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Comparison of the effects of lavender and diazepam on the anxiety level of patients before orthopedic surgery

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ABSTRACT

Background: Waiting for surgery is one of the stressful environmental factors for each patient. The anxiety caused by waiting could have adverse effects on the patient treatment and recovery process. Given the complications caused by the management of anxiety through pharmaceutical methods, the application of complementary medicine is of paramount importance. This study aimed to compare the effects of lavender and diazepam on the anxiety level of the patients before orthopedic surgery.

Methods: This clinical trial was conducted on the patients undergoing orthopedic surgery, who referred to one of the teaching hospitals of Bojnord, Iran, in 2015. In total, 60 patients were selected through randomized convenience sampling and divided into the intervention and control groups. The intervention group received 300 mg of lavender extract, whereas the control group orally consumed diazepam 5 mg prior to the surgery. The anxiety level of the patients was measured one night and one hour before the surgery using the Spielberger's State-Trait Anxiety Inventory. The data analysis was performed in the SPSS version 16, using the paired sample t-test, Fisher's exact test, Chi-square test, and independent t-test.

Results: According to the results of the present study, the mean anxiety level of the intervention group varied from 9.8±6.0 to 76.2±5.5 (P<0.001) after the intervention. On the other hand, the mean anxiety level of the participants of the control group decreased from 100.0±5.5 to 80.0±5.7 (P<0.001). However, this difference was not statistically significant between the two groups.

Conclusion: As the findings indicated, similar to diazepam, the lavender can diminish the anxiety level in the patients before the orthopedic surgery. It is recommended to use the lavender before the surgeries to decrease the anxiety level since the herbal medicine is associated with less complications, compared to the diazepam.

1. Introduction

Surgery is a part of medicine through which the tissues are cut and manipulated to detect or treat an injury or disease.[1] Any form of surgery is described as a stressful experience since it is considered as a life-threatening process, which endangers the body as a whole.[2] This anxiety, which is a vague feeling, along with the concern, discomfort, and fear starts from the point that the patient learns about the necessity of the surgery and reaches its peak during the hospital stay before the surgery.[3]

Anxiety during the surgery and recovery period could be associated with severe complications, leading to adverse consequences, such as increased pain after surgery, higher demand for analgesics, delayed recovery and discharge, high expenses, and prolonged hospital stay.[4] These complications highlight the necessity of the management of this type of anxiety before the surgery. Accordingly, the importance of anxiety elimination prior to the surgery has been underscored in the literature.[3, 5]

Several studies have recommended the application of the pharmacological and non-pharmacological methods to decrease the level of anxiety in the patients before a surgery procedure.[6, 7] In the pharmacological method, the pre-anesthetic agents are administered orally or intravenously. Benzodiazepines and diazepam are among the most common and practical pre-anesthetic agents,

respectively,[8, 9] which could be consumed orally or intravenously prior to a surgery. However, the consumption of these medications could lead to such complications as sleepiness the day after consumption, dizziness, ataxia (especially in the elderly), amnesia, unusual irritability, and in some cases, headache, vertigo, and low blood pressure.[10] Meanwhile, the herbal medicines have less side effects, and they can be used both independently and supplementarily.[11] These types of medications are an important part of the traditional medicines of different countries and have a significant value in the modern treatment approaches.[12]

Lavender (Lavendula stoechas) is one of the medicinal herbs with anti-anxiety properties.[13, 14] This herb, which is known as nerve protector, massively affects the peripheral and central nervous system by producing sedative, anxiolytic, antidepressant, and antiepileptic effects.[15] In a study conducted by Moradi et al. (2016), the use of lavender resulted in decreased level of anxiety and improved vital signs in the patients with heart attacks.[16] They concluded that lavender can be used as an alternative, cost-effective, and risk-free treatment in this regard. Furthermore, Abuhamdah and Chazot (2008) reported no side effects for this herb.[17]

Many studies have been conducted to evaluate the positive effects of lavender inhalation on decreased level of anxiety in the patients under such invasive and stressful conditions as IUD insertion, child birth, and abortion. Regarding this, little attention has been paid to the oral consumption of this medicinal herb.[18- 20]

Given the needs of the patients to appropriate methods with few side effects for the reduction of anxiety level before a surgery procedure, this study aimed to compare the effects of orally consumed lavender and diazepam on the level of anxiety in the patients prior to the orthopedic surgery.

2. Methods

2.1. Design

This clinical trial was conducted on the patients undergoing orthopedic surgery with general anesthesia, who were admitted to the Imam Ali Hospital in Bojnurd, Iran, in 2015.

2.2. Participants and setting

The sample size was calculated to be 55 subjects using a pilot study and mean comparison formula (S_1=3.7, S_2=3.4, M_1=48.0, M_2=51.9, $Z_{1-\alpha/2}$=1.96, $Z_{1-\beta}$=0.84). Given the possible sample loss, 60 patients (i.e., 30 individuals in each group) were selected and entered into the study.

