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A Systematic Review of the Effect of Aromatherapy and Storytelling on Anxiety in Children during Dentistry

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Abstract

Background

There is limited study and a lack of systematic review in the field of aromatherapy with orange~~,~~ and storytelling and their positive effects as ~~a~~ safe, simple and low-cost. The present study is aimed to provide a comprehensive review of the alleviating effects of aromatherapy with orange and therapeutic storytelling on anxiety during dentistry.

Materials and Methods: Systemic search of online databases (Medline, Web of Science, Cochrane, EMBASE and Scopus), for randomized control trial and non-randomized prospective or retrospective clinical studies without time and language limitation, using related keyword combinations were searched up to Mar 2019. Two reviewers did study selection and the evaluation of studies was conducted by Jadad scale.

Results: Finally, three studies were included in a systematic review. In the first study, salivary cortisol and pulse rate improved significantly in both aromatherapies with and without orange aroma. In the second study, there was no significant difference in the mean of blood pressure, oxygen saturation, and pulse rate between groups (orange essential oil and without aroma) of children during dental treatment; anxiety level was assessed with Venham's picture scale. Comparison between groups regarding Venham's picture test was significant. In the third study, there was significant decrease of anxiety, pain and anger in the storytelling psychotherapy group compared with~~,~~ the placebo and control groups of children receiving treatment by the dentist.

Conclusion

Both methods, orange odor and storytelling, were effective~~ness~~ in decreasing the anxiety level of children receiving dental treatment.

Key Words: Anxiety, Aromatherapy, Children, Dentistry, Storytelling.

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1- INTRODUCTION

Since dental anxiety is historically rooted in dentistry, the assorted ways of controlling pain have been developed over decades and centuries. Children's frustration and anxiety in dentistry is very important ~~one~~, appearing as negative behaviors during examination, such as fear, anxiety, pain and anger. Anxiety and fear related behaviors in children are considered the most difficult aspects of child control (1). These behaviors are the consequences of separation from the mother, exposure to the dental equipment, and disparate dental treatment methods. Anxiety in children and its repetition during the following therapeutic sessions will assuredly affect the efficiency of the dentist so that it lessens the probability of successful treatment (2).

Pediatric anxiety is commonly initiated by seeing a syringe (3). Fear in children is also voiced immediately after seeing the needle; meanwhile the sudden movement of children may cause injury by the needle (4-6). Anxiety has a variety of effects on children's life; in addition to the anxiety and fear the children are faced with, these feelings have some other consequences for the patient such as disregard for oral health, pain, and abscess, loss of milk and permanent teeth and occlusion dislocation.

Anxiety at a lower level, can lead to irregular referrals and lack of follow-up treatments (7). Anxiety can cause problems such as sleep disorder and low self-esteem (8). Children express fear in different ways (9). Pain and anxiety can raise the heart rate, blood pressure, respiration rate and unintentional body movements (10). Accordingly, anxiety control is one of the most important factors in successful treatment. Although there are various ways to control dental anxiety, the primary one is short-term distraction. Other control techniques for dental anxiety include usage of sedative and soporific drugs (11), psychological techniques (e.g., storytelling) (11), and combination of both techniques (12). Aromatherapy has also been reported effective in controlling anxiety (13). The use of complementary therapies as a low-risk, cost-effective, easy-to-use treatment with limited side effects is expanding in health care centers (14-16). One of the methods of complementary and alternative medicine is aromatherapy (17). Oils utilized in aromatherapy containing eucalyptus, jasmine, chamomile, sage, orange, spring orange, rose, and lavender (18). Citrus fruits also have positive antioxidant impact as an important source of phalaenoid (19-22). Citrus fruits are one of the most important commercial fruit crops grown worldwide (23).

Orange peel essential oil is one of the most prevalent and important essential oils produced worldwide, with a high reputation being due to its fragrance, making it easy to deal with and thus benefit from its therapeutic properties. Orange peel essence benefits from the following properties: transparency, pleasantness, fragrance, and high level of freshness just like an orange fruit. The essential oil of orange peel with the scientific name *Citrus Science*, consists of limonene, myrrh, linalool, octane, decanal, etc. (24, 25).

