Research Article

The Effect of Inhaling the Aroma of Rosemary Essential Oil on the Pre-Hospital Emergency Personnel Stress and Anxiety: A Quasi-Experimental Study

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Abstract

Background: The prevalence of stress and anxiety in pre-hospital emergency personnel is high.

Objectives: The present study was conducted to investigate the effect of inhaling the Aroma of Rosemary essential oil on stress and anxiety of emergency medical personnel.

Methods: In this quasi-experimental study, 8 pre-hospital emergency stations affiliated to Birjand University of Medical Sciences in Birjand city were randomly selected. Then, 4 stations were randomly allocated to the intervention group and 4 stations were assigned to the control group. In the next step, among personnel of each station about 8-10 participants were selected according to the inclusion criteria (39 participants in each group). Afterwards, these participants completed demographic and DASS-42 questionnaires (stress and anxiety subscales). Badges with 25% rosemary essential oil in the intervention group and badges impregnated with refined sweet almond oil were used in the control group for two hours in 3 shifts per week for one month. The anxiety and stress subscales of the DASS-42 questionnaire were completed by the participants one hour as well as 30 days after the last intervention in each group. In this study, chi-square, Mann-Whitney and Friedman tests were used.

Results: The statistical analysis showed that the mean stress and anxiety scores in the two groups did not have significant differences before intervention (P > 0.05). One hour after the last intervention, statistical analysis showed that the mean of stress scores in the intervention group was significantly reduced compared to the control group (P < 0.05). One month after the intervention, no significant changes occurred in the mean scores of stress in intervention group (P > 0.05). In the case of anxiety, one hour after the intervention the mean scores in the intervention group were significantly decreased compared to the control group (P < 0.05). One months after the intervention, no significant changes occurred in the mean scores of anxiety in intervention group (P > 0.05).

Conclusions: Aromatherapy with rosemary essential oil can have positive effects in reducing stress and anxiety in pre-hospital emergency personnel.

Keywords: Anxiety, Aromatherapy, Rosemary, Stress

1. Background

Pre-hospital emergency personnel are one of the most important resources in the pre-hospital emergency organizations (1). Success of this organization depends heavily on the proper and effective use of these strategic resources (2). Pre-hospital emergency technicians are among the first ones to be present on emergency situations (3). Generally speaking, pre hospital medical emergency has a traumatic nature. in term of the prevalence of physical complications, emergency medical service is at second rank and psychological complication is in the fourth rank of hard jobs (4). The impossibility of taking hourly leave, 24-hour working shifts, tight shifts per month, facing badly injured patients or patients with a psychiatric history or drug use, performing therapeutic procedures in the presence of relatives and the risk of infectious diseases make the personnel get exposed to physical and mental illness (5). Among other problems, stress and anxiety are highly experienced by pre-hospital emergency personnel (6). In a study by Seyedjavadi et al. a high prevalence of stress was reported among pre-hospital emergency personnel (7). Stress is one of the most important factors in the incidence of many disease such as gastrointestinal disorders, sleep disorders,

mood disorders, and depression (8, 9).

Stress can affect the efficiency and productivity of employees, which leads to increased absence of work, disruption in communication, weakness of immunity system, and increased complaints of physical disorders (10). Anxiety occurs when an individual experiences stressful conditions in his/her life too long or repeatedly (11).

The results of a systematic review study showed that the prevalence of anxiety is high in pre-hospital emergency personnel (12). Tabatabaei et al. also reported that the state and trait anxiety among the emergency personnel is above medium (13). Irritability, depression, dizziness, loss of appetite, and digestive problems are among the complications of anxiety (14). Also, chronic and iterative stress and anxiety increase therapeutic mistakes, medication mistakes, incorrect clinical diagnosis, and finally, harm to the patient and society (6). Taking care of physical and emotional health of the pre-hospital emergency personnel is important as they are human beings in the first place, and as they take care of the health and well-being of other members of the community in the second place (15). Complementary and alternative medicine is a process that can be used to improve the mental health of this group of health care staff (1). It is used to improve the healthcare-therapeutic programs because it is inexpensive, easy to implement, non-invasive, cost-effective and low risk (16). One of the complementary and alternative medical methods that has grown considerably in most countries in recent years is aromatherapy (17, 18). Aromatherapy is the controlled use of aromatic oils to protect and promote physical and mental health (19). Various studies have shown that the therapeutic aroma affects the hypothalamus, endocrine and autonomic nervous system and improves the circulation, respiratory regulation, heart rate and blood pressure (20). Rosemary has lots of applications in aromatherapy (21). Terpenoids in rosemary cause dilatation of the vessels to improve blood circulation. Its analgesic, calming and relieving effects has been shown in vitro experiments (22).

