

Original article

The Effect of Aromatherapy with *Citrus Aurantium* on Sleep Quality among Nursing Students: A Randomized Clinical Trial

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SUMMARY

Nursing students are more susceptible to sleep disturbances. The dormitory life also decreases the quality of their sleep. Due to the restriction of the use of drugs for the management of sleep disorders, the study was conducted to investigate the effect of aromatherapy with *Citrus aurantium* essence on the sleep quality among nursing students. In this randomized controlled trial, 100 nursing female students, who lived a dormitory life and met the inclusion criteria, were randomly allocated to the intervention and control group. The intervention group received aromatherapy with the essence of *Citrus aurantium* for 15 minutes overnight, for 14 nights, while the control group received no intervention. The sleep quality of all the students was measured by Pittsburgh Sleep Quality Index (PSQI) after the intervention in both groups. The data were analyzed using the SPSS 11.5 software and inferential and descriptive statistics. The obtained results showed that the mean score of sleep quality of the intervention and control group before the intervention was 7.38 ± 2.12 and 7.19 ± 2.43 , respectively, which yielded no statistically significant difference ($p = 0.403$); however, after the intervention in the intervention group (3.30 ± 0.97) compared with the control group (7.73 ± 2.64), there was a significant difference ($p < 0.001$). This means that the intervention group compared with the control group had better sleep quality. We expect aromatherapy with the essence of *Citrus aurantium*, which is a relatively simple, inexpensive, and non-invasive technique with low side effects, to be used by nursing students residing in dormitory to manage their sleep quality.

Key words: aromatherapy, sleep quality, *Citrus aurantium*, nursing student, clinical trial

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INTRODUCTION

Sleeping is one of the vital human behaviors that covers almost one-third of human life (1). Sleep disorder is a common psychiatric disorder, and nearly one out of seven people in America suffers from it (2). Studies have shown that poor sleep quality directly affects the quality of human life, because it is associated with autonomic disorders, psychiatric disorders, low operational performance, premature aging, depression, decreased work efficiency (3). It is estimated that 59% of people between 18-29 years of age experience sleep deprivation (4). Among the different groups in society, some groups such as women (with hormonal changes) and students (with high stress) are more affected by sleep disorders (5, 6). With starting student life and presence of students in a new social situation and living in a dormitory, sleep quality and the number of students change (7). Moreover, due to high levels of stress and pressure, and heavy educational programs, the inability to use the equipment and fear of making mistakes in care delivery, nursing students are more susceptible to sleep disturbances (8). The use of anti-anxiety drugs such as benzodiazepines is one of the most common approaches in sleep management, which have many side effects (9). However, in recent years, the use of non-drug based methods in the field of psychiatry such as sleep management is a relatively simple, inexpensive, and non-invasive method with fewer side effects compared with pharmaceutically based methods (10). One of the common non-pharmaceutical, non-invasive methods in complementary medicine is aromatherapy, which means using extracts from various plants for their medicinal properties (11). The essence of *Citrus aurantium* is used in aromatherapy as a signal that is sent to the olfactory bulb, which is closely related to the limbic system, the motional center of the brain that produces all the major emotions. Limbic system influences the endocrine and autonomic nerves (12). Today, the focus in nursing is on holistic care and aromatherapy that can be used as a nursing intervention along with medical treatments (13-14). Considering an important role of complementary medicine in helping people, an important role of nursing students' health in public health, and a limited number of studies in this field, the present study is aimed to investigate the effect of aromatherapy with *Citrus aurantium* on the sleep quality among nursing students.

MATERIAL AND METHODS

The present clinical trial was conducted to deter-

mine the effect of aromatherapy with *Citrus aurantium* on sleep quality among nursing students. Participants were 100 nursing female students who lived in dormitory and were selected by the convenience sampling method.

The inclusion criteria were: female nursing undergraduate students who lived in dormitory, willing to participate in the study, with healthy sense of smell (by examining the olfactory nerve), who earned a score of 5 or higher based on the PSQI, without mental disorders, depression and acute stress disorder and without concurrency of the study with their final exams. The exclusion criteria were the unwillingness of the students to participate in or continue the study, absence of more than one session in the intervention process, feeling uncomfortable from the essence smell of *Citrus aurantium*, wearing perfume or cologne during the intervention, having consecutive night shifts, being used to sleeping and herbal drugs during the intervention. Written consents were obtained from eligible participants who were then randomly divided into an intervention group and a control group. The blocking technique was used to randomize the assignment of participants to groups.