The results of a study in which the effect of orange and lavender essential oils was examined on dental patients, showed an alleviating effect on anxiety, confirming the theory that inhalation of aromatic substances such as orange essence is effective in stress control in dentistry (26). According to another study, psychotherapy, such as storytelling, can reduce anxiety, pain, and anger due to dentistry (27). There is limited study and a lack of systematic review in the field of aromatherapy with orange~~,~~ and storytelling and their positive effects as ~~a~~ safe, simple and low-cost. The present study is aimed to provide a comprehensive review of the

alleviating effects of aromatherapy with orange and therapeutic storytelling on anxiety during dentistry.

2- MATERIALS AND METHODS

2-1. Study design

Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) checklist was used as a template for this review (28).

2-2. Search strategy

To find clinical trials on the effects of aromatherapy and therapeutic storytelling on children's anxiety during dental procedures, systematic research of electronic databases: Medline (via PubMed), Web of Science, Cochrane, EMBASE and Scopus were searched without time and language limitation. Search words were a combination of (Aroma OR aromatherapy OR olfactory OR odors OR oils OR storytelling) AND (Dental OR dental health services). Figure.1 shows a flow chart of the process used to select studies. Two reviewers did the search independently and in duplication, the supervisor resolved any discrepancies between the reviews. In addition, in this search, date of publication was not considered and any articles up to Mar 10, 2019 were included.

2-3. Study selection

A database search was done for possible studies, abstracts of the studies were screened for identification of eligible studies, full text articles were obtained and assessed and a final list of included studies was made. This process was done independently and in duplication by two reviewers and any discrepancies was resolved by a third reviewer.

2-4. Included studies

Randomized controlled trials (RCT), clinical studies both randomized and nonrandomized either retrospective or prospective.

2-5. Selection of related studies

A selection of relevant studies was independently implemented. Initially, all articles that appeared to meet the inclusion and exclusion criteria were selected by reading the abstracts of the articles, then the full texts of the relevant articles were carefully reviewed, and the articles that met the inclusion and exclusion criteria enrolled in the systematic review. References to related articles and review articles on the subject of the study were also reviewed.

2-6. Data extraction

A checklist of necessary study information provided in **Table.1** include, author's name, year, measurable clinical criteria, and type of intervention/control, number and age, type of design, country, and main outcomes. Two reviewers collected the data independently and a third reviewer resolved any discrepancies.

2-7. Quality assessment

The evaluation of studies was conducted by Jadad scale (29). This scale uses three criteria to rate the articles: randomization, blindness, and a report of dropped or missed cases to be tracked. The evaluation score ranged from zero to five (**Table.2**). Two reviewers did the assessment independently.

Table-1: Some of characteristics of included studies.

Author, Year, Country, Reference	Tool	Type of designee	Number of participants and age group	Type of intervention/ control	Measurable clinical criteria	Results
Pakdaman and Davodi, 2015, Iran, (32)	CFSS-DS	Intervention	39 children	Narrative therapy o	Anxiety, pain and anger	There were significant decreases on anxiety, pain and anger in the control group compared with, placebo and control groups in children during dental treatment.
Soni et al., 2018, India, (31)	CFSS-DS	Original Control Trial	30 children (15 boys, 15 girls) Between 6 and 9 years	Orange essential oil/without aroma	Blood pressure, pulse and oxygen saturation	Salivary cortisol and pulse rate improved significantly in both aromatherapies with and without orange aroma.
Jaafarzadeh et al., 2019, Iran, (30)	-	Clinical trials and blind trials	30 children (10 boys, 20 girls) 6 to 9 years	Orange essence /any aroma (control)	Saliva pulse and cortisol	Inhalation of orange can decrease anxiety state because salivary cortisol and pulse rate decreased significantly as indicators of anxiety state in children during dental treatment.

CFSS-DS: Children's Fear Survey Schedule.

Table-2: The evaluation of quality of included studies by Jadad scale (29).

