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Original Research Article

Chromotherapy: a useful tool for managing anxiety in children

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ABSTRACT

Background: Dental anxiety is a type of fear developed due to threatening stimuli. Assessing the child's level of dental anxiety is very important to successfully carry out many treatment procedures in dentistry. Needles in general can cause dental anxiety. Chromotherapy is an ancient alternative medicine practice that uses the energy of the visible spectrum of electromagnetic radiation (i.e., coloured light) to induce changes in the human body. The objective of this study was to clinically evaluate and compare the effect of chromotherapy on the level of anxiety in patients treated with infiltration under local anaesthesia.
Methods: This is a randomized control trial where anxiety was assessed using heart rate and animated emoji scale (AES) in children aged 4-14 years requiring infiltration injection of local anaesthesia. Patients were divided into 4 groups: group-1 blue, group-2 pink and group-3 yellow, group 4-control. Evaluation of all parameters was carried out at three levels, i.e., pre-operative, post-chromotherapy session and infiltration after local anaesthesia.
Results: This study demonstrated that patients subjected to blue, pink and yellow colour therapy had a statistically significant reduction in anxiety compared to the control group after chromotherapy.
Conclusions: Chromotherapy plays an important role in managing dental anxiety in children and can be effectively incorporated into routine practice.

Keywords: Chromotherapy, Dental anxiety, Needle phobia

INTRODUCTION

Dental anxiety is a widespread problem that affects individuals of various age groups. It is characterized by intense fear or anxiety associated with dental visits and procedures that exceeds typical nervousness and may lead to increased levels of stress or avoidance of dental care.[1] The origins of dental anxiety are multifaceted and stem from factors such as past negative dental experiences, fear of pain, fear of loss of control, and social influences. For many individuals, the fear of unknown aspects of dental procedures, combined with the sensory elements of the dental environment, contributes to increased anxiety. The sounds of dental equipment, the clinical smell of the office, and the perceived invasiveness of specific procedures can increase these fears. In addition, cultural attitudes towards dentistry and personal experiences play a significant role in shaping an individual's dental anxiety.[1] The consequences of dental anxiety go beyond emotional stress, which can lead to delayed or neglected dental care, ultimately compromising oral health. Postponing routine dental checkups and necessary treatments can exacerbate dental problems, introduce a cycle of avoidance, and worsen oral health. Addressing dental anxiety is critical to promoting overall well-being and preventing complications related to oral health. Understanding the origins of this anxiety, utilizing empathic communication between dental professionals, and integrating relaxation techniques can help create a more comfortable and supportive dental environment. By acknowledging and addressing dental anxiety, individuals can work to break

the cycle of fear, promote better oral health and a more positive dental experience. This study aimed to clinically evaluate and compare the effect of chromotherapy on anxiety levels in patients undergoing treatment under local anaesthesia infiltration injection.

METHODS

This is a randomised control trial conducted in the department of paediatric and preventive dentistry Mathrusri Ramabai Ambedkar dental college and hospital, by a single operator. Before beginning with the study, the study design was approved by the Institution ethics committee: IEC/MRADC&H/EC-051/2023 and a written informed consent was obtained from patient's parents, with assent from patient. Study was under for a period of 6 months i.e. June 2023 to November 2023.

Inclusion criteria

Patients who fulfil below criteria were included in study.

Age range: Children aged between the 4 and 14 years.

Needle anxiety: Presence of needle anxiety, as assessed through validated screening tools or clinical evaluation.

Willingness to participate: Willingness of child to participate in study, and parental or guardian consent.

Good general health: Overall good physical health without serious medical conditions that may interfere with participation.

Ability to understand and communicate: Adequate cognitive and linguistic abilities to understand study procedures and communicate effectively.

Parental or guardian involvement: Parental or guardian involvement and consent for child's participation.

Not currently participating in similar studies: Not currently participating in other research studies related to anxiety or needle procedures.

No severe mental health disorders: Absence of severe mental health disorders that could significantly affect study outcomes.

