

Effectiveness of aromatherapy in managing pediatric dental anxiety: a comparative in-vivo study

¹Dr.Amutha M V Soorya, ²Dr. Vishnu Rekha Chamarthi, ³Dr.Santhosh Priya A K R, ⁴Dr.Dhanraj Kalaivanan, ⁵Dr.Sumaiyya Saleem

¹Postgraduate student, ²Professor and Head of department, ^{3,5}Assistant Professor, ⁴Reader
Department of Pediatric and Preventive Dentistry
Sathyabama Dental College and Hospital
Chennai, India.

Abstract- Background / Introduction: In Pediatric Dentistry, controlling a child's fear is essential for successful treatment. An alternative way to reduce anxiety levels in dental clinics is the use of aromatherapy. The potential effects of essential oils have been associated with decrease in anxiety, and have mild sedative effect

Aim: To compare and evaluate the efficacy of aromatherapy using lavender oil and orange essential oil in the management of anxious pediatric dental patients

Methodology: Children aged between 4-6 years were randomly allocated to either a control or an experimental group who had received lavender oil or orange essential oil before dental procedure. The child's pulse rate and oxygen saturation level were recorded using a pulse oximeter. The child's behavior was assessed using Ven ham's picture test and facial image scale (FIS) before and after aromatherapy.

Results: The control group vs aromatherapy groups showed significant statistical difference with respect to Ven ham's picture test and Facial image scale both lavender and orange essential oil reduced posttreatment anxiety levels, with better anxiety reduction with orange essential oil

Conclusion: The positive effects of lavender oil and orange essential oil in children can be inhaled to reduce anxiety in children.

Index Terms: Fear, anxiety, behavior management, aromatherapy.

I. INTRODUCTION

Fear of dentistry and dentists is a prevalent and potentially upsetting issue that affects both the general public and dental professionals. Dental anxiety can have negative effects on behavior, cognition, and physiology. It is described as "abnormal fear or dread of visiting the dentist for preventive care or therapy and unwarranted anxiety over dental procedures." [1] There have been reports that dental anxiety frequently leads to higher caries levels and behavioral management issues in kids.

A little over half of the kids reported having low to moderate dental anxiety, and between 10% and 20% reported having extreme dental anxiety. [2] Furthermore, nervous kids exhibit increased pain sensitivity, which is the main cause of their recalcitrant behavior during dental treatment. In order to attain optimal oral and dental health through consistent dental appointments, it is imperative to assist patients in surmounting their anxiety and dread. In a pediatric dental setting, the sounds of drilling, the sights (needles), the scents of cut dentin and eugenol, and the feeling of a high vibration frequency are typically stimuli that elicit fear. [3] Studies has shown that anxiety-provoking situations alter physiological functions like pulse rate and blood pressure. This alternation in pulse rate, blood pressure and oxygen saturation indirectly attributed to stress. [4]

With varied degrees of success, a variety of pharmacological and nonpharmacological methods of behavior management are used in ordinary dental treatment. However, there are hazards associated with using pharmacological techniques like conscious sedation or general anesthesia, so not every patient receiving dental care may benefit from these procedures on a regular basis. [5] This strategy can have a favorable physiological effect through the sense of smell, supporting the idea of aromatic essential oils being used therapeutically. Aromatherapy is a cheap, easy method to promote relaxation and reduce symptoms of anxiety. Because lavender essential oil stimulates the autonomic nerve system in a parasympathetic manner, it can improve mood, reduce anxiety, and increase sedation. [6] There are various ways to employ aromatherapy, such as massage, topical treatment, compresses, baths, and inhalation. The most popular methods are inhalation and massage, particularly in medical procedures.

Research on children undergoing dental restorations have documented the anxiolytic effects of orange and lavender essential oils, which are shown to lower heart rate and salivary cortisol levels. Another study has shown that using lavender essential oil during dental extractions significantly reduces the anxiety and suffering that children experience.[7] Studies have shown that orange scent is a suitable aroma to decrease anxiety. It increases the activity of the parasympathetic nervous system by 12% and decreases the activity of the sympathetic nervous system by 16%.[8] Hence, the aim of the study was to compare and evaluate the efficacy of aromatherapy using lavender oil and orange essential oil in the management of anxious pediatric dental patients.