Author, Year, Country, Reference	Randomization			Blinding			Report of dropping out
	Mention randomization	Appropriate Method	Inappropriate Method	Mention blinding	Appropriate method	Inappropriate method	
Pakdaman and Davodi, 2015, Iran, (32)	*	*	-	-	-	-	*
Soni et al., 2018, India, (31)	*	*	-	-	-	-	*
Jaafarzadeh et al., 2019 Iran, (30)	*	*	-	*	*	-	*

3- RESULTS

Finally, three studies were included into systematic review (30-32) (**Figure.1**). In Jaafarzadeh et al. salivary cortisol and pulse rate improved significantly in both aromatherapy with and without orange aroma (P=0.014, P=0.005, Paired-t-test, respectively). It seems inhalation of orange can decrease anxiety state because salivary cortisol and pulse rate decreased significantly as an indicator of anxiety state in children during dental treatment (30). In Soni et al.'s study, there was no significant difference in means of blood pressure, oxygen saturation, and pulse rate between the groups (orange essential oil and without aroma) in children during dental treatment. Anxiety level assessed with Venham's picture scale, comparison between groups regarding Venham's picture test was significant (31). In Pakdaman and Davodi's study, there were significant decreases of anxiety, pain and anger in the intervention group compared with, the placebo and control groups in

children receiving treatment by the dentist. The findings suggest that storytelling as psychotherapy can decrease anxiety, pain and anger amongst 4-8 years old children receiving treatment by the dentist (32).