The study was conducted after the approval of the Medical Research Ethics Committee of Tabriz University of Medical Sciences, receiving an ethical code, and obtaining informed consent from all the participants.

This study was recorded with code of: IRCT2016070223525N5 in the Iranian Registry of Clinical Trials (IRCT).

Using the statistical formula, confidence level of 95%, test power of 80%, and considering the sample loss of 25%, the sample size was calculated as 50 individuals for each group, amounting to 100 individuals in total.

To test the health of the sense of smell, the researcher asked participants to close their eyes. Then, a cotton soaked in alcohol was placed in front of each of the nasal passages and they were asked to identify the odor with their eyes closed.

Data were collected using a demographic information form (age, sex, marital status, semester, rank birthday and smoking background, mental illness and mental health, sedating medications) and the Pittsburgh Sleep Quality Index (PSQI).

The questionnaire includes a measure of the quality and patterns of sleep in adults and comprises 19 items referring to subjective estimation of sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month. Each item is

weighted on a 0-3 interval scale. The total PSQI score is then calculated by totaling the seven component scores, providing an overall score ranging from 0 to 21, where lower scores denote a healthier sleep quality and higher scores indicate a lower quality of sleep. A score of five or more indicates a poor sleep quality. It took 5–10 minutes to complete the questionnaire (15). Tsay et al. reported the reliability of Pittsburg sleep quality questionnaire to 82 and 83 for internal consistency and test-retest reliability with 77 and 85 for the two groups of patients and healthy subjects (16). The questionnaire reliability was studied and estimated above 0.8 in Iran by Cronbach's alpha (17).

PROCEDURES

The qualified subjects were randomly allocated to the intervention and control group (50 subjects in each group). The procedure of random allocation was as follows: first, the subjects were asked to mention the number of their room and floor in each of the questionnaires, and then the researcher recorded the number of the qualified subject's room and floor in a list. In order to prevent the allocation of roommate subjects to the groups, the rooms with even number and the rooms with odd number were selected as the intervention and control groups, respectively. Subsequently, in the intervention group, the aromatherapy was performed using orange blossom essence at nights (due to the necessity of presence of all the female students in the dormitory from 8 pm) for two weeks (14 nights). The required essence of *Citrus aurantium* was prepared from Abyaz Shimi Paint & Essence Manufacturing Company with Arzhan® registered trademark, with the production license (34/1621) of the Ministry of Health & Medical Education as well as the Health Apple Statuette (Sib-e-Salamat symbol). The subjects inhaled 4-5 drops of the pure essence of *Citrus aurantium* for 15 min over 14 consecutive nights, in a way that the essence was poured in a plastic bag along with some essence-mingled cotton lumps, and the plastic bag was put at the distance of 6-9 cm from the nose. Afterwards, at night 15, after the intervention, sleep quality of the female students of nursing BS was measured by PSQI. However, no intervention was performed on the control group, and the subjects underwent only the pretest and post-test. In order to observe the ethical considerations, after collecting the post-intervention data, the control group was provided by the intervention protocol as well as how to use it. In the present study, after collecting the information from the subjects,

the obtained data was analyzed by SPSS-11 software. At the descriptive statistics level, the mean and standard deviation were used for quantitative variables, and the frequency and percentage were used for qualitative variables; on the other hand, at the inferential statistics level, the Shapiro-Wilk, Chi-squared and independent-T, Mann-Whitney, and Wilcoxon tests were used to investigate normality of the sleep quality scores, to compare the qualitative and quantitative characteristics in both groups, to compare the sleep quality before the intervention as well as the sleep quality scores variations in both groups, and to compare the pre - and post-intervention sleep quality scores in both groups, respectively. The significance level in these tests was considered equal to 0.05.