II. MATERIALS AND METHODS

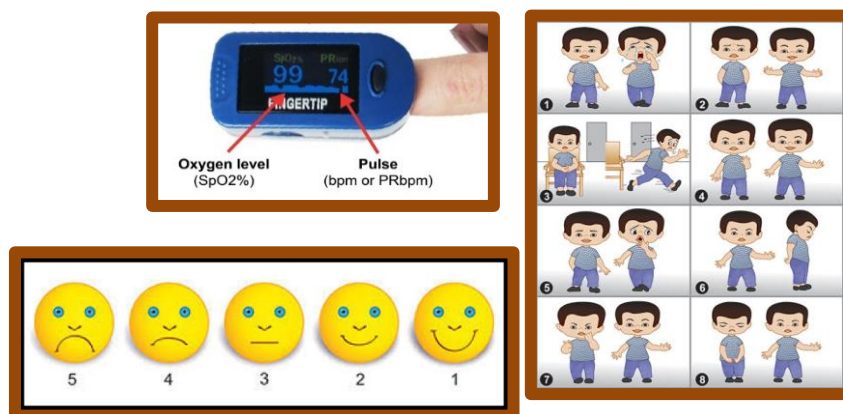
Before the study was carried out, the institutional ethical committee reviewed and approved the research protocol. After gaining the parents' signed informed agreement, study participants were chosen from the outpatient pediatric and preventive dentistry department. Children between the ages of 4 and 6 who were seeking routine dental care but had never received dental care before participated was included in the study. Children with specific needs and those with impaired health with cardiac issues, allergies, colds, or sudden tooth pain are excluded from the study.

Group I: Orange oil [n=15]

Group II: Lavender oil [n=15]

Group III: Control [n=15]

All the children who visited the department for their first dental visit was randomly allocated to three groups. The children's oxygen saturation and pulse rate was recorded using pulse oximeter before the start of clinical examination. Venham's picture test and facial image scale (FIS) was shown to the children and was asked to indicate which of the five faces in the facial image scale (FIS) and Venham's picture test images, at that moment, he or she felt most like before the start of clinical examination and the results was recorded. Following which the children was asked to inhale either lavender or orange essential oil in experimental group and control group patients had given no inhalation therapy. On a particular day only one essential oil was used to prevent mixing of two different aroma to same patient. After clinical examination and routine dental treatment, the second set of values was recorded and behavior was assessed like the way how we have done for baseline estimation.



III. STATISTICAL ANALYSIS

SPSS software version 22.0 was used to do statistical analysis on the data, which were entered into a spreadsheet. Changes in pre- and posttreatment mean anxiety levels was assessed using ANOVA test, median changes in pre- and posttreatment levels of pulse rate and levels of oxygen saturation was assessed using Kruskal–wallis test. Change in posttreatment levels of anxiety levels between each study group was assessed using Tukey's test. The levels of pulse rate and oxygen saturation between each study groups were assessed using Mann–whitney test.

IV. RESULTS

Comparison of median anxiety levels of different groups according to Venham's picture test and facial image scale showed a significant reduction in anxiety levels in both the experimental groups. [Table 1]

Comparison of pre- and posttreatment pulse rate and oxygen saturation with respect to control group, lavender oil group, and orange oil groups showed with respect to pulse rate there was reduction between pre and post-operative values but not statistically significant. Owing to no much changes in oxygen saturation for all the three groups. [Table 2]

In comparison between the change in pre-treatment and posttreatment anxiety scores with respect to Venham's picture test, facial image scale, pulse rate, respiratory rate, and oxygen saturation showed statistically significant difference for Venham's picture test and facial image scale in assessing the anxiety. [Table 3]

Comparison between different groups based on the mean and median with respect to the difference in pre- and posttreatment change in anxiety levels (based on Venham’s picture test and facial image scale) and pulse rate and oxygen saturation levels did not show any statistical significance in posttreatment levels of biomarkers, the lavender group showed better results with comparatively more reduction in the levels of pulse rate and respiratory rate and a slight increase in oxygen saturation levels compared to the orange oil. [Table 4]

Table 1
Median anxiety levels of different groups according to Venham’s picture test and facial image scale

	Venham’s picture test		Facial image scale	
	Pre	Post	Pre	Post
Control group	4	4	3	3
Lavender oil group	4	0	4	1
Orange oil group	4	0	3	1

Table 2
Pre- and posttreatment pulse rate and oxygen saturation (mean ± SD) with respect to control group, lavender oil group, and orange oil group

	Pulse rate		oxygen saturation	
	Pre	Post	Pre	Post
Control	98.4 ± 12.74	103.2 ± 11.2	97.72 ± 1.25	97.58 ± 1.09
LAVENDER OIL	100.5 ± 13.18	91.02 ± 10.2	97.56 ± 1.25	98.08 ± 1.12
ORANGE OIL	99.2 ± 12.23	90.36 ± 10.71	97.84 ± 1.25	98.12 ± 0.98

Table 3
Change in pre-treatment and posttreatment anxiety scores with respect to Venham’s picture test, facial image scale, pulse rate, respiratory rate, and oxygen saturation