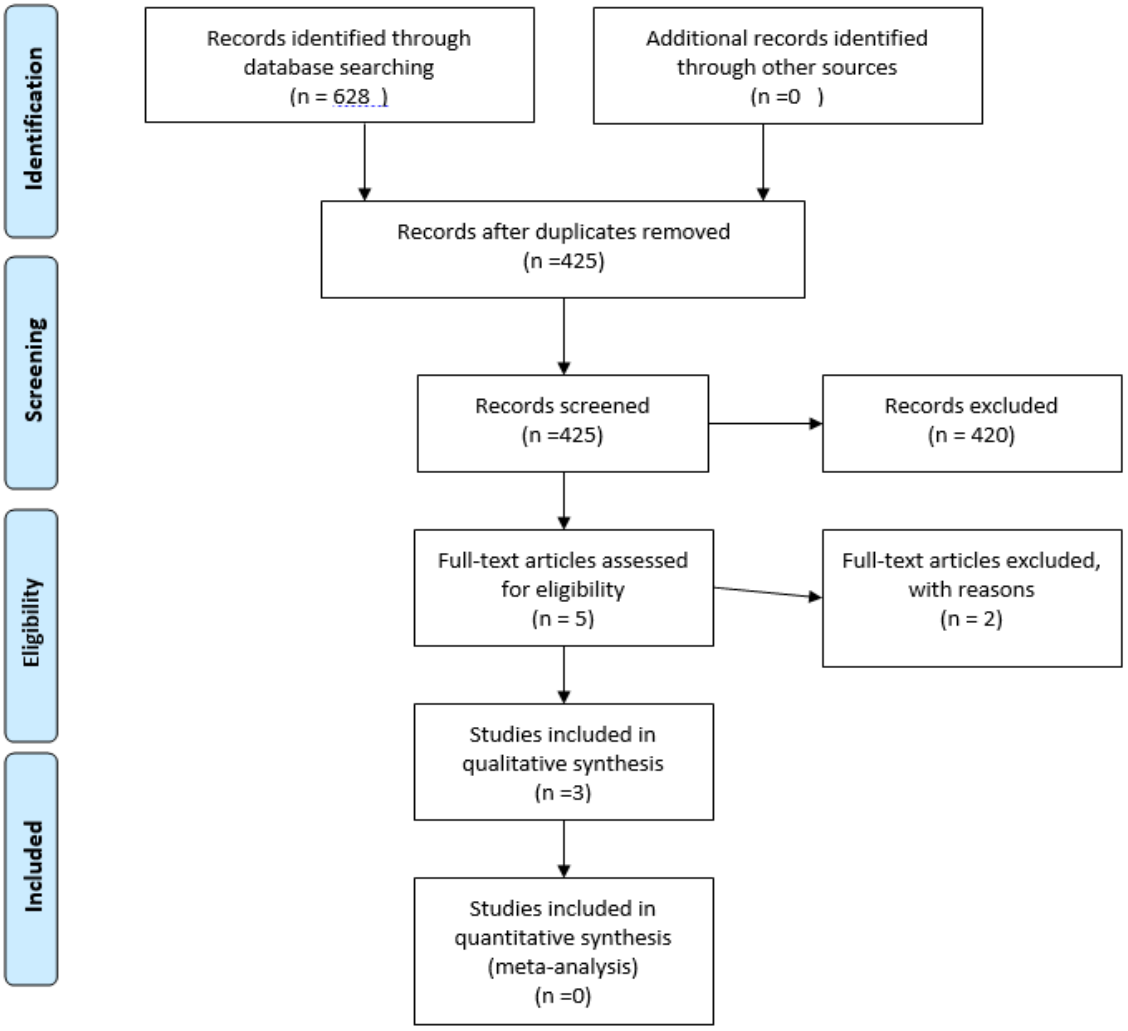

Fig.1: PRISMA flowchart.

4- DISCUSSION

Nowadays, one of the challenges to protect children's oral health is to counteract the children's anxieties of dentistry. There are various approaches managing the anxiety of dentistry, such as stress and anxiety management through aromatherapy and cognitive therapy. Our study is the first review of clinical trials to evaluate the efficacy of aromatherapy and storytelling on anxiety disorders in children. The present study aims to determine the effect of the orange essence and the storytelling therapy utilized to control the anxiety in children during dental treatment. Herbal medicine research is a first-line medical research priority in our country. Pediatric anxiety control has influence on the dental process and the quality of pediatric dental work, and mutual satisfaction. The usage of complementary therapies as a low-risk, cost-effective, easy-to-treat and limited-effect treatment is expanding in health care centers (14-16). One of the alternative and complementary therapies is aromatherapy (17), defined as the usage of volatile oils or aromas extracted from fragrant plants for the therapeutic purposes (33), which

can be described as a part of an integrated and multidisciplinary event used to optimize outcomes for children with various health issues. The use of aromatherapy could assist staff in efficacious care of patients (34). Extensive clinical research is currently being undertaken concerning use of aromatherapy and herbal essences worldwide (15). Aromatherapy stimulates the senses through smell. Scientific research has not 100% proven that aromatherapy can affect the brain and nervous system as drugs do (35). A therapeutic practice combines the nature of the science and art of nursing (36). Today, the U.S. Board of Nurses as part of holistic nursing (37) has introduced this treatment. This type of treatment in the UK is considered an accepted component of nursing practice. Nurses in more than 30 countries are licensed to use holistic complementary therapies, including aromatherapy, in holistic nursing care (38).

There is currently extensive clinical research on the various uses of aromatherapy and the use of herbal essential oils worldwide (39). Research has shown, aromatherapy to be one of the treatments available to reduce stress, anxiety, and depression (40). We found two studies, which investigated the effects of orange aromatherapy on Pediatric anxiety. In the first study, salivary cortisol and heart rate improved significantly using aromatherapy with orange aroma (30). In the second study, orange inhalation may have reduced anxiety state because salivary cortisol and heart rate decrease significantly as an indicator of anxiety state in children during dental treatment (31). Oranges are arboreal plants belonging to citrus aurantium that are grown in different parts of North and South of Iran. Due to the inexpensive Iranian raw material and Iranian processing facility, it can be an appropriate alternative to other chemical drugs that have a common usage with this essential oil (41). Production of essence from citrus peel has significant economic value (24, 25). Furthermore, many households use orange essential oil due to its delectable properties, potentiality for amalgamationwith other aromatic compounds, low cost and availability (24). Orange peel essential oils are beneficial in the food, pharmaceutical, confectionery, and cosmetics industries, as aromatic and flavoring products (42). The most important ingredients of orange peel essence are bioactive compounds, which make orange peel essential oil a suitable substitute for synthetic antioxidants. There are many reports about the antioxidant properties of orange peel essence. Orange essential oil also stimulates the central nervous system, enhances the mood, and has sedative and soothing effects (43-48). Aromatic molecules, when they reach the olfactory area in the brain, which is closely related to the limbic system, the center of emotion control, exert their inhibitory or stimulatory effect. Inhalation of the orange essential oil is effective in reducing anxiety in hemodialysis patients and has no significant side effect (49).

