ORIGINAL RESEARCH PAPER

Paediatric & Preventive Dentistry

INVESTIGATION OF PARENTAL AND CHILD ANXIETY ABOUT DENTAL TREATMENT: A CROSS-SECTIONAL OBSERVATIONAL STUDY

KEY WORDS: Dental Anxiety; Sedation; Melatonin; Nitrous Oxide; Parental Anxiety.

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ABSTRACT

Context: Anxiety affects children's dental experiences and is often influenced by parental fear; clarifying this relationship helps optimise behaviour management in paediatric dentistry. **Aims:** To evaluate parental and child anxiety during dental treatment using Tell-Show-Do, oral melatonin sedation, and nitrous oxide inhalation sedation as behavior management techniques. **Settings and Design:** Cross-sectional observational study of 60 children (5–8 years) and their accompanying parents. **Methods and Material:** Participants received Tell-Show-Do (Group A), oral melatonin (Noctura 3 mg/5 ml; 0.5 mg/kg, max 6 mg; Group B) or N_2O inhalation sedation (MATRX DC; Group C) according to parental choice. Child and parent anxiety were measured with the Modified Child Dental Anxiety Scale (MCDAS) and Modified Dental Anxiety Scale (MDAS), respectively. Parental pulse rate and SpO_2 were recorded at baseline (T0), intra-operative (T1) and 10 minutes post-procedure (T2). **Statistical Analysis used:** Paired t-test, independent t-test and one-way ANOVA; significance set at $p < 0.05$; analyses performed with SPSS v26.0 (IBM). **Results:** Baseline MCDAS and MDAS did not differ significantly between groups. Parents in the oral melatonin and N_2O groups showed significant intra-operative pulse rate reductions versus the TSD group (melatonin $p = 0.000$; N_2O $p = 0.001$). Post-operative pulse rate differences between sedation and non-sedation groups were also significant ($p < 0.005$). No significant intergroup differences were observed for SpO_2. **Conclusions:** Oral melatonin and N_2O inhalation sedation reduced parental physiological indicators of anxiety during paediatric dental treatment and may improve child cooperation and treatment outcomes.

INTRODUCTION

Dental anxiety in children is a considerable issue in Paediatric Dentistry.[1] Dental procedures can be stressful for both children and their parents because of an unfamiliar environment, potential discomfort and uncertainty about the planned interventions. This distress may reduce cooperation and lead to treatment avoidance. Multiple factors, including temperament, prior painful experiences and parental influences, contribute to the development of dental anxiety in children.[2] Parental anxiety plays a major role in transmitting dental fear to children through modelling, verbal warnings and avoidance behaviours.[3] Lechner et al. identified maternal anxiety as a key influence on child behaviour in the dental setting.[4] Although efforts to mitigate children's dental anxiety have advanced, relatively few studies have focused specifically on the burden of anxiety experienced by parents during their child's treatment.[5] Parents' own dental experiences and beliefs often shape their reactions and consequently affect the child's perception of dental encounters.[6] Affrunti et al. reported that higher parental anxiety increases the likelihood of children interpreting situations as threatening.[7] Similarly, Muris et al. found that parental modelling contributes to children's fear responses, with maternal fearfulness influential.[8] Klingberg et al. further highlighted the substantial impact of maternal dental anxiety on the child's development of dental fear.[9] Understanding parental acceptance of behaviour management approaches is important because acceptance itself can reduce apprehension.[10] The Tell-Show-Do (TSD) technique, introduced by Addleston in 1959, remains a core non-pharmacological strategy to familiarise children with the clinical environment and procedures.[11] Radhakrishna et al. demonstrated that TSD improves communication and reduces fear in many young patients.[12] However, introducing pharmacological behaviour management methods can paradoxically increase parental stress in some contexts,4 even though many parents prefer conscious sedation for their children.[13] Nitrous oxide (N_2O) inhalation is widely used because of its anxiolytic properties and rapid recovery profile,[14] while oral sedatives such as midazolam are commonly employed for their anxiolytic efficacy.[15] Melatonin has been explored as an oral option owing to its favourable safety profile and potential anxiolytic effects.[16] Communicating the range of strategies and engaging parents in shared decision-making may increase acceptance and reduce parental anxiety. Identifying parental triggers for anxiety therefore helps clinicians tailor interventions to optimise both parental comfort and child cooperation.[17] This study therefore investigates parental and child anxiety during dental treatment using three distinct behaviour management techniques—TSD, oral melatonin sedation and N_2O inhalation sedation—with validated self-report scales and physiological monitoring to elucidate relationships among management approach, parental anxiety and child cooperation. Ultimately, this research aims to determine the parental and child anxiety associated during the dental treatment with Tell-Show-Do, Oral Melatonin Sedation, and Nitrous Oxide Inhalation Sedation as behavior management techniques.

