherapy inhaled three drops of pure lavender essential

oil (Barij Essence Pharmaceutical Company, Kashan, Iran) for ten minutes and through a facemask. These three drops were already diluted by five milliliters of distilled water and were sprayed in the area by a nebulizer. On the other hand, patients in the control group inhaled five milliliters of distilled water in the same way as the patients in the experimental group. Immediately after the intervention, the patients in both groups were asked to recomplete the State Anxiety Inventory. Next, they underwent a colonoscopy and finally, they recompleted the inventory after undergoing a colonoscopy for the third time.

The SPSS software version 19.0 was used for data analysis. The measures of descriptive statistics such as frequency, mean and standard deviation were used for the purpose of data description. Moreover, the groups were compared with one another in terms of the participants' demographic and clinical characteristics through the Chi-square and Fisher's exact tests. Moreover, comparisons regarding the participants' anxiety scores were made by using the independent sample t-test and repeated measures analysis of variance (RM ANOVA). The level of significance for all statistical tests was set at less than 0.05. The present study was registered in the Iranian registry of clinical trials with the code of IRCT2015073123427N1.

#### 4. Results

This study was done on 50 patients, 25 in each group. Statistical analyses indicated no significant difference between the groups regarding the patients' demographic and clinical characteristics such as age, gender, reason and length of colonoscopy, as well as employment, educational and marital status ( $P > 0.05$ ; Table 1).

Based on the results of the independent sample t-test, the baseline mean anxiety score in the aromatherapy group ( $52.3 \pm 6.4$ ) did not significantly differ from the corresponding score in the control group ( $52.4 \pm 7.2$ ;  $P = 0.967$ ). At the second measurement time point, i.e. before the colonoscopy, the mean anxiety score in the aromatherapy group was significantly different from the score in the control group ( $44.8 \pm 7.1$  vs.  $50.1 \pm 5.9$ ;  $P < 0.002$ ). However, after the colonoscopy, the difference between the aromatherapy and the control groups in terms of the anxiety mean score was not statistically significant ( $47.5 \pm 6.6$  vs.  $49.1 \pm 5.2$ ;  $P = 0.162$ ; Table 2).

The RM ANOVA was used to compare the level of anxiety amongst the participants across the three measurement time points. The results of this analysis illustrated a significant difference across the time points in the experimental group ( $P < 0.0001$ ). In other words, the differences between the first and the second, the first and the third as well as the second and the third measurement time

points were statistically significant ( $P < 0.002$ ). Similarly, the within-group difference across the three measurement time points regarding the mean score of anxiety was also statistically significant in the control group ( $P = 0.002$ ; Table 2). Additionally, statistical analyses on the within-group mean differences of the anxiety scores between each two measurement time points also showed that decreases in the mean scores of anxiety in the aromatherapy group across the three measurement time points were significantly larger than the control group (Table 3).

#### 5. Discussion

The aim of this study was to evaluate the effects of inhalation aromatherapy with lavender on anxiety amongst patients undergoing a colonoscopy. The findings showed that before and after a colonoscopy, the level of anxiety in the aromatherapy group was lower than the control group even though the difference was significant only before the colonoscopy. In other words, although after the colonoscopy the level of anxiety in the aromatherapy group was lower than the control group, this difference was not statistically significant.

Routine anxiolytic medications delay post-colonoscopy recovery (20). The results of the present study showed that aromatherapy could facilitate recovery and reduce colonoscopy-related costs through tranquilizing patients and reducing their needs to chemical tranquilizers. Arıkan (2010) also used the Spielberger's Anxiety Inventory to assess the level of anxiety amongst patients who were candidates for an elective colonoscopy and an upper gastrointestinal endoscopy. They measured the anxiety of their participants both at the admission to the hospital and immediately before the procedures. Their findings indicated that the level of anxiety amongst patients who were going to undergo an endoscopy significantly increased from  $36.9 \pm 10.0$  at admission to  $45.7 \pm 10.2$  immediately before the endoscopy. Moreover, the level of anxiety amongst patients who were candidates for a colonoscopy significantly elevated from  $36.2 \pm 7.4$  to  $44.8 \pm 10.1$ . However, the between-group difference regarding the mean score of anxiety was statistically significant neither at the hospital admission nor immediately before the procedures (21), while our findings showed that the level of anxiety in the aromatherapy group decreased significantly after aromatherapy, i.e. before colonoscopy.