Stable living situation: A stable living situation, which ensures continued participation and follow-up

No recent traumatic events: Absence of recent exposure to the traumatic events that may influence anxiety levels.

Exclusion criteria

The patients who not fulfil below criteria were excluded from the study.

Medical conditions: Serious medical conditions that may affect the child's ability to participate safely.

Mental health conditions: Severe anxiety or mental health disorders unrelated to needle anxiety.

Previous exposure to chromotherapy: Prior exposure to chromotherapy for anxiety management or other reasons.

Sensitivities: Photosensitive conditions that may be aggravated by chromotherapy.

Cognitive impairments: Cognitive impairments affecting the child's ability to understand and communicate their experiences.

Age criteria: Children outside the predefined age range for the study.

Parental consent issues: Lack of parental or guardian consent for participation in the study.

Recent traumatic events: Recent exposure to traumatic events that may influence anxiety levels.

Inability to follow study procedures: Inability/ unwillingness to comply with study procedures and interventions.

In this study where anxiety was assessed using heart rate by pulse oximeter i.e. physiological assessment using heart rate and subjective assessment using AES in children aged 4-14 years requiring infiltration injection of local anaesthesia. The total sample included was 240 subjects who were divided into 4 groups of 60 each, depending on the colour-group 1 blue, group-2 pink and group-3 yellow, group 4-control. Evaluation of all parameters was carried out at three levels, i.e., pre-operative, post-chromotherapy session and after local anaesthesia infiltration. Measures of ANOVA test followed by Bonferroni's post hoc test was done.

Figure 1: Pre-operative.

Figure 2: Post-chromotherapy.

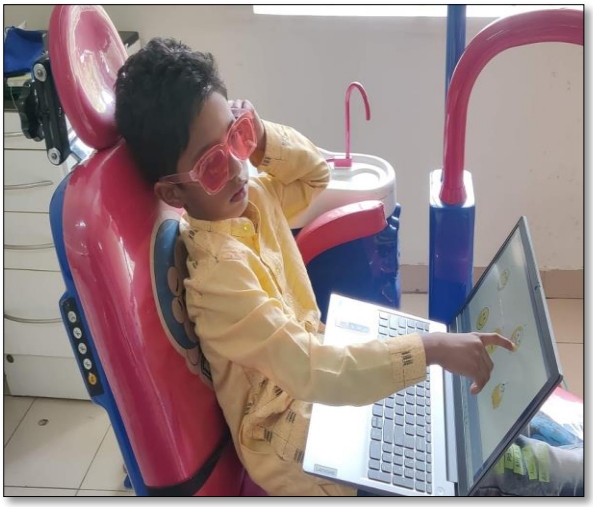

Figure 3: After local anaesthesia.

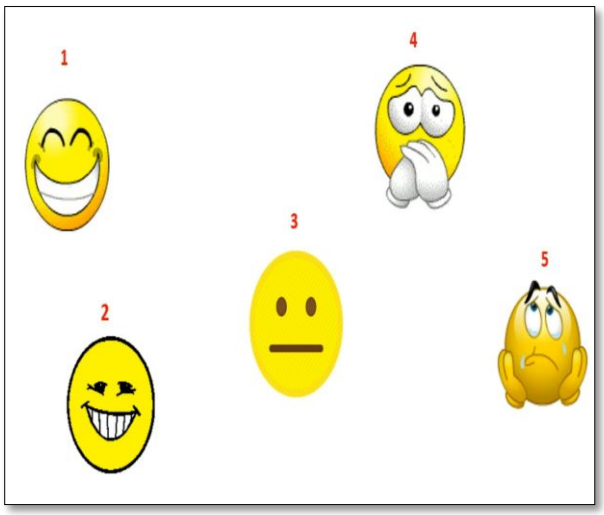

Figure 4: AES.