METHODOLOGY

Study Design:

This was a prospective observational study designed to evaluate the association between parental anxiety and children's dental experiences across three behaviour-management approaches.

Participants:

Children aged 5–8 years requiring pulpectomy and their

accompanying parent or legal guardian were recruited. Inclusion criteria were cooperative or potentially cooperative children without sensory or cognitive impairments and parents willing to provide written informed consent. Exclusion criteria comprised children with significant medical or psychological disorders, contraindications to sedation techniques, or parents/guardians unwilling to consent. Demographic data (child age, sex; parent relationship to child) were recorded for all enrolled dyads.

Ethical Clearance:
The study was approved by the Institutional Review Board (IRB), ITS-CDSR (Approval no.: ITSCDSR/Director-Principal/2024/L011) and conducted in accordance with the Declaration of Helsinki.

Trial Registration: Not applicable (observational study; no interventional trial registration).

Settings and Study Period:
Recruitment and data collection were carried out at the Department of Paediatric and Preventive Dentistry, ITS-CDSR. The observation period extended from December 2023 to March 2024.

Sample Size Determination:
A priori power analysis, assuming a medium effect size (Cohen's d = 0.5), $\alpha = 0.05$ and power $(1 - \beta) = 0.80$ for two-group comparisons, yielded a required sample of approximately 60 participants. Accordingly, 60 parent–child dyads were enrolled and allocated into three groups of 20 each.

Group Allocation:
Allocation to one of three groups was determined by parental choice of behaviour-management strategy at the time of treatment:

- Group A (TSD): Tell-Show-Do behaviour management (n = 20).
- Group B (Oral Melatonin): Oral melatonin sedation — Noctura 3 mg/5 ml; administered at 0.5 mg/kg, maximum 6 mg (n = 20).
- Group C (N_2O inhalation sedation): Nitrous oxide inhalation sedation using the MATRX DC delivery system (n = 20).

Procedures:
After obtaining written informed consent, baseline demographic and clinical data were recorded. Parental anxiety was assessed using the Modified Dental Anxiety Scale (MDAS) (5 items; score range 5–25). Child anxiety was evaluated using the Modified Child Dental Anxiety Scale (MCDAS). Physiological monitoring of accompanying parents included pulse rate and oxygen saturation (SpO_2) measured with a digital pulse oximeter. Measurements were obtained at three time points: baseline on arrival (T0), intra-operatively during the child's treatment (T1) and 10 minutes post-procedure (T2). All clinical procedures (pulpectomy) were performed per standard departmental protocols. For Group B, oral melatonin was administered pre-operatively as per the dosage stated above. For Group C, N_2O was administered and titrated to effect using the MATRX DC system under standard monitoring. Any adverse events were recorded.

Statistical Analysis
Descriptive statistics summarised demographics and baseline anxiety scores (means ± SD). Within-group pre- and post-treatment comparisons were performed using paired t-tests. Between-group comparisons employed independent t-tests and one-way ANOVA where appropriate; post-hoc pairwise comparisons were applied for significant ANOVA results. Statistical significance was set at $p < 0.05$. Analyses were conducted using SPSS v26.0 (IBM).

