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Original Article

Dentistry Section

Alteration in Taste Perception among Young Children following the Use of Oral Irrigants in Pulpectomy Procedure: A Randomised Controlled Trial

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ABSTRACT

Introduction: The impact of oral irrigants on taste perception during pulpectomy procedures focuses on how these sensory experiences affect patient comfort and cooperation. This study aims to identify child-friendly irrigants with natural taste profiles that minimise discomfort and enhance procedural success.

Aim: This study evaluated the effects of different oral irrigants-chlorine dioxide, Saline, Chlorhexidine Gluconate, and Sodium Hypochlorite-on taste perception in children undergoing pulpectomy procedures.

Materials and Methods: A randomised controlled trial was conducted at Saveetha Dental College and Hospital from July to December 2024, involving 100 children aged 6-9 years undergoing pulpectomy procedures. Participants were randomly assigned to four groups based on the irrigant used: chlorine dioxide, saline, chlorhexidine gluconate, and sodium hypochlorite. The study assessed taste perception using a 5-point Likert scale and a validated questionnaire at baseline and during the second visit. Demographic parameters such as age, gender, and oral health metrics were recorded to ensure group homogeneity. Statistical analysis included paired t-tests, one-way Analysis of Variance (ANOVA), and effect size estimation, with a p-value of <0.05 considered significant.

Results: Significant differences in taste alteration scores were observed across the four oral irrigants. Chlorine dioxide exhibited the most substantial reduction in taste alteration scores from T0 (2.96±1.24) to T1 (1.40±0.76), followed by Saline (T0: 3.12±1.01; T1: 2.24±1.27). In contrast, chlorhexidine and sodium hypochlorite showed minimal changes between baseline and follow-up scores. ANOVA revealed statistically significant differences in taste perceptions for chlorine dioxide ($p<0.001$), Saline ($p=0.007$), and Chlorhexidine ($p=0.033$), while Sodium Hypochlorite exhibited borderline significance ($p=0.057$). Effect size analysis indicated that chlorine dioxide ($Eta^2=0.398$) had the largest impact, particularly influencing sweetness and bitterness perceptions, which played a crucial role in the overall treatment experience.

Conclusion: The study underscores the importance of selecting irrigants that balance clinical efficacy with sensory acceptability. Chlorine dioxide demonstrated the greatest impact on taste alteration, necessitating the development of paediatric-friendly formulations to enhance patient cooperation and comfort.

Keywords: Dental care for children, Paediatric dentistry, Patient compliance, Sensory thresholds

INTRODUCTION

Pulpectomy, a crucial procedure in paediatric dentistry, is designed to manage infected or necrotic primary teeth and preserve oral health and function. The success of this procedure relies heavily on the use of root canal irrigants, which play an essential role in disinfecting, debriding, and preparing the canal system. However, the sensory effects of these irrigants, particularly their taste, have often been overlooked. In paediatric patients, taste sensitivity significantly influences their comfort, cooperation, and overall experience during treatment, making it an important aspect to address in dental care [1,2].

Each commonly used irrigant offers specific advantages and limitations. Chlorine dioxide (0.1%) is recognised for its strong antimicrobial efficacy and low toxicity, making it a suitable choice for paediatric use [3,4]. Saline (0.9%) is appreciated for its neutral taste and high safety profile, although its antimicrobial effectiveness is limited. Chlorhexidine gluconate (2%) is well-known for its broad-spectrum antibacterial properties and substantivity, but its bitter taste presents challenges in paediatric settings. Sodium hypochlorite (1%), widely utilised for tissue dissolution and microbial eradication, is often associated with an unpleasant taste and potential irritation, making it less tolerable for children [5,6]. Comparing these irrigants in terms of their sensory impact provides valuable insights for enhancing paediatric dental care.

Taste perception, regulated by the gustatory system, involves the detection of five primary modalities: sweet, sour, salty, bitter, and umami. Oral taste receptors are connected to brain regions such as the orbitofrontal cortex and amygdala, which influence emotions, stress, and behaviour [7,8]. Adverse taste experiences, including bitterness or metallic sensations caused by irrigants, disrupt taste bud function and elicit negative reactions in children. These sensory challenges often result in gagging, vomiting, or behavioural resistance, complicating the treatment process and increasing dental anxiety. Optimising the taste profiles of these irrigants is therefore essential for improving cooperation and minimising discomfort during paediatric procedures [9].