Evidently, the nature of stress and anxiety and their sources is different in pre-hospital emergency personnel (23, 24). To our best knowledge, there is not a scientific research on the effect of aromatherapy on the stress and anxiety of the pre-hospital emergency personnel. Such studies can lead to a more developed the body of knowledge related to aromatherapy and its implications.

2. Objectives

The present study, therefore, was designed to investigate the effect of inhaling the aroma of rosemary essential oil on stress and anxiety of the pre-hospital emergency personnel.

3. Methods

3.1. Type of Research

This quasi-experimental study was conducted in 2019. The sample size was calculated regarding the Hongratana-worakit's study (25) results ($S_1 = 1.45$, $S_2 = 3.28$, mL $= 39.17$, $m_2 = 37.3$) with $\alpha = 0.05$, $\beta = 0.2$ and the Equation 1, 78 persons (39 persons in each group).

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right)^2 \left(S_1^2 \times S_2^2 \right)}{\left(m_1 - m_2 \right)^2} \tag{1}$$

3.2. Samples

First, 8 pre-hospital emergency stations affiliated to Birjand University of Medical Sciences in Birjand city were selected. Then, 4 stations were randomly allocated to the intervention group and 4 stations were assigned to the control group. In the next step, among personnel of each station about 8 - 10 participants were selected according to the inclusion criteria (39 participants in each group). The inclusion criteria were don't use of anti-anxiety and anti-depressant drugs, don't use of perfumes during the intervention, no allergies and migraines, no liver and kidney diseases, non-drug addiction (according to participants declare themselves), and healthy olfactory sense. Exclusion criteria consisted of the incidence of allergy during the intervention and reluctance to continue participating in the study. In the next step, the selected personnel completed demographic and DASS-42 questionnaire (stress and anxiety subscales) (26).

The health test of olfactory was performed using the Iran Smell Identification Test (Iran-sit) standard tool. This tool is an Iranian version of the university of Pennsylvania smell identification test (UPSIT). It contains 6 fragrances (banana, rose water, cinnamon, garlic, Mint toothpaste and Cantaloupe) as a Nano capsule that spreads by scratching the surface of the nano capsule labels. The performance and health of olfactory was confirmed by using Iran-sit with 5 to 6 correct answers. In less than 3 minutes, Iran-sit can assess the performance of olfactory (27).

3.3. Ethical Considerations

This research was approved by the Ethics Committee of Birjand University of Medical Sciences (IR.BUMS.REC.1397.352). It was then registered in the Iranian registry of clinical field trial with the number (IRCT20190515043601N1). The purpose of the study and possible complications of the selected intervention were

explained for all of participants. The informed consent was signed by participants. The participants were informed that they can leave the study at any stage of the research without any penalty. They also were assured of the confidentiality of the data collected.

3.4. Intervention

To extract Rosemary essential oil that was used in the intervention group, a steam distillation method was used by Tabib Daru Co. In the next step, to produce 25% Rosemary essential oil, under the supervision of a pharmacologist, Pure Rosemary Essence was combined with refined sweet almond oil respectively with a ratio of 1/4. Linen fabric was used for the purpose of preparing chest budges. The size of budges was 3×5 cm. The chest badges were stuck to the uniform of the intervention group participants at a distance of 30 cm from the nose. Then essential oil of 25% rosemary was distributed to the intervention group in 20 cc sprays which they were similar in color and shape. Afterwards, the participants were asked to spray 2 puffs (1 cc) of the essential oils on their badges at 8 O'clock every morning. The essential oils of rosemary were applied from 8 to 10 O'clock (2 hour) at 3 shifts per week for one month. The researcher reminded the subjects of the intervention by telephone calls and texting using the Auto SMS Reminder software. Finally, one hour and 30 days after the last intervention, the DASS-42 questionnaire (stress and anxiety subscale) was re-completed by the participants.

In the control group, the size of the badges, time and duration of intervention, the volume of spray on the budges and the distance of the budges from the nose was exactly similar to the intervention group. However, in this group, the sprays contained refined sweet almond oil produced by Tabib Daru Co. Finally, one hour and 30 days after the last intervention, the DASS-42 questionnaire (stress and anxiety subscale) was re-completed by the participants in the two groups.

3.5. Data Collection

Demographic and stress and anxiety subscales of the DASS42 questionnaire were used to collect data. Demographic questionnaire included age, marital status and work experience of participants. The DASS42 questionnaire was developed by Lovibond in 1995 and includes three sub-scales of stress, anxiety and depression (each subscale has 14 questions) to be completed by self-reporting.in Dass42 questionnaire, Answers include 4 options. The responses in each question are from "never" (0) to "always" (3). Higher scores in each subscale represent more stress, anxiety and depression (26). In Iran, the validity and reliability of this questionnaire were confirmed.