Our review showed that in addition to aromatherapy, other anxiety control processes in dentistry, such as cognitive thinking through storytelling and visual storytelling, provide information to help express, promote communication, cognition, and recalling skills, and take an effective part in children's awareness as opposed to developing strategies. In these situations, therapeutic storytelling provides growth for the child. During the storytelling of the child, it seems that by observing the characters in the story who have anxiety problems, they identify the symptoms of anxiety and learn that there are other children may have problems. The child learns how to deal with the problem by engaging in the story and talking about the protagonist's problem and their

anxiety. The anxious child then tries to deal with his or her anxiety through the way the protagonist copes with his or her anxiety. The cognitive process that begins in the child with the aid of the story ends by learning the ways to overcome the problems (27)

4-1. Limitations of the study

Limited data for meta-analysis due to the small number of articles has been known as the limitation of the current study. The methodology of some of the studies reviewed in this review was systematically of low quality. These deficiencies included the absence or inadequate reporting of random allocation sequences, the absence or inadequate blindness report, the lack of intention-to-treat analysis suggested, and follow-up studies based on the censorship being designed and reported. Other limitations of this study include the small number of studies and their small sample sizes, indicating the requirement for further studies with larger sample sizes. Some studies with small sample sizes may change their results in the case of sample increment.

5- CONCLUSION

Both the orange aroma and the storytelling methods were effective in reducing anxiety levels of children treated by the dentist. The complementary and alternative therapies such as aromatherapy with orange and storytelling can be utilized in the medical center, as they are low-risk, cost-effective, easy to apply, and have limited side effects.

6- CONFLICT OF INTEREST: None.

7- REFERENCES

1. Campbell C. Dental Fear and Anxiety in Pediatric Patients: Practical Strategies to Help Children Cope: Springer; 2017.

2. Schuurs AH, Makkes PC, Duivenvoorden HJ. Attendance pattern of anxiety-treated dental patients: a pilot study. Community dentistry and oral epidemiology. 1992; 20(4):221-3.

3. Oliveira MAHDM, De Menezes FCH, Oliveira CRB. Device For Covering a Syringe and Needle in Order to Alleviate the Fear and Anxiety Experienced During Pediatric Medical and Odontological Procedures, Such as the Administration of Anesthetics and the Like. Google Patents; 2012.

4. Seyrek SK, Corah NL, Pace LF. Comparison of three distraction techniques in reducing stress in dental patients. Journal of the American Dental Association (1939). 1984;108(3):327-9.

5. Berggren U, Carlsson SG. Psychometric measures of dental fear. Community Dentistry and Oral Epidemiology. 1984;12(5):319-24.

6. Roberts G. Management of pain and anxiety. Oxford University Press; 1997.

7. Hägglin C, Hakeberg M, Ahlqwist M, Sullivan M, Berggren U. Factors associated with dental anxiety and attendance in middle-aged and elderly women. Community dentistry and oral epidemiology. 2000; 28(6):451-60.

8. Cohen S, Fiske J, Newton J. Behavioural dentistry: The impact of dental anxiety on daily living. British dental journal. 2000; 189(7):385.

9. Dean JA, Jones J, La Quia A. McDonald and Avery's Dentistry for the Child and Adolescent. 2015.

10. Avery DR, McDonald RE, Dean JA. McDonald and Avery Dentistry for the Child and Adolescent-E-Book: Elsevier Health Sciences; 2010.

11. Pawlicki RE. Psychological/behavioral techniques in managing pain and anxiety in the dental patient. Anesthesia progress. 1991; 38(4-5):120.

12. Hmud R, Walsh LJ. Dental anxiety: causes, complications and management approaches. J Minim Interv Dent. 2009; 2(1):67-78.

13. Kritsidima M, Newton T, Asimakopoulou K. The effects of lavender scent on dental patient anxiety levels: a cluster randomised-controlled trial. Community

dentistry and oral epidemiology. 2010; 38(1): 83-7.

14. McCaffrey R, Thomas DJ, Kinzelman AO. The effects of lavender and rosemary essential oils on test-taking anxiety among graduate nursing students. Holistic nursing practice. 2009;23(2):88-93.