RESULTS

The study comprised 60 children (mean age: 5.96 ± 0.862 years) and their parents. No significant age differences were observed among children across the three groups, nor between fathers and mothers participating in the study. (Table 1, Graph 1)

Anxiety Scoring Using MCDAS and MDAS
The Modified Child Dental Anxiety Scale (MCDAS) was used to assess baseline anxiety in children. Scores below 19 indicated no state anxiety, scores of 19 or higher signified state anxiety, and scores above 31 suggested a severe phobic disorder. The mean MCDAS score was 20.2 ± 1.225. A comparison of anxiety scores among children across the three groups revealed no statistically significant difference ($p = 0.470$), as illustrated in Table 2. Similarly, Table 3 demonstrates that parental anxiety levels, measured using the Modified Dental Anxiety Scale (MDAS), did not differ significantly among the groups ($p = 0.179$). The MDAS classifications were as follows: scores below 9 indicated mild anxiety, 9–12 represented moderate anxiety, 13–14 signified high anxiety, and 15–25 corresponded to severe anxiety or phobia. Thus based on the MCDAS and MDAS (Parents) pre-treatment assessment questionnaire it was discovered that the participants presented with varied degrees of dental anxiety, although none of them were phobic.

Changes in the Pulse Rate of Parents at T_0, T_1, and T_2
In the Tell-Show-Do group, parents' intraoperative pulse rate increased compared to their preoperative pulse rate, suggesting heightened anxiety; however, the difference was not statistically significant ($p = 0.396$). Although anxiety levels decreased 10 minutes after treatment, this reduction was also not significant ($p = 0.351$). Conversely, in both the oral melatonin ($p = 0.000$) and nitrous oxide inhalation sedation groups ($p = 0.001$), the intraoperative pulse rate showed a significant reduction from the preoperative pulse rate. No significant differences were observed between intraoperative and post-operative pulse rates in either group. When comparing post-operative to pre-operative pulse rates, no significant changes were found in the Tell-Show-Do group. In contrast, both the oral melatonin and nitrous oxide groups exhibited highly significant differences (Table 4, Graph 2). Additionally, no significant differences were observed in SpO_2 levels.

Comparison of the Anxiety Among Parents Between the Groups
The study detected significant differences in intraoperative and post-operative pulse rates across the three groups. Tell Show Do, Oral Melatonin, and Nitrous Oxide Inhalation sedation. Group 1 had the highest pulse rates, followed by group 2 and group 3. SpO2 results were not significant in any group. The Tell Show Do group showed a significant difference in intra-operative pulse rate compared to Oral Melatonin, and a highly significant difference in post-operative pulse rate. (Table 5)

DISCUSSION

Several studies suggests that parental anxiety is transferred to the child, with a parent's fear of dental procedures often leading to increased anxiety in their child [Al-Eheideb and Herman[19], 2003; Doerr et al.[20], 1998; Johansson et al.[21], 1993; Kaczkurkin and Foa[22], 2015]. This phenomenon can be linked to a variety of causes, including children's intrinsic desire to mimic the behaviors of their parents and their dependence on parental cues to determine the safety of unknown environments. As a result, a parent's anxiety about dental procedures typically triggers similar concerns in their children, continuing a cycle of dental anxiety within the family. Understanding this relationship emphasizes the significance of treating parental fear while also applying techniques to ease children's concerns. So, creating a supportive environment conducive to positive dental

experiences for both parents and children. Researches suggest that parental fear and anxiety can impact various aspects of a child's dental care experience, including their perception, cooperation, and overall response to treatment. [Goettems et al.[23], 2012; Keeton et al.[24], 2015; Mills et al.[28], 2015; Stenebrand et al.[26], 2013].

Impact of Behavior Management Techniques

Other than the effect of parental anxiety on child the study explores the impact of Behavior Management Techniques on their anxiety. The present study reveals that there was a decrease in the anxiety of parents during and after the treatment which was done under nitrous oxide inhalation sedation and oral melatonin sedation. This can be due to the fact that their child was sedated and less anxious during the treatment. Also, research indicates that parents generally prefer conscious sedation over other techniques.