Moreover, analysing the taste profiles of these irrigants aligns with the principles of patient-centred care. By understanding the sensory tolerability of different solutions, clinicians are able to make informed decisions that prioritise both efficacy and comfort. This also facilitates the development of new, paediatric-specific irrigants with improved taste profiles, ensuring better acceptance and compliance during treatment. By examining children's responses to the sensory characteristics of these solutions, the study contributes to improving the quality of care in paediatric dentistry and informs future formulations.

While existing literature largely emphasises the antimicrobial efficacy of oral irrigants, there is a gap in comprehensive evaluations of

taste perception changes in children undergoing pulpectomy. This study primarily aims to evaluate the alterations in taste perception induced by various oral irrigants during paediatric pulpectomies and their impact on children's comfort and cooperation. The secondary objective is to provide clinical recommendations for selecting patient-friendly irrigants that minimise discomfort and improve the treatment experience, ultimately enhancing paediatric patient cooperation during pulpectomy procedures. The null hypothesis (H0) states that there is no significant difference in taste perception alterations induced by different oral irrigants, while the alternative hypothesis (H1) suggests that there is a significant difference in taste perception alterations caused by various irrigants.

MATERIALS AND METHODS

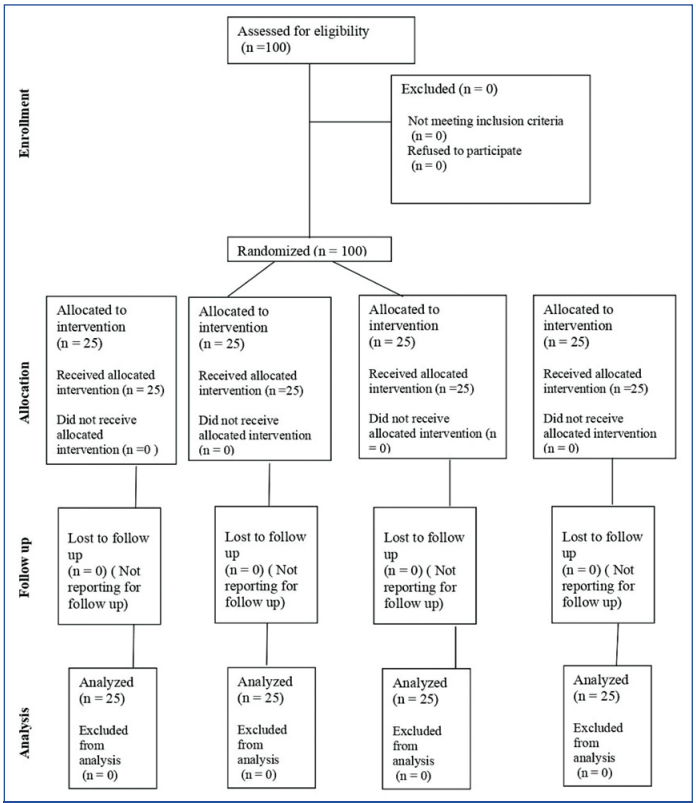
A randomised controlled trial was conducted involving 100 children at the Department of Paediatric Dentistry, Saveetha Dental College and Hospital, Chennai, Tamil Nadu, India, from July to December 2024. The study aimed to evaluate changes in taste perception following the use of various irrigants during pulpectomy procedures. Ethical approval was obtained from the Institutional Ethics Committee (IEC No. IHEC/SDC/UG-1750/24/PEDO/244), and informed parental consent, along with child assent, was secured. Written and informed consent was collected from each participant prior to data collection. All procedures adhered to the Declaration of Helsinki guidelines and were approved by the Institutional Human Ethics Committee Review Board.

Sample size calculation: The power analysis for the present study, using a one-way ANOVA with four groups, indicates that a total sample size of approximately 24 participants is needed to achieve 85% statistical power. The effect size (f) was calculated as 0.7668, suggesting a medium to large effect derived from Lim S et al., as it provided comparable outcome parameters. The significance level (α) was set at 0.05, and the actual power of the study was 85%, meaning there is a good likelihood of detecting a true effect if it exists. The critical F value for the analysis was 2.9011, and the non-centrality parameter was 21.1680, indicating strong statistical reliability for the study. Reducing the sample size to 25 participants per group still allows for a reasonable chance of detecting a true effect, albeit with slightly less confidence than the 95% power scenario [10].