RESULTS

This study was conducted on 100 female students of nursing residing in dormitories of Tabriz University of Medical Sciences (50 participants in the intervention group and 50 in the control group). In the intervention group, the average age and grade point average were 20.98 and 16.47, respectively. Also, 84% of the subjects were single and the rest (14%) were married; besides, in terms of educational level, most of them (34%) were senior students. On the other hand, in the control group, the average age and grade point average were 21.20 and 16.66, respectively; furthermore, 82% of the subjects were single and the rest (18%) were married. Also, 32% of them were senior students. The intervention and control groups did not show any significant difference in their demographic features ($p > 0.05$) (Table 1). Before the intervention, the intervention and control group did not show any significant difference in sleep quality score ($p > 0.05$) (Table 2). In other words, before the intervention, the subjects in the two groups were in similar status in terms of the sleep quality score. The analysis results indicated that in the aromatherapy group, the sleep quality variable was significantly different before and after the intervention ($p < 0.05$), while, in the control group, the sleep quality variable demonstrated no significant difference before and after the intervention ($p > 0.05$) (Table 3).

The results of Mann-Whitney test showed that the difference in the sleep quality score variations between the control and aroma-therapy group was significant ($p < 0.001$) (Table 4).

Table 1: Comparison of demographic characteristics of the intervention and control group

Variable		Intervention group (n = 50)	Control group (n = 50)	Sig
Marital status	Single	42 (84%)	41(82%)	0.790
	Married	8(16%)	9(18%)	
Educational year	First	8 (16%)	10(20%)	0.292
	Second	13 (26%)	15(30%)	
	Third	12 (24%)	9(18%)	
	Fourth	17(34%)	16(32%)	
Birth rank	First	20 (40%)	26(52%)	0.844
	Second	13 (26%)	12(24%)	
	Third or more	12(34%)	12(24%)	
Age(Mean \pm SD)		20.98 \pm 1.54	21.20 \pm 1.71	0.502
Mean(Mean \pm SD)		16.47 \pm 1.05	16.66 \pm 1.07	0.379

Table2: Comparison of mean sleep quality scores for pre-implementation in the intervention and control group

Variable	Intervention group (n = 50)	Control group (n = 50)	Sig.*
Sleep quality	7.2 \pm 38.12	7.2 \pm 19.43	0.403

*Mann-Whitney test

Table 3: Comparison of mean sleep quality scores of pre- and post-implementation in the intervention and control group

Variable	Group	Time	Mean \pm SD	Sig.*
Sleep quality	Control	Pre	7.19 \pm 2.43	0.009
		post	7.73 \pm 2.64	
	Intervention	Pre	7.37 \pm 2.12	0.001
		post	3.30 \pm 0.97	

*Wilcoxon Test

Table 4: The mean of variations in sleep quality scores in intervention and control group

Variable	Group	Mean \pm SD	Sig.*
Sleep quality	Control	0.54 \pm 1.26	0.001
	Intervention	-4.08 \pm 2.07	

* Mann-Whitney test

DISCUSSION

The present study investigated the effect of aromatherapy with the essence of *Citrus aurantium* on the sleep quality of female nursing undergraduate students. The results revealed that mean of the sleep quality score in the intervention group decreased over time significantly ($p < 0.001$). This means that the intervention group compared with the control group had better sleep quality. The essence of *Citrus aurantium* is absorbed through inhalation and is able to cross the blood-brain barrier and it reacts with receptors in the central nervous system (18). The flavonoid as one of the chemical compounds in the essence of *Citrus aurantium* serves as the agonist of the benzodiazepine receptors and provides relaxation (19). In their study, Dabirian et al. showed that inhalation of lavender essence could improve the quality of sleep in patients undergoing hemodialysis (20). Also, Hajibaghri et al. showed that the inhalation essence of Rosa damascene could improve the quality of sleep in cardiac patients (21). However, in a study by Shamskhanian et al., which was carried out to determine the "impact of aromatherapy with lavender on the sleep quality of nursing students" on 66 female nursing students for 7 nights, revealed that the total mean of sleep quality score was not of significant difference between the intervention and control groups ($p = 0.02$) (22).

Moreover, in a study that ÇEVİK et al. carried out to determine the effect of aroma (orange and lavender oil) inhalation on anxiety and vital signs of nursing students during their first blood drawing practice on 72 nursing students. The study findings revealed that aroma inhalation had no effects on nursing students' anxiety levels and vital signs during their first blood drawing experience ($p > 0.05$) (23).

The reason for lack of significant difference of results between the two groups in the study was possibly due to the short duration of the study, the small sample size and dependent variable (anxiety).

When comparing the variable sleep quality before and after the intervention in the control group, there was a statistically significant difference ($p = 0.009$). However, the mean score of sleep quality in the group from 19/7 (pre-test) to 73/7 (post-test) was changed. The factors such as poor physical condition, nearness of mid-term exams, high volume courses, demanding homework assignments, their intellectual concerns and preoccupations about the course of the career in the future may be the probable causes (24, 25).