The participants were selected using the convenience sampling method and divided into two groups of lavender (intervention group) and diazepam (control group) by the random assignment technique. The random table was used to randomly allocate the subjects to the study groups. The inclusion criteria were: 1) being conscious, 2) minimum literacy level, 3) mild-severe anxiety before the intervention (based on the Spielberger State-Trait Anxiety Inventory [STAI]), and 4) no history of mental diseases.

On the other hand, the exclusion criteria included the use of anti-anxiety and sedative medications before the surgery by the subjects of the intervention group. It should be mentioned that all data related to the inclusion and exclusion criteria were collected through interviewing with the participants and their companions as well as reviewing their medical records.

2.3. Instruments

The data were collected using the STAI and demographic form, which included such information as age, gender, marital status, history of hospitalization or any surgeries, hours of sleep the night before the surgery, fasting time, and the number of hospital stay days. The STAI was first introduced by Ketl, and then more comprehensively by Spielberger (1970). This 20-item inventory contains two parts evaluating the state and trait anxiety, corresponding the feelings of an individual in general and on spontaneous response, respectively.

The items of the state anxiety section are scored based on a four-point Likert scale (1: very low, 2: low, 3: high, 4: very high). Similarly, the trait anxiety section measures the natural feeling of the patients based on a four-point Likert scale (1: never, 2: sometimes, 3: often, and 4: always). In this section, the scoring weights were reversed for the items that indicate no anxiety.[21]

In terms of the state anxiety, obtaining an score range of 20- 31 was indicative of slight anxiety, whereas other ranges, including 32- 42, 43- 53, 54- 64, 65- 75, and 76<, revealed moderate to low, moderate to high, relatively serve, severe, and extremely severe anxiety, respectively. On the other hand, regarding the trait anxiety, the score ranges of 20- 31, 32- 42, 63- 72, and 73< were suggestive of mild, moderate to low, moderate to high, relatively severe, severe, and extremely severe anxiety, respectively.

The total anxiety score is within the range of 20-80. In this regard, the score of 20 was interpreted as lack of anxiety, whereas obtaining 80 indicated the highest rate of anxiety. Additionally, 20-39, 40-59,

and 60-80 represented mild, moderate, and severe anxiety levels, respectively. The validity and reliability of this instrument have been evaluated in various studies in Iran.[21, 22] In a study conducted by Ajorpaz et al. (2015), the reliability of this inventory was reported as 89%.[23] In the present study, this inventory rendered a Cronbach's alpha coefficient of 0.88.

2.4. Data Collection

The researcher evaluated the eligibility of the participants the night before the surgery. Subsequently, by taking the ethical considerations into account, the researcher visited the orthopedic ward at 21 p.m. with prior arrangements made with the physician of the participants. The subjects of the intervention group were required to consume 300 mg of lavender extract (Zardband Co., product number: 092-[z-b]-87-m, factory standard: 65/81/00001) along with 50 cc tap water. The same process was applied for the participants of the control group; however, the lavender extract was replaced with oral consumption of diazepam 5 mg (prepared before the intervention) with 50 cc tap water.

The levels of the state and trait anxiety were evaluated a night and a hour before the surgery as pre- and post-tests, respectively, in the form of self-report.

2.5. Ethical considerations

To follow the ethical considerations, the objectives of the study were explained to the participants. Furthermore, they were ensured that the participation in the study was completely voluntary, and that their withdrawal from the study did not affect their treatment process. Moreover, the researcher was available during the study process and answered all the questions of the subjects. The written informed consents were obtained from the participants prior to the study.

2.6. Statistical analysis

The data analysis was performed in the SPSS version 16 using the descriptive statistics (mean and standard deviation), Fisher's exact test, and Chi-square test (to compare the two groups in terms of gender, marital status, as well as history of hospitalization and surgeries), independent t-test (to compare the study groups regarding the quantitative variables, such as age, sleep hour the night before the intervention, fasting time, number of hospital stay days, and mean anxiety score), and paired t-test (to compare the mean anxiety scores before and after the intervention).

3. Results

Demographic characteristics of the patients are provided in Table 1, which revealed no significant difference between the study groups in terms of the evaluated variables. According to Table 2, the mean scores of the state and trait anxiety significantly decreased in the intervention ($P<0.001$) and control ($P<0.001$) groups following the intervention. However, this difference was not significant between the two groups.