In this randomised controlled trial, a total of 100 children aged 6 to 9 years, with clinical indications for pulpectomy, were included in the study. These participants were equally divided into four groups, with 25 participants in each group, based on the type of irrigant used during the pulpectomy procedure. The groups were as follows: Group 1: Chlorine dioxide (0.1%), Group 2: Saline (0.9%), Group 3: Chlorhexidine Gluconate (2%), and Group 4 (Control group): Sodium Hypochlorite (1%). To ensure unbiased allocation, participants were randomly assigned to each group using a table of random numbers. The study was conducted over two evaluation sessions. Session I (T0) involved the baseline evaluation before pulp therapy, during which access opening was performed and the first irrigation was carried out. Session II (T1) was conducted one week later and included a second irrigation, Biomechanical Preparation (BMP), and obturation during the procedure. This randomisation process helped eliminate any bias in group selection, thereby improving the validity and reliability of the study's findings.

The procedure involved key steps to assess changes in taste perception during the second visit of the paediatric pulpectomy procedure. The BMP was carried out by a blinded investigator, who performed the pulpectomy on the treated teeth. The canals were then cleaned and irrigated with 20 mL of the assigned irrigant. Immediately after irrigation, participants rated the taste intensity using a 5-point Likert scale, where 1 indicated the "worst taste ever" and 5 indicated the "best taste ever." This was followed by a second evaluation after the treatment, during which participants again marked their responses based on personal judgement. A novel prevalidated questionnaire, developed by the author in English and assessed for reliability and validity, guided the evaluation, with a blinded investigator reading and recording the participants' responses. It was used by individuals and children who understood English.

This CONSORT diagram [Table/Fig-1] illustrates a randomised controlled trial involving 100 participants. All participants were found eligible, randomly assigned equally into four groups of 25, and received the assigned interventions. There was no loss to follow-up, and all participants were included in the final analysis without any exclusions.



[Table/Fig-1]: CONSORT flow diagram depicting participant progress through the phases of the randomised controlled trial.

Inclusion criteria:

- Children between the ages of 6 and 9 years.
- No history of taste disorders or any conditions that might alter taste perception.
- Children who could undergo a follow-up for pulpectomy were selected.
- Parental consent and child assent were obtained before participation.
- Ability to comprehend and respond to the taste perception evaluation in the English language.

Exclusion criteria:

- A history of systemic diseases (e.g., cardiovascular, metabolic, or renal diseases), acute upper respiratory tract infections, gastrointestinal disorders (such as acid reflux or recent oral infections), or those currently undergoing drug therapy (e.g., antibiotics, analgesics, or any other medications known to alter taste perception).
- Currently undergoing orthodontic treatment or having recently completed orthodontic procedures.
- Known allergies or hypersensitivity to any of the irrigant solutions used in the study (chlorine dioxide, saline, chlorhexidine gluconate, or sodium hypochlorite).
- Participants unable to understand or respond to the taste evaluation.

- Use of fluoride mouthwash, caffeine, or tea within six hours prior to testing, as these could interfere with taste perception.

Validity and reliability of the questionnaire: The factor analysis conducted for the study on the role of oral irrigants in taste alteration during paediatric pulpectomy demonstrated that the 10 selected questionnaire items were successfully grouped into three constructs: sweetness, bitterness, and overall experience. Items related to sweetness (Questions 1, 4, 7), bitterness (Questions 3, 5, 10), and overall experience (Questions 2, 6, 8, 9) were appropriately clustered, confirming the construct validity of the questionnaire. The Content Validity Index (CVI) was calculated to be 0.80, indicating good content validity, with 12 out of 15 items being deemed relevant by expert paediatric dentists. These findings, along with the content validity assessment, suggested that the questionnaire was both reliable and valid for measuring taste alteration in paediatric pulpectomy. The questionnaire was reviewed by 10 paediatric dentist professors to evaluate its relevance [Appendix 1].