The reliability of the questionnaire for stress and anxiety subscales was reported to be 0.76 and 0.77, respectively. Cronbach's alpha was reported to be 0.78 and 0.74 for the subscales of stress and anxiety, respectively (28). In this study, only stress and anxiety subscales were used.

3.6. Statistical Analysis

Data were analyzed by SPSS 16.0. Groups were compared with each other respecting participants' demographic characteristics including age, marital status, and work experience using the Chi-square or Fisher's exact test. The Kolmogorov-Smirnov test indicated that the scores of stress and anxiety were not normally distributed. Therefore, to compare changes regarding stress and anxiety over time within groups Friedman test was used, and for pair wise comparison of intervention and control groups Mann-Whitney test was used. The significant level was set at P < 0.05 for all analyzes.

4. Results

In this study, 78 participants (39 people in each group) were examined. There was no statistically significant difference between the two groups in terms of demographic variables (P > 0.05; Table 1). The mean scores of stresses between intervention and control groups before intervention were not significantly different (P > 0.05). In the intervention group, the mean score of stress, was decreased significantly one hour and 30 days after the last intervention, compared to the pre-intervention phase (P < 0.05). Statistical analysis showed that the mean stress scores in the intervention group one hour after the last intervention had a significant decrease, compared to the control group (P < 0.05). However, the changes in mean score of stress were not statistically significant in one month after the end of intervention (P > 0.05; Table 2).

The mean scores of anxiety between intervention and control groups before intervention were not significantly different (P > 0.05). In the intervention group, the mean score of anxiety, was decreased significant, one hour after and one month after the intervention, compared to the before intervention (P < 0.05). Statistical analysis showed that the mean anxiety scores in the intervention group, one hour after the last session of the intervention had a significant decrease, compared to the control group (P < 0.05). However, the changes in mean score of anxiety were not statistically significant in one month after the end of intervention (P > 0.05; Table 2).

Table 1. Demographic Characteristic of Two Groups[a]

Variable	Groups		P Value[b]
	Intervention	Control	
Age			0.45
20 - 25	5 (12.84)	7 (17.94)	
26 - 30	11 (28.20)	12 (30.79)	
31 - 35	12 (30.76)	13 (33.33)	
≥ 36	11 (28.20)	7 (17.94)	
Marital status			0.49
Single	30 (76.92)	28 (71.79)	
Married	9 (23.08)	11 (28.20)	
Work experience			0.67
1 - 5	6 (15.38)	9 (23.08)	
6 - 10	14 (35.90)	15 (38.46)	
11 - 15	12 (30.76)	9 (23.08)	
16 - 20	7 (17.96)	6 (15.38)	

[a]Values are expressed as No. (%).
[b]Chi-squared test results.

5. Discussion

Previous studies showed that the prevalence of stress and anxiety is high in pre-hospital emergency personnel ([7], [13]). Therefore, the present study was conducted to investigate the effect of inhaling the aroma of rosemary essential oil on the stress and anxiety of the pre-hospital emergency personnel.

In this study, there was a significant decrease in the mean stress scores in the intervention group, immediately and one month after the intervention. Also, immediately after intervention, mean score of stress in intervention group was significantly lower compared to the control group. Research was carried out by Hongratanaworakit with the aim of determining effect of massage aromatherapy using rosemary oil. In this study autonomic and psychologic factors of 35 healthy men were investigated before and after intervention. In the intervention group, massage with Rosemary oil significantly reduced respiratory rate and systolic/diastolic blood pressure. Also, participants in the intervention group had more concentration and happiness than the control group after the end of intervention. finally, researchers said that massage with rosemary oil could be effective in reducing stress ([25]).

Lee et al. conducted a research on the effects of inhaling rosemary oil, lavender and mint on stress and anxiety of 78 nursing students before entering clinical field. The intervention group consisted of 35 people. In the intervention group, the findings indicated a decrease in mental stress after intervention ([29]).

In the Park and Lee study, the sample size was 77 people, which 39 were in the intervention group. Intervention group received Aroma of Rosemary oil, lavender, peppermint and Mari. The findings showed a significant reduction in physical stress and perceived stress in the intervention group. While the changes in the scores of physical stress and perceived stress in the control group were not statistically significant ([30]). McCaffrey et al. investigated the effect of aromatherapy with rosemary oil and lavender on test anxiety and stress. The sample size included 120 nursing students. The findings of this study showed that inhaling the Rosemary aroma has increased the concentration of students in the test sessions and significantly reduced stress ([31]). In the study of Atsumi and Tonosaki the inhalation of rosemary and lavenders oils had a significant decreased on salivary cortisol levels in the intervention group compared to the control group. In this study, in the intervention group, level of salivary cortisol was 23% lower than the control group in the post-intervention phase. Since salivary cortisol level changes are directly related to the stress level, the findings of this study are consistent with the present study ([32]). No studies with contradicting the findings of present study about the effect of stress, were found in the databases.