The Evaluation of Anxiety Levels

In this study, pre-anxiety levels of both the parent and child were measured using the Modified Dental Anxiety Scale (MDAS) and the Modified Child Dental Anxiety Scale (MCDAS), respectively. Furthermore, physiological parameters, including pulse rate and oxygen saturation of the accompanying parents, were monitored at different time intervals. The study found that parental anxiety levels varied across different behavior management techniques, with intraoperative pulse rates showing significant differences between groups. While the Tell-Show-Do group exhibited increased anxiety levels during the procedure, both oral melatonin and nitrous oxide sedation groups experienced reduced anxiety. Similarly, Patel et al. (2016) found that oral sedation was the most preferred approach among parents, as it resulted in the lowest levels of parental anxiety, followed by general anesthesia, active immobilization, and passive immobilization.[24] On the Contrary, AlQhtani FA et al. (2019) reported that introducing a pharmacological approach to behavior management by Nitrous oxide inhalation sedation and General Anesthesia greatly increased the parent's anxiety levels compared to that of Tell-Show-Do.[5] Differences in results from the present study can be due to the preference and education of the parents about behavior modification techniques. The demographic characteristics of the sample, such as age, cultural background, and previous dental experiences, can also influence anxiety levels.

Clinical Significance of the Study:

Understanding the causes and effects of parental anxiety is essential for designing effective strategies in pediatric dentistry. This study highlights the importance of personalized approaches that manage both parental and child anxiety.

1. Tailored Approaches: The study emphasizes the importance of personalized therapy that precisely addresses parental and child anxiety. Acknowledging that parental anxiety can significantly influence a child's emotional response and behavior during dental procedures, targeted strategies are necessary to address the needs of both the child and the parent effectively.
2. Holistic Care: Understanding parental anxiety allows for a more comprehensive approach to pediatric dental care. By addressing parental anxiety alongside child anxiety, dental practitioners can create a supportive and nurturing environment that fosters positive dental experiences for the entire family unit.
3. Improved Patient Outcomes: Effective management of parental anxiety can lead to improved patient outcomes, including increased compliance with dental treatments, reduced stress during appointments, and enhanced overall satisfaction with dental care services. By prioritizing the mitigation of parental anxiety, dental practitioners can optimize patient outcomes and promote long-term oral health.
4. Enhanced Provider-Parent Communication: Open and transparent communication about parental anxiety can foster trust and collaboration, ultimately leading to more effective treatment planning and better adherence to dental recommendations.

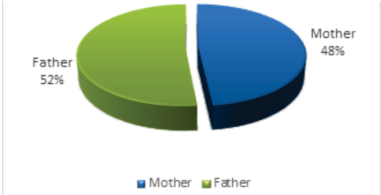
Although this study offers valuable insights into the relationship between parental anxiety and children's dental experiences, several limitations must be considered, as they may influence the interpretation and generalizability of the findings:

1. The study included a relatively small sample of 60 children and their parents, which may limit its representativeness of the broader population. As a result, the findings may not be easily generalized to diverse demographic groups or various clinical settings. Additionally, the study did not acknowledge information on the socio-economic background or cultural diversity of the participants, which could impact anxiety levels and treatment preferences.
2. The participants were selected based on their willingness to undergo dental treatment using specific behavior management techniques. This may introduce selection bias, as parents who are more anxious or have strong preferences for certain techniques may be more likely to participate.
3. Anxiety levels were assessed using self-report questionnaires (MDAS and MCDAS) and physiological measures (pulse rate, oxygen saturation). Although these measures offer valuable insights, they are inherently subjective and may be affected by factors such as social desirability bias or individual differences in anxiety sensitivity. Incorporating objective measures, such as biomarkers or behavioral observations, could enhance the assessment by providing a more comprehensive understanding of anxiety responses.

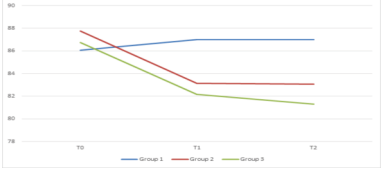
Future research that addresses these limitations could enhance the evidence base for effective strategies to reduce parental and child anxiety in pediatric dentistry, ultimately improving the quality of dental care for young patients and their families.