Reliability statistics revealed a Cronbach's Alpha value of 0.829 for the 10-item questionnaire, demonstrating strong internal consistency. This indicated that the items within the questionnaire consistently measured the same construct, ensuring reliable and stable results across respondents. The symmetric measures table showed a Kappa value of 0.825, reflecting a high level of agreement among the 10 paediatric dentist examiners who reviewed the questionnaire. The approximate significance was 0.001, which was statistically significant, confirming that the raters had consistent views on the relevance of the items. This reinforced the excellent inter-rater reliability in evaluating the questionnaire for the study.

Outcome measures: The primary outcome of the study was the change in taste perception before and after the pulpectomy procedure, influenced by the four irrigants (chlorine dioxide, saline, chlorhexidine gluconate, and sodium hypochlorite). This was assessed using a 5-point Likert scale at two time points: baseline (T0) and one week after treatment (T1). The secondary outcome focused on the children's overall experience with the irrigants, evaluating their cooperation and emotional response during the procedure. This was measured through a prevalidated questionnaire that assessed discomfort, acceptability, and sensory experiences, divided into three constructs: sweetness, bitterness, and overall experience.

STATISTICAL ANALYSIS

Data were analysed using Statistical Package for Social Sciences (SPSS) version 27.0. The statistical analysis of this study involved several steps. Descriptive statistics were used to summarise the mean and standard deviation of the taste perception scores for each group at baseline (T0) and follow-up (T1). Factor analysis was conducted to ensure that the questionnaire measured the intended constructs of sweetness, bitterness, and overall experience, confirming its construct validity. A paired t-test was performed to compare taste perception scores between T0 and T1, while a one-way ANOVA was used to compare scores among the four groups (chlorine dioxide, saline, chlorhexidine gluconate, and sodium hypochlorite), with post-hoc tests identifying significant differences. Cronbach's Alpha was used to assess the internal consistency of the questionnaire, and Kappa statistics were calculated to evaluate inter-rater reliability among the paediatric dentists.

RESULTS

The study found significant differences in taste alteration scores across the various oral irrigants used during paediatric pulpectomy. Chlorine dioxide exhibited the most substantial effect on taste perception, followed by chlorhexidine, saline, and sodium hypochlorite, with varying degrees of impact. Paired t-tests revealed significant changes in taste perception for all irrigants, with the largest effect observed for chlorine dioxide. The ANOVA results for the ten taste-related questions highlighted significant differences in perceptions of sweetness, bitterness, and pleasantness, while taste attributes such as soreness and irritation had a lesser effect. Effect size analyses indicated that sweetness and bitterness had the most substantial influence on the overall treatment experience. The participants had a mean age of seven years (SD=2.16), with 48% male children (n=48) and 52% female children (n=52).

The ANOVA results evaluating taste alteration scores across the four oral irrigants used in paediatric pulpectomy revealed statistically significant differences among the groups. At baseline (T0), the mean taste alteration scores were 2.96±1.24 for chlorine dioxide, 3.12±1.01 for saline, 4.44±1.61 for chlorhexidine, and 4.68±0.47 for sodium hypochlorite. At the one-week follow-up (T1), the scores changed to 1.40±0.76 for chlorine dioxide, 2.24±1.27 for saline, 4.64±1.22 for chlorhexidine, and 4.52±0.71 for sodium hypochlorite. These results suggest that chlorine dioxide and saline led to a marked reduction in taste perception over time, whereas chlorhexidine and sodium hypochlorite showed minimal change. Post-hoc Tukey analysis confirmed that chlorhexidine and sodium hypochlorite were associated with significantly higher taste alteration scores compared to chlorine dioxide and saline, emphasising the importance of irrigant choice in minimising postoperative taste disturbances in children. Eta-squared tends to slightly overestimate the proportion of variance explained, particularly in small samples, whereas epsilon-squared offers a more conservative and less biased estimate. Omega-squared is generally considered the most accurate and least biased measure of effect size [Table/Fig-2].