15. Maddocks-Jennings W, Wilkinson JM. Aromatherapy practice in nursing: literature review. Journal of advanced nursing. 2004; 48(1):93-103.

16. Fitzgerald M, Culbert T, Finkelstein M, Green M, Johnson A, Chen S. The effect of gender and ethnicity on children's attitudes and preferences for essential oils: a pilot study. Explore: The Journal of Science and Healing. 2007; 3(4):378-85.

17. Care I. Clinical aromatherapy Part I: An introduction Into nursing practice. Clinical journal of oncology nursing. 2003;7(5):595.

18. Esmaelzadeh SS, Torkashvand S, Rahimzadeh KM, Lotfi R, Akbari KM, Khosravi N. Effect of aromatherapy with Boswellia Carteri on anxiety in first stage of labor in nulliparous women. 2016.

19. Matasyoh JC, Kiplimo JJ, Karubiu NM, Hailstorks TP. Chemical composition and antimicrobial activity of essential oil of Tarchonanthus camphoratus. Food chemistry. 2007; 101(3):1183-87.

20. Gil MI, Tomás-Barberán FA, Hess-Pierce B, Kader AA. Antioxidant capacities, phenolic compounds, carotenoids, and vitamin C contents of nectarine, peach, and plum cultivars from California. Journal of Agricultural and Food Chemistry. 2002; 50(17):4976-82.

21. Khan MM, Iqbal M, Hanif MA, Mahmood MS, Naqvi SA, Shahid M, et al. Antioxidant and antipathogenic activities of citrus peel oils. Journal of Essential Oil Bearing Plants. 2012; 15(6):972-9.

22. Sharma N, Tripathi A. Fungitoxicity of the essential oil of Citrus sinensis on post-harvest pathogens. World Journal of Microbiology and Biotechnology. 2006; 22(6): 587-93.

23. Ozgoli G, Shahveh M, Esmaielli S, Nassiri N. Essential oil of Citrus sinensis for the treatment of premenstrual syndrome; a randomized double-blind placebo-controlled trial. Journal of Reproduction & Infertility. 2011;12(2):123-29 .

24. Mercy N, Nithyalakshmi B, Aadhithiya L. Extraction of orange oil by improved steam distillation and its characterization Studies. International Journal of Engineering Technology, Management and Applied Sciences. 2015;3(2):1-8.

25. Teixeira MI, Andrade LR, Farina M, Rocha-Leão MHM. Characterization of short chain fatty acid microcapsules produced by spray drying. Materials Science and Engineering: C. 2004;24(5):653-8.

26. Lehrner J, Marwinski G, Lehr S, Johren P, Deecke L. Ambient odors of orange and lavender reduce anxiety and improve mood in a dental office. Physiology & Behavior. 2005;86(1-2):92-5.

27. Pakdaman F, Davodi I, Mehrabi zad honarmand M. The effect of narrative therapy on anxiety, pain and anger dentists in dental care for children 8-4 years under the city of Neka and Sari. IJPD. 2015; 10 (2):17-34

28. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses*:* The PRISMA Statement. Int J Surg 2010; doi:10.1016/j.ijsu.2010.02.007.

29. Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJM, Gavaghan DJ, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? Controlled clinical trials. 1996;17(1):1-12.

30. Jafarzadeh M, Arman S, Pour FF. Effect of aromatherapy with orange essential oil on salivary cortisol and pulse rate in children during dental treatment: A randomized controlled clinical trial. Advanced biomedical research. 2013;2: 10.

31. Soni S, Bhatia R, Oberoi J. Evaluation of the Efficacy of Aromatherapy on Anxiety Level among Pediatric Patients in a Dental Setting: A Randomized Control Trial. International Journal of Oral Care and Research.2018;6(2):44-9.

32. Pakdaman F, Davodi I. The effect of narrative therapy on anxiety, pain and anger

dentists in dental care for children 8-4 years under the city of Neka and Sari. Iranian Journal of Pediatric Dentistry. 2015;10(2):17-34.