CONCLUSION

It seems that aromatherapy, which is a relatively simple, inexpensive, and non-invasive technique with low side effects, can be used by nursing students residing in dormitory to manage their sleep quality.

Limitations

Investigating the total score of the sleep quality regardless of its seven components might have led to significance of the results of the present study. Moreover, this study was conducted only on female nursing students living in dormitories; thus, the obtained results cannot be generalized to all the students of the University.

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References

1. Miller MA. The Role of Sleep and Sleep Disorders in the Development, Diagnosis, and Management of Neurocognitive Disorders. *Front Neurol* 2015; 23; 6:224.
2. Haack M, Mullington JM. Sustained sleep restriction reduces emotional and physical well-being. *Pain* 2005; 119:56-64.
<https://doi.org/10.1016/j.pain.2005.09.011>
3. Silva M, Chaves C, Duarte J, et al. Sleep quality determinants among nursing students. *Procedia Soc Behav Sci* 2016; 217:999-1007.
<https://doi.org/10.1016/j.sbspro.2016.02.090>
4. Anil Jain, Sandeep Verma. Prevalance of sleep disorders among college students:A clinical study. *JAMDSR* 2016; 4:103-6.
5. Tamanna S, Geraci SA. Major sleep disorders among women: (women's health series).*South Med J* 2013; 106:470-8.
<https://doi.org/10.1097/SMJ.0b013e3182a15af5>
6. Hershner SD, Chervin RD. Causes and consequences of sleepiness among college students. *Nat Sci Sleep* 2014; 23:73-84.
<https://doi.org/10.2147/NSS.S62907>
7. Wolgast B. Discussion of causes and consequences of sleepiness among college students, 2014. *Nat Sci Sleep* 2016; 19:159-62.
<https://doi.org/10.2147/NSS.S106494>
8. Silva M, Chaves C, Duarte J, et al. Sleep quality determinants among nursing students. *Procedia Soc Behav Sci* 2016; 217: 999-1007.
<https://doi.org/10.1016/j.sbspro.2016.02.090>
9. Xie Z, Chen F, Li WA, et al. A review of sleep disorders and melatonin. *Neurol Res* 2017; 39:559-65.
<https://doi.org/10.1080/01616412.2017.1315864>
10. Maust DT. Complementary and Integrative Therapies for Mental Health and Aging. *Am J Psychiatry* 2016; 173:737-8.
<https://doi.org/10.1176/appi.ajp.2016.16040462>
11. Fradelos E., Komini A. The use of essential oils as a complementary treatment for anxiety. *AJNS* 2015; 4: 1-5.
<https://doi.org/10.11648/j.ajns.s.2015040201.11>
12. Yazdkhasti M, Pirak A. The effect of aromatherapy with lavender essence on severity of labor pain and duration of labor in primiparous women. *Complement Ther Clin Pract* 2016; 25:81-6.
<https://doi.org/10.1016/j.ctcp.2016.08.008>
13. Kinchen E.Development of a Quantitative Measure of Holistic Nursing Care. *J Holist Nurs* 2014; 33: 238-46. <https://doi.org/10.1177/0898010114563312>
14. Allard, M.,Katseres, J.Using Essential Oils to Enhance Nursing Practice and for Self-Care. *AJN* 2016;116: 42-9.
<https://doi.org/10.1097/01.NAJ.0000480495.18104.db>
15. Backhaus J, Junghanns K, Broocks A, et al. Test-retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. *J Psychosom Res* 2002; 53:737-40.
[https://doi.org/10.1016/S0022-3999\(02\)00330-6](https://doi.org/10.1016/S0022-3999(02)00330-6)
16. Tsay S-L, Chen H-L, Chen S-C, et al. Effects of reflexotherapy on acute postoperative pain and anxiety among patients with digestive cancer. *Cancer Nurs* 2008; 31:109-15.
<https://doi.org/10.1097/01.NCC.0000305694.74754.7b>
17. Ghoreishi A, Aghajani A. Sleep quality in Zanjan university medical students. *TUMJ* 2008; 66:61-7.
18. Namazi M, Akbari AA, Mojab F, et al. Effects of Citrus aurantium (bitter orange) on the Severity of First-Stage Labor Pain. *Iran J Pharm Res* 2014; 13: 1011-8.