Table 1. Demographic characteristics of the participants

Variables	Groups	Intervention	Control	P-value
		N(%)	N(%)	
Gender	Male	26(86.7)	23(76.7)	*0.1
	Female	4(13.3)	7(23.3)	
Marital status	Single	19(63.3)	17(56.7)	**0.35
	Married	11(36.7)	13(43.3)	
History of hospitalization	Yes	3(10.0)	4(13.3)	*0.67
	No	27(90.0)	26 (86.7)	
History of surgery	Yes	2 (6.7)	1 (3.3)	*0.7
	No	28 (93.3)	29 (96.7)	
Age (year)	M±SD	31.2±9.2	32.1±9.5	***0.3
Sleep hours the night before the intervention	M±SD	8.4±1.1	8.0±0.9	***0.71
Fasting time (hour)	M±SD	9.9±1.0	9.1±0.9	***0.65
Number of hospital stay days	M±SD	2.7±0.7	3.1±0.8	***0.18

*Fisher's exact test; **Chi-square; ***independent t-test

Table 2. Comparison of the mean scores of state and trait anxiety before and after the intervention in the study group

Anxiety	Groups	Intervention M±SD	Control M±SD	*P-value
State anxiety	Before intervention	48.9±6.1	50.2±5.0	0.20
	After intervention	37.7±5.5	40.9±6.2	0.45
	P-value**	<0.001	<0.001	
Trait anxiety	Before intervention	49.9±6.0	49.8±5.8	0.19
	After intervention	38.5±5.5	39.1±5.5	0.60
	P-value**	<0.001	<0.001	
Total score	Before intervention	98.8±6.0	100.0±5.5	0.20
	After intervention	76.2±5.5	80.0±5.7	0.51
	P-value **	<0.001	<0.001	

*Independent t-test; **paired t-test

4. Discussion

According to the findings of the current study, lavender is as effective as the oral consumption of diazepam in the reduction of the patients' anxiety prior to the orthopedic surgery. While no study was found comparing the lavender with sedative agents, several studies have evaluated the sedative and anti-anxiety effects of this plant. In this regard, in a study conducted by Bakhsha et al. (2014), the use of lavender before the surgery was reported to decrease the level of anxiety in the women undergoing curettage.[20] Similarly, Lehrener et al. (2005) indicated that the application of the lavender extract led to decreased symptoms of anxiety in patients.[24] In another study carried out by Yaghoobi et al. (2016), the anti-anxiety and sedative properties of the lavender were demonstrated.[15] Although the patients of the aforementioned studies consumed lavender for a longer period of time and mainly used the extract of this plant, their results are in congruence with our findings. This similarity between the findings might be due to the presence of flavonoid compounds affecting benzodiazepine receptors,[25] which results in anti-anxiety and sedative effects.[26] In addition, it has been marked that the lavender imposes its psychological effects through affecting the limbic system, particularly the amygdala and hippocampus.[15] The results obtained by Abuhamdah and Chazot (2008) also indicated that the linalool in lavender acts as a sedative agent, which inhibits the release of acetylcholine and changes the function of ion channel at the neuromuscular junction. This function justifies the traditional consumption of this herb as a sedative and soporific.[17]

Moreover, Rahmati et al. (2013) reported that the short-term consumption of this herb (two weeks) led to improved nocturnal sleep, as well as decreased anxiety and need for soporifics. These results are indicative of the fast effects of this herb, thereby justifying the findings of the present study.[27] In another study conducted by Rabi'ee et al. (2014), the positive effects of lavender were demonstrated, and the linalool component of this plant was recognized as the sedative agent.[28]

Inconsistent with our findings and the results of the aforementioned studies, Muzzarelli et al. (2006) demonstrated no significant difference between the subjects in terms of the patients' levels of anxiety before and after the lavender administration, which might be due to differences in the sample population.[29] Some of the complications associated with medicinal herbs, especially lavender, are appearance, smell, taste, and method of administration. However, in this study, these problems were solved by preparing the herbs in form of capsules.

Since the majority of the patients in the hospital under investigation were candidates for the orthopedic surgery, the subjects with this type of operation were chosen for the investigation. However, this is considered as a drawback of this study, which affects the generalizability of the results.

5. Conclusion

As the findings of the present study indicated, similar to the oral consumption of diazepam, lavender can decrease the anxiety in the patients before the orthopedic surgery. Given the high tendency of our community toward the use of medicinal herbs due to their anti-anxiety and sedative effects, the lavender can be used to reduce the side effects caused by the administration of chemical anti-anxiety agents, such as diazepam. It is recommended that this type of study be carried out on larger sample populations with wider range of surgeries in the future to obtain more accurate results.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

Javad Shahinfar: Study design, drafting the manuscript. Hossein Zera'ati: Study design, drafting

the manuscript, confirming the final draft. Mahnaz Masroornia: Data collection, participation in drafting the manuscript. Shayan Vafayi: Study design, data collection, drafting the manuscript. Fahimeh Hashemi: Data collection, participation in drafting the manuscript.

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