RESULTS

The mean heart rate during post local anaesthetic period showed significant difference between 4 groups at p=0.008. Multiple comparison of mean difference between groups revealed that control group showed significantly higher mean heart rate as compared to blue group, pink group and yellow group and the mean differences were statistically significant at p=0.03, p=0.02 and p=0.02 respectively (Table 1).

However, no significant differences were noted in the mean heart rate between 3 interventional groups during the preoperative period (Table 2).

Repeated measures of ANOVA test and Bonferroni's post hoc test

T0-pre-operative period, T1-post chromotherapy period and T2-post local anaesthetic period were performed showing following results.

In blue group, the mean heart rate showed a statistically significant difference between 3-time intervals at p=0.004. Multiple comparison b/w time intervals revealed that T0 showed significantly higher mean heart rate as compared to T1 and T2 time intervals and the mean differences were statistically significant at p=0.02 and p=0.005. However, no significant difference was observed between T1 and T2 time intervals (Table 1).

In control group, the mean AES scores showed significant increase during post local anaesthetic period as compared to pre-op period and the mean difference was statistically significant at p=0.01 (Table 1).

The mean heart rate during pre-operative period showed no significant difference between 4 groups (Table 2).

The mean heart rate during post-chromotherapy period showed no significant difference between 3 interventional groups (Table 3).

The mean heart rate during post local anaesthetic period showed significant difference between 4 groups at p=0.008, (Table 4). Multiple comparison of mean difference b/w groups revealed that control group showed significantly higher mean heart rate as compared to blue group, pink group and yellow group and the mean differences were statistically significant at p=0.03, p=0.02 and p=0.02 respectively.

However, no significant differences were noted in the mean heart rate between 3 interventional groups.

Anxiety scores are indicated by the AES scores showed difference in the anxiety levels with higher anxiety scores in control group as compared to chromotherapy groups (Table 5).

Table 1: Comparison of mean heart rate (in BPM) between time intervals in each group using repeated measures of ANOVA test followed by Bonferroni's post hoc test.

Groups	Time	N	Mean	SD	P value	Sig. diff	P value
Blue	T0	60	105.90	8.89	0.004	T0 vs T1	0.02
	T1	60	99.90	9.72		T0 vs T2	0.005
	T2	60	99.80	8.48		T1 vs T2	1.00
Pink	T0	60	107.80	9.48	0.005	T0 vs T1	0.04
	T1	60	101.80	7.02		T0 vs T2	0.003
	T2	60	99.60	5.32		T1 vs T2	1.00
Yellow	T0	60	104.80	13.05	0.09	T0 vs T1	..
	T1	60	100.60	10.24		T0 vs T2	..
	T2	60	99.30	12.35		T1 vs T2	..

Table 2: Comparison of mean heart rate (in BPM) between groups during pre-operative period using one-way ANOVA test.

Group	N	Mean	SD	Min	Max	P value
Blue	60	105.90	8.89	89	120	0.89
Pink	60	107.80	9.48	96	122	
Yellow	60	104.80	13.05	79	122	
Control	60	107.80	9.48	96	122	

Table 3: Comparison of mean heart rate (in BPM) between groups during post-chromotherapy period using one-way ANOVA test.

Group	N	Mean	SD	Min	Max	P value
Blue	60	99.90	9.72	80	115	0.90
Pink	60	101.80	7.02	95	114	
Yellow	60	100.60	10.24	82	115	

Table 4: Comparison of mean heart rate (in BPM) between groups during post-local anaesthesia period using one-way ANOVA test.

Group	N	Mean	SD	Min	Max	P value
Blue	60	99.80	8.48	87	113	0.008
Pink	60	99.60	5.32	92	108	
Yellow	60	99.30	12.35	88	125	
Control	60	112.30	10.03	100	128	

Table 5: Comparison of mean AES scores b/w groups during post-local anaesthesia period using Kruskal Wallis test.