19. Akhlaghi M, Shabaniyan G, Rafeieian-Kopaei M, et al. Citrus aurantium blossom and preoperative anxiety. *Braz J Anesthesiol* 2011; 61:702-12.
[https://doi.org/10.1016/S0034-7094\(11\)70079-4](https://doi.org/10.1016/S0034-7094(11)70079-4)
20. Dabirian A, Sadeghim M, Mojab F, et al. The Effect of Lavender Aromatherapy on Sleep Quality in Hemodialysis Patients. *Advances in nursing & midwifery* 2013; 22 [Abstract in English]
21. Hajibagheri A, Babaii A, Adib-Hajbaghery M. Effect of Rosa damascene aromatherapy on sleep quality in cardiac patients: a randomized controlled trial. *Complement Ther Clin Pract* 2014; 20(3):159-63.
<https://doi.org/10.1016/j.ctcp.2014.05.001>
22. Shamsikhani S, Sajadi M, Khorsani S, et al. Effect of aromatherapy with Lavender on quality of sleep of Nursing students. *CMJA*.2014; 4:904-11 [Abstract in English].
23. Çevik K., İnce S., Ayceman N., et al. Effects of aroma inhalation on anxiety and vital signs of nursing students during their first blood drawing practice. *Int J Health Sci Res* 2017; 7:243-52.
24. Lund HG, Reider BD, Whiting AB, et al. Sleep patterns and predictors of disturbed sleep in a large population of college students. *J Adolesc Health* 2010; 46:124-32.
<https://doi.org/10.1016/j.jadohealth.2009.06.016>
25. Kabrita CS, Hajjar-Muçã TA, Duffy JF. Predictors of poor sleep quality among Lebanese university students: association between evening typology, lifestyle behaviors, and sleep habits. *Nat Sci Sleep* 2014; 6:11-18.
<https://doi.org/10.2147/NSS.S55538>

Efekat aromaterapije *Citrus aurantium*om na kvalitet sna kod studentkinja sestrinstva: randomizirana klinička studija

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SAŽETAK

Studenti sestrinstva su podložniji poremećajima sna. Stanovanje u studentskim domovima takođe smanjuje kvalitet njihovog sna. Zbog ograničenja upotrebe lekova za lečenje poremećaja sna, studija je sprovedena radi istraživanja efekata aromaterapije na bazi esencije *Citrus aurantium* na kvalitet sna kod studenata sestrinstva. U ovom randomiziranom, kontrolisanom probnom ispitivanju, 100 studentkinja sestrinstva, koje su živele u domu i ispunjavale kriterijume za učestvovanje u studiji, nasumično su podeljene na ispitivanu i kontrolnu grupu. Ispitivana grupa je bila izložena delovanju aromaterapije na bazi esencije *Citrus aurantium* u trajanju od 15 minuta preko noći, tokom 14 noći, dok kontrolna grupa nije bila izložena ovoj terapiji. Kvalitet sna svih studenata meren je Pitsburgovim indeksom za procenu kvaliteta sna (PSQI) nakon intervencije u obe grupe. Podaci su analizirani pomoću softvera SPSS 11.5 i inferencijalne i deskriptivne statistike. Dobijeni rezultati pokazuju da je srednja vrednost kvaliteta sna u ispitivanoj i kontrolnoj grupi pre intervencije iznosila $7,38 \pm 2,12$ i $7,19 \pm 2,43$, što nije rezultiralo statistički značajnom razlikom ($p = 0,403$); međutim, nakon intervencije u ispitivanoj grupi ($3,30 \pm 0,97$), u poređenju sa kontrolnom grupom ($7,73 \pm 2,64$), uočena je značajna razlika ($p < 0,001$). To implicira da je ispitivana grupa, u poređenju sa kontrolnom grupom, imala bolji kvalitet sna. Očekujemo da se aromaterapija na bazi esencije *Citrus aurantium*, koja je relativno jednostavna, jeftina i neinvazivna tehnika sa niskim neželjenim efektima, koristi od strane studenata sestrinstva koji žive u studentskim domovima u cilju popravljavanja kvaliteta sna.

Ključne reči: aromaterapija, kvalitet spavanja, *Citrus aurantium*, student sestrinstva, kliničko ispitivanje