In the present study, the intervention group had a significant reduction in the mean of anxiety scores, one hour and one month after the intervention. Also, in the intervention group, one hour after the intervention, the mean of anxiety scores was significantly lower than the control group.

Rho et al. also investigated the effects of massage aromatherapy on the anxiety and self-esteem of Korean elderly women. The sample size consisted of 36 subjects, 16 people of whom were in the intervention group. Aromatherapy Massage sessions were performed using rosemary oil, lemon, lavender and chamomile. The intervention was performed for Three weeks, three times per week and 20 minutes per session intervention group. The results showed a significant decrease in anxiety, number of pulses, and a significant increase in self-confidence in the intervention group compared to the control group ([33]). Nematolahi et al. investigated the effect of rosemary on stress, anxiety, memory, and sleep quality. The sample size consisted of 68 students who were placed in the intervention and control group. The intervention group received 500 mg of rosemary powder twice a day orally in a month. The results showed a decrease in the mean scores of stress and anxiety and also improved memory scores and sleep quality ([34]). Diego et al. compared the effects of rosemary and lavender on the mood, electroencephalography (EEG) pattern and math computations in 40 adults. The partic-

Table 2. Comparison of Stress and Anxiety Score Before, One Hour, and 30 Days After the Last Session of the Intervention Within and Between Groups[a]

Variables/Groups	Before Intervention	One Hour After Intervention	One Month After Intervention	P Value[b]
Stress				
Intervention	15.5 (8.7 - 21.2)	11.0 (5.0 - 18.2)	8.0 (4.0 - 17.2)	0.03
Control	13.5 (6. 5 - 18.2)	7.5 (1.5 - 13.7)	5.0 (2.0 - 20.2)	0. 27
P value[c]	0.31	0.02	0.75	
Anxiety				
Intervention	10 (5.0 - 14.0)	7.0 (2.75 - 12)	6.5 (4.0 - 12.0)	0.03
Control	7.0 (2.75 - 12)	5.5 (1.0 - 10.25)	5.0 (1.75 - 10.5)	0.27
P value[c]	0.07	0.02	0.15	

[a]Values are expressed as median (first, third quartile).
[b]Friedman rest result.
[c]Mann-Whitney test result.

ipants were exposed to fragrances for 3 minutes. Participants in the Rosemary group reported more relaxation and had lower anxiety scores than lavender group (35). McCaffrey research results also show the beneficial effects of aromatherapy using rosemary mix with lavender in reducing nursing student's test anxiety (31). The findings of Park and Lee's study are consistent with the results of the present study, so that inhaling Rosemary oil, Lavender, Mint, and Marjoram has reduced the anxiety of nursing students (30). Also, Laboratory studies have examined the effects of rosemary on anxiety. Findings of the study, Noori Ahmad Abadi et al. showed the anxiolytic effects of oral hydroalcoholic extract of rosemary in mice. These anti-anxiety effects were similar to those of the standard anti-anxiety drugs, such as diazepam (36). Finally, as noted before, numerous studies confirm that the essential oil of rosemary or the main components of its leaves have a protective effect on the mood and behavior of individuals (36, 37). Rosemary is useful for reducing stress and anxiety (38).

The compounds in the essential oil of rosemary, such as linalool and flavonoids such as genkwanin, luteolin, and antiprostaglandin compounds causing secretion of enkephalin and endorphins. These neurotransmitters have sedative effect and reduce stress and anxiety (39).

It is noteworthy that any complications were not reported by participants in this research. Future studies can investigate the effect of rosemary essential oil in concentrations different from the present study on the anxiety and stress of pre-hospital personnel. Also, further studies with interventional design with longer duration and different times of daytime are recommended in this area.

5.1. Conclusions

Present research is directly related to holistic nursing. Aromatherapy, as complementary and alternative medicine, is used to treat complications such as stress, anxiety, headache and insomnia. The findings of this study showed that inhaling the Rosemary aroma reduces stress and anxiety in pre-hospital emergency personnel. Therefore, Rosemary aroma as an inexpensive, safe and available tool can be used to reduce the stress and anxiety of pre-hospital emergency staff.

Acknowledgments

Footnotes

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