CONCLUSION

The study underscores the profound influence of parental anxiety on a child's dental experience, highlighting the importance of implementing effective strategies to manage anxiety in both parents and children. It also emphasizes the effectiveness of behavior management techniques, such as oral sedation and nitrous oxide inhalation, in alleviating parental anxiety. Present study emphasizes the importance of tailoring interventions to individual needs and preferences, using validated scales and physiological measurements for comprehensive assessments. The findings have practical implications for Pediatric Dentistry, emphasizing the need for a holistic approach to address parental and child anxiety.



Graph 1: Gender Distribution Among the Parent Population



Graph 2: Changes in Pulse Rate of Parents at T_0, T_1, and T_2 Between Three Groups

Table 1: Age Distribution

	Age (Years) Mean ± SD	p Value (≤0.05= Significant)
Group 1	6.15 ± 0.22094	0.444NS
Group 2	5.8 ± 0.01559	
Group 3	5.95 ± 0.94451	
Total	5.9667 ± 0.86292	

Table: 2 Anxiety Scoring of Children Using MCDAS

	N	MCDAS Mean ± SD	p Value (≤0.05= Significant)
Group 1	20	19.9 ± 1.116	0.470NS
Group 2	20	19.85 ± 0.875	
Group 3	20	20.3 ± 1.162	
Total	60	20.2 ± 1.225	

Table: 3 Anxiety Scoring of Parents Using MDAS

	N	MDAS Mean ± SD	p Value (≤0.05= Significant)
Group 1	20	11.05 ± 1.432	0.179NS
Group 2	20	10.3 ± 1.380	
Group 3	20	10.25 ± 1.682	
Total	60	10.53 ± 1.523	

Table 4: Changes in the Pulse Rate of Parents at T_0, T_1, and T_2

Group	Time Interval	Mean ± SD	p Value
1	Pre-operative to Intra-operative	-0.950 ± 4.893	0.396 NS
	Intra-operative to Post-operative	0.000 ± 4.519	1.000 NS
	Post-operative to Pre-operative	-0.950 ± 4.442	0.351 NS
2	Pre-operative to Intra-operative	4.6 ± 4.235	0.000**
	Intra-operative to Post-operative	0.1 ± 3.093	0.887 NS
	Post-operative to Pre-operative	4.7 ± 6.018	0.002**
3	Pre-operative to Intra-operative	4.6 ± 4.235	0.001**
	Intra-operative to Post-operative	0.85 ± 4.893	0.198 NS
	Post-operative to Pre-operative	5.45 ± 4.235	0.000**

Table 5: Multiple Comparisons

Dependent variables	Group (I)	Group (J)	Mean Difference ± SD (I-J)	p Value (≤0.05= Significant)
Pre Operative Pulse rate	Group 1	Group 2	-1.700 ± 1.486	0.772
		Group 3	-0.700 ± 1.486	1.000
	Group 2	Group 3	1.000 ± 1.486	1.000
Intra Operative Pulse rate	Group 1	Group 2	3.850 ± 1.551	0.048*
		Group 3	4.850 ± 1.551	0.008**
	Group 2	Group 3	1.000 ± 1.551	1.000
Post Operative Pulse rate	Group 1	Group 2	3.900 ± 1.728	0.078
		Group 3	5.700 ± 1.728	0.005**
	Group 2	Group 3	-1.750 ± 1.728	0.946
Pre Operative SpO2	Group 1	Group 2	0.400 ± 0.252	0.355
		Group 3	0.450 ± 0.252	0.240
	Group 2	Group 3	0.500 ± 0.252	1.000
Intra Operative SpO2	Group 1	Group 2	0.250 ± 0.252	0.442
		Group 3	0.000 ± 0.252	1.000
	Group 2	Group 3	-0.250 ± 0.252	0.442
Post Operative SpO2	Group 1	Group 2	0.200 ± 0.155	0.607
		Group 3	-0.050 ± 0.155	1.000
	Group 2	Group 3	-0.250 ± 0.155	0.337

List Of Abbreviations

MCDAS: Modified Child Dental Anxiety Scale
MDAS: Modified Dental Anxiety Scale
TSD: Tell Show Do

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