33. Afkham Ebrahimi A, Bandi G, Salehi M, Tafti K, Vakili Y, Farsi A. Sleep parameters and the factors affecting the quality of sleep in patients attending selected clinics of Rasoul-e-Akram hospital. Razi Journal of Medical Sciences. 2008;15:31-8.

34. Rawlings F, Meerabeau L. Implementing aromatherapy in nursing and midwifery practice. Journal of clinical nursing. 2003;12(3):405-11.

35. Alamri H, Almoghairi A, Almasood A, Alotaibi M, Alonazi S. Do We Need Premedication Before Coronary Angiography? A Controlled Clinical Trial. Cardiology research. 2011;2(5):224.

36. Sahebzamani M, Khanvari M, Alavi Majd H, Mirkarimi M. The effects of Aromatherapy on anxiety and depression of nursing students. Islamic Azad University, Tehran Medical Branch. 2011;20(3):175-81.

37. Sahebalzamin M, Khanavi M, Alvi majd H, Mirkarimi S M, Karimi M. Effects of inhalation aromatherapy on female students' anxiety and depression settling in dormitory of Tehran University of Medical Sciences. Medical Sciences. 2010; 20 (3):175-81.

38. Babashahi M, Babashahi F, Fayazi S. Comparing the effect of massage Aromatherapy and massage on anxiety level of the patients in the preoperative period: a clinical trial. Evidence Based Care. 2012; 2(2):19-28.

39. Ni C-H, Hou W-H, Kao C-C, Chang M-L, Yu L-F, Wu C-C, et al. The anxiolytic effect of aromatherapy on patients awaiting ambulatory surgery: a randomized controlled trial. Evidence-Based Complementary and Alternative Medicine. 2013;2013.

40. Kianpour M, Mansouri A, Mehrabi T, Asghari G. Effect of lavender scent inhalation on prevention of stress, anxiety and depression in the postpartum period. Iranian journal of nursing and midwifery research. 2016;21(2):197.

41. Latifi M. The effect of aromatherapy with orange essential oils on sleep quality in the school-age children whit ALL. Complementary Medicine Journal of faculty of Nursing & Midwifery. 2015;5(1):1113-22.

42. Azar AP, Nekoei M, Larijani K, Bahraminasab S. Chemical composition of the essential oils of Citrus sinensis cv. valencia and a quantitative structure-retention relationship study for the prediction of retention indices by multiple linear regression. Journal of the Serbian Chemical Society. 2011;76(12):1627-37.

43. Frassinetti S, Caltavuturo L, Cini M, Della Croce C, Maserti B. Antibacterial and antioxidant activity of essential oils from Citrus spp. Journal of Essential Oil Research. 2011;23(1):27-31.

44. Kamal GM, Ashraf MY, Hussain AI, Shahzadi A, Chughtai MI. Antioxidant potential of peel essential oils of three Pakistani citrus species: Citrus reticulata, Citrus sinensis and Citrus paradisii. Pak J Bot. 2013;45(4):1449-54.

45. Al-Juhaimi FY, Ghafoor K. Bioactive compounds, antioxidant and physico-chemical properties of juice from lemon, mandarin and orange fruits cultivated in Saudi Arabia. Pak J Bot. 2013;45(4):1193-6.

46. Trabelsi D, Ammar AH, Bouabdallah F. Antioxidant and Antimicrobial Activities of Essential Oils and Methanolic Extracts of Tunisian Citrus Aurantium L. 2014.

47. Singh P, Shukla R, Prakash B, Kumar A, Singh S, Mishra PK, et al. Chemical profile, antifungal, antiaflatoxigenic and antioxidant activity of Citrus maxima Burm. and Citrus sinensis (L.) Osbeck essential oils and their cyclic monoterpene, DL-limonene. Food and Chemical Toxicology. 2010;48(6):1734-40.

48. Jorge N, Silva ACd, Aranha CP. Antioxidant activity of oils extracted from orange (Citrus sinensis) seeds. Anais da Academia Brasileira de Ciências. 2016;88(2):951-8.

49. Rashidi Fakari F, Tabatabaeichehr M. Comparing the effect of geranium and orange essential oils on level of anxiety during delivery. Journal of Mazandaran University of Medical Sciences. 2015;25(123):208-11.