Parameters	Control group	lavender oil group	orange oil group	p – value
*Venhams picture test	0.006±1.24	- 4.1±1.45	-4.1±2.15	<0.001
*Facial image scale	0.42±1.16	-2.23±1.04	-2.34±1.04	<0.001
**Pulse rate	5(-4.22)	-9(-43.17)	-8(41.5)	0.0001
**Oxygen saturation	0(-2.2)	1(-3.5)	0(-1.2)	0.005

p < 0.001 is considered significant

*Mean ± S.D, the p value is computed using ANOVA test

**Median (Min, Max), the p value is computed using Kruskal–Wallis test

Table 4
Comparison between different groups based on the mean * and median ** with respect to the difference in pre- and posttreatment change in anxiety levels (based on Venham’s picture test and facial image scale) and pulse rate and oxygen saturation levels

	Venham’s picture test*	Facial image scale*	Pulse rate**	Oxygen saturation**
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Control Vs lavender oil group	<0.0001	<0.0001	<0.0001	0.001
Control Vs orange oil group	<0.0001	<0.0001	<0.0001	0.012
Orange Vs lavender oil group	1.0	0.66	0.87	0.16

* p value is computed using Tukey's HSD test (Facial image scale and Venham's picture test)

**p value is computed using Mann-Whitney test; $p < 0.016$ is significant after adjusting for multiple comparison (pulse rate and oxygen saturation)

V. DISCUSSION

In order to reduce the anxiety levels of pediatric patients, the current study contrasted two types of essential oil aromatherapy with those of the control group. Since anxiety is a complicated condition, more thorough assessment methods are required, which helps us comprehend the patient's emotions. Asking kids about their feelings is easiest and most frequently done using self-report anxiety scales. Pulse rate is proved to be the most common physiological indicator for anxiety and fear. The reduction in pulse was due to the interaction of essential oil with the parasympathetic nervous system to modulate anxiety.[9] Pulse rate was selected for investigation because it is the easiest biological metric to measure. It has been demonstrated that, compared to other physiological measures, this index more closely reflects the anxiety associated with dental appointments.

Hence two objective measures pulse rate, and oxygen saturation levels as well as two subjective measures the Venham's picture test and Facial Image Scale [FIS] were used to assess the efficacy of the two approaches in reducing dental anxiety.

FIS and the Venham's picture test are two trustworthy indicators of children's self-reported anxiety. According to research by Venham and Gaulin-Kremer, the picture test is a straightforward, valid, and accurate indicator of how a young kid reacts to stress in their environment.[10] Eight pairs of photographs depicting different emotions are presented to children, and they are asked to choose the ones that most accurately represent their emotional state. Different scores were assigned to the photos, ranging from 0 (no anxiety) to 8 (extreme anxiety). Even for very young children, it is a useful tool for evaluating dental anxiety in state children.

Aromatherapy as stated earlier its non-invasive and inexpensive. It is a scented, volatile liquid substances mostly extracted from plants using steam or pressure.[11] Studies have shown that odors possess the property to alters emotional condition of human beings. Aromatherapy proved to be very effective in reducing the anxiety levels of the children. In the present study When compared to the controls, aromatherapy was found to be quite helpful in lowering the anxiety levels of the children. The degrees of anxiety reduction observed in the aromatherapy group were consistent with research conducted on elderly dentistry patients awaiting dental procedures by Lehrner et al.[8] and Kritsidima et al.[12] According to Lehrner et al., patients who were exposed to orange essential oil exhibited a higher degree of serenity. Although it had no effect on subsequent visits, Kritsidima et al. found that dental patients' anxiety is reduced by the aroma of lavender. The study's findings demonstrated that, in comparison to the anxiety levels observed in the control group, the anxiety reduction impact of essential oil aromatherapy but was not statistically significant.

When volatile molecules in scented oils are inhaled, they attach to olfactory receptors and trigger an electrical reaction that travels all the way to the brain. This response is likely to trigger neocortex activation, which affects olfactory perception and travels to the limbic system, affecting the amygdale and hypothalamus, regions that regulate hormone levels and emotions. As a result, following aromatherapy, the pulse rate lowers, as this study clearly shows. The results of this study are consistent with those of studies conducted by Jaafarzadeh et al.[3] and Pradopo et al.[13] that used aromatherapy with pandan leaves and orange essential oil, respectively, to lower dental anxiety in young patients.

Based on the results of the present study, the children undergoing basic, noninvasive dental operations, aromatherapy with orange and lavender essential effectively lowered physiological indicators of stress and alleviated dental anxiety when compared to control group. Also, orange essential had a better effect than lavender essential oil.

VI. CONCLUSION

For the assessment of anxiety in children to be successful, this measurement technique is essential. But the study contained flaws that made it impossible to hide the participants or the evaluators. Since aromatherapy lessens anxiety without impacting pain, it is a useful alternative therapy that dentists can use with nervous pediatric dental patients. It is an approach that complements conventional treatment practices without using drugs. Children experiencing dental anxiety who were having an invasive dental surgery responded well to aromatherapy.

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