Group	N	Mean	SD	Min	Max	P value
Blue	60	1.50	0.71	1	3	<0.001
Pink	60	1.90	0.88	1	3	
Yellow	60	2.70	0.82	2	4	
Control	60	4.10	0.74	3	5	

DISCUSSION

Managing dental anxiety in children is a significant challenge within the field of dentistry, impacting both dentists and parents alike. Early identification of dental anxiety is crucial for effective diagnosis and ensuring a positive dental experience. Neglecting dental care due to anxiety can exacerbate behavioural challenges and result in compromised oral hygiene. Addressing this issue promptly is essential for the overall well-being of child.

Colour plays a significant role in a child's life, influencing various aspects such as clothing, toys, and home accessories, which can communicate psychological messages.[1] Goldstein asserted that specific colours can evoke distinct emotional responses. Clinicians argue that a child's use of colour in art reflects their underlying emotional well-being. This study incorporates three easily recognizable colour groups-blue, pink and yellow. These colours align with the principal colours (blue, green, yellow, red) of the Munsell system. Pink colour is

included due to its potential association with bodily tissues.[4]

During a visit to a dental clinic, children encounter unfamiliar individuals, which can present potentially threatening and invasive situations to a child. For those who are more susceptible, adapting to these new experiences may prove challenging, leading to increased anxiety. Notably, behaviours associated with anxiety are acknowledged as the most challenging aspect of guiding children in dental operatory settings.[4] Consequently, it is essential to identify and measure anxiety levels in order to address and manage them effectively.

The objective of this study was to clinically evaluate and compare the effect of chromotherapy on the level of anxiety in patients treated under local anaesthesia infiltration.

A study conducted by Saklecha et al suggested that the patients subjected to blue and pink colour therapy had a statistically significant reduction in anxiety as compared to the control group after chromotherapy and post endodontic treatment ($p<0.05$).[1] However, in the study that we performed it also showed a significant change in the heart rate post chromotherapy when subjected to colour yellow. In earlier studies chromotherapy room was created with the use of long drapes of blue- and pink-coloured cloth for blue and pink groups, respectively, covering the walls and ceiling of the room. Patients were given blue- and pink-coloured goggles according to the group allotment. However, in our study only coloured tinted glasses were given to make the surroundings appear coloured and no changes in the armamentarium was done.

Behavioural management parameters, AES was used to evaluate anxiety. In study conducted by Setty et al. the assessment of dental anxiety using AES demonstrated a significant correlation with VPT, and children expressed a preference for the former due to the absence of confusion with figures, a common issue with VPT cards where certain figures resembled each other and were often challenging to interpret.[2] Additionally, considering the current generation's familiarity with expressing emotions through emojis on social networking applications, AES becomes particularly appealing to young children as it includes animated emoticons.[2] AES was used to measure anxiety and pain associated with different clinical settings in studies conducted by Saklecha et al in the year 2022 and by Umamaheshwari et al.[4] AES was used to measure anxiety and pain in our study as well as, to compare associated feeling with different state of mind in a child.[4]

In control group, the mean AES scores showed significant increase during post local anaesthetic period as compared to pre-op period and the mean difference was statistically significant at $p=0.01$ which is a usual occurrence in a dental set up.

The mean heart rate during post Local Anaesthetic period showed significant difference between 4 groups. In our study multiple comparison of mean difference b/w groups revealed that control group showed significantly higher mean heart rate as compared to blue group, pink group and yellow group and the mean differences were statistically significant at $p=0.03$, $p=0.02$ and $p=0.02$ respectively. However, this clearly shows that the chromotherapy using tinted eye wear has shown significant reduction in anxiety.

Limitations

The children in our study group were randomly assigned into the different groups. We did not take into consideration or classify the children based on their appeal and ability. Further studies can be conducted based on evaluation of each child.

CONCLUSION

The current study demonstrated that chromotherapy plays a pivotal role in anxiety reduction before and during the dental treatment procedure and positive effect on managing dental anxiety in children as indicated by heart rate and anxiety scale. Hence can be effectively incorporated during routine practice. Studies using this concept can be used to assess the anxiety in diverse population with large sample numbers.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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