Park and Kim (2009) also investigated the effects of ten-minute aromatherapy on pre-colonoscopy anxiety by using three drops of lavender mixed with bergamot and sandalwood oils. In line with our findings, they also found that this mixed aromatherapy intervention significantly reduced anxiety (18). However, they failed to assess the

**Table 1.** The Participants' Personal Characteristics

| Variables                       |                        | Aromatherapy Group<br>(Mean $\pm$ SD) | Control Group (Mean $\pm$ SD) | Statistical Test                |
|---------------------------------|------------------------|---------------------------------------|-------------------------------|---------------------------------|
| Age (year)                      |                        | 41.4 $\pm$ 10.3                       | 943.4 $\pm$ 9.8               | Independent sample t, P = 0.478 |
| Length of colonoscopy (Minutes) |                        | 9.6 $\pm$ 1.7                         | 10.1 $\pm$ 1.6                | Independent sample t, P = 0.318 |
|                                 |                        | N (%)                                 | N (%)                         |                                 |
| Education                       | Illiterate and primary | 8 (32)                                | 5 (20)                        | Chi-square, P = 0.216           |
|                                 | Below diploma          | 1 (4)                                 | 5 (20)                        |                                 |
|                                 | Higher                 | 16 (64)                               | 15 (60)                       |                                 |
| Gender                          | Male                   | 16 (64)                               | 9 (36)                        | Chi-square, P = 0.266           |
|                                 | Female                 | 9 (36)                                | 16 (64)                       |                                 |
| Marital status                  | Single                 | 2 (8)                                 | 3 (12)                        | Chi-square, P = 0.9310          |
|                                 | Married                | 23 (92)                               | 22 (88)                       |                                 |
| Employment status               | Self-employed          | 10 (40)                               | 4 (16)                        | Fisher's exact, P = 0.134       |
|                                 | Blue-collar worker     | 0 (0)                                 | 5 (20)                        |                                 |
|                                 | White-collar worker    | 10 (40)                               | 6 (24)                        |                                 |
|                                 | Housewife              | 5 (20)                                | 8 (32)                        |                                 |
|                                 | Unemployed             | 0 (0)                                 | 2 (8)                         |                                 |
| Reason for colonoscopy          | Screening              | 11 (44)                               | 10 (40)                       | Chi-square, P = 0.736           |
|                                 | Digestive problems     | 14 (56)                               | 15 (60)                       |                                 |

pure effects of lavender on anxiety. Lee and Ahn (2010) also investigated the impacts of aromatherapy with the essential oils of neroli, chamomile, lavender and lemon on colonoscopy-associated anxiety. Patients in their aromatherapy group inhaled the oils for five minutes. The oils had been poured on a piece of stone and the stone was placed beside patients' pillow. In agreement with our findings, Lee and Ahn (2010) also found aromatherapy effective in alleviating anxiety (22). However, our findings contradicted the findings reported by Muzzarelli et al. (2006). In their study, three drops of 10% lavender essential oil, already solved in grape seed oil, were poured on a piece of towel and then, the towel was placed beside each patient for five minutes. Finally, their findings revealed that aromatherapy was not effective in significantly reducing anxiety. The discrepancy between the findings of the present study and the findings reported by Muzzarelli et al. (2006) may be due to the differences in the length of aromatherapy, the concentration of essential oils and the aromatherapy protocols in these two studies (17).

Babashahi et al. (2010) also found that twenty-minutes of aromatherapy with two drops of lavender was effective in significantly reducing preoperative anxiety from  $51.00 \pm 8.94$  to  $38.61 \pm 9.79$  (10). This is again in line with our findings. Mirmohammad et al. (2012) also made a study

regarding the effects of lavender aromatherapy on anxiety associated with intrauterine device insertion. Patients in their study inhaled three drops of lavender essential oil for five minutes before the insertion of the device. Their findings were consistent with ours in that their lavender aromatherapy significantly reduced procedural anxiety (23).

### 5.1. Conclusion

The findings of the present study showed the effectiveness of aromatherapy with lavender in alleviating colonoscopy-associated anxiety. Given the increasing use of complementary therapies, lavender aromatherapy is recommended to be used as a noninvasive non-pharmacological modality for alleviating pre-colonoscopy anxiety.

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**Table 2.** Comparison of the Mean Scores of Anxiety in Both Groups at Different Measurement Time Points

| Time                              | Groups                         |                           | P Value (The Independent Sample t Test) |
|-----------------------------------|--------------------------------|---------------------------|---|
|                                   | Aromatherapy Group (Mean ± SD) | Control Group (Mean ± SD) |   |
| At admission                      | 52.3 ± 6.4                     | 52.4 ± 7.2                | 0.967                                   |
| Before colonoscopy                | 44.8 ± 7.1                     | 50.1 ± 5.9                | 0.002                                   |
| After colonoscopy                 | 47.5 ± 6.6                     | 49.1 ± 5.2                | 0.162                                   |
| P value (The results of RM ANOVA) | P < 0.001                      | P = 0.022                 | -                                       |

**Table 3.** Comparison of the Mean Difference of Anxiety Scores at Different Time Points

| Time                                      | Groups                         |                           | P Value   |
|---|--------------------------------|---------------------------|-----------|
|   | Aromatherapy Group (Mean ± SD) | Control Group (Mean ± SD) |           |
| Before and after aromatherapy             | -7.48 ± 3.7                    | -1.44 ± 2.87              | P < 0.001 |
| Before and after colonoscopy              | -4.76 ± 3.38                   | -2.44 ± 3.57              | P = 0.022 |
| Before aromatherapy and after colonoscopy | 2.72 ± 3.82                    | -1 ± 3.16                 | P < 0.001 |

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