S. No.	Variable	Mean±SD	F-value	p-value
Baseline (T0)				
1.	Chlorine dioxide	2.96±1.24	14.59	<0.001
2.	Saline	3.12±1.01		
3.	Chlorhexidine	4.44±1.61		
4.	Sodium hypochlorite	4.68±0.47		
One week after treatment (T1)				
1.	Chlorine dioxide	1.40±0.76	63.57	<0.001
2.	Saline	2.24±1.27		
3.	Chlorhexidine	4.64±1.22		
4.	Sodium hypochlorite	4.52±0.71		

[Table/Fig-2]: Comparison of taste alteration scores at baseline and one week post-treatment among oral irrigants using ANOVA and Tukey post-hoc test.
*Test applied: One-way ANOVA; *p-value <0.05 is statistically significant; S. No.: Serial number; F: F-ratio; Sig.: Significance level (p-value)

The paired t-test results for the study comparing taste perception before (T0) and after (T1) the use of different oral irrigants revealed significant changes in all groups. Chlorine dioxide showed the largest effect, with a significant difference (t=5.54, p<0.0001). Chlorhexidine also produced a significant change (t=4.11, p<0.0001). Saline demonstrated a moderate effect, with a significant difference (t=2.28, p=0.032). Sodium hypochlorite exhibited a moderate change as well, with a significant result (t=2.57, p=0.017). Overall, all irrigants caused significant changes in taste perception, as each irrigant influenced taste intensity to different extents, as indicated by the statistical significance [Table/Fig-3].

Paired t-test (T0-T1)	Mean difference	95% CI of difference (lower, upper)	t	df	Sig. (2-tailed)
Chlorine dioxide	1.56	(0.96,2.16)	5.54	24	p<0.001
Saline	0.88	(0.20, 1.56)	2.28	24	0.032
Chlorhexidine	0.20	(-0.56, 0.96)	4.11	24	p<0.001
Hypochlorite	0.16	(-0.13, 0.45)	2.57	24	0.017

[Table/Fig-3]: Paired t-test results comparing taste perception before and after use of oral irrigants.
*Test applied: Paired t-test (T0–T1); mean difference, CI: Confidence interval; t: t-value; df: Degrees of freedom; Sig. (2-tailed) - p-value for two-tailed test <0.05 is statistically significant

[Table/Fig-4] displays the ANOVA results for ten questions assessing taste alteration during paediatric pulpectomy. It highlights significant differences for the following questions: "I liked the sweet taste of the solution used during my treatment" (p=0.001), "I found the solution to be bitter" (p=0.001), "I found the solution to be pleasant" (p=0.003), "The flavour of the solution was more palatable for me" (p=0.014), and "I think the taste of the solution was the best part of my overall experience" (p=0.021). Other questions, such as "The sour taste of the solution was enjoyable for me" (p=0.142), "I prefer the solution to taste sweeter over other flavours" (p=0.388), and "The taste of this solution was irritating and made me feel the treatment lasted longer" (p=0.056), showed no significant differences.

S. No.	Question	Sum of squares (between groups)	df	Mean square	F	Sig.
1	I liked the sweet taste of the solution used during my treatment.	9.882	1	9.882	12.859	p<0.001
2	The sour taste of the solution was enjoyable for me.	2.724	1	2.724	2.231	0.142
3	I found the solution to be bitter.	14.637	1	14.637	20.298	p<0.001
4	I prefer the solution to taste more sweet over other flavours.	1.241	1	1.241	0.76	0.388
5	I found the solution to be more salty.	0.657	1	0.657	1.183	0.282
6	I found the solution to be more pleasant.	10.14	1	10.14	9.958	0.003
7	The flavour of the solution was more palatable for me.	8.537	1	8.537	6.516	0.014
8	I think the taste of the solution was the best of my overall experience.	6.98	1	6.98	5.729	0.021
9	I would recommend having the solution with the flavour once again.	5.442	1	5.442	3.586	0.064
10	The taste of this solution was irritating and made me feel the treatment was longer.	3.593	1	3.593	3.841	0.056

[Table/Fig-4]: ANOVA results for taste perception questions during paediatric pulpectomy.
*Test applied: One-way ANOVA; S. No.: Serial number; df: Degrees of freedom, F: F-ratio (test statistic); Sig.: Significance level (p-value <0.05 is statistically significant), Mean square: Average of sum of squares per degree of freedom

The effect sizes for the ten questions related to taste alteration during paediatric pulpectomy were measured using Eta-squared, Epsilon-squared, and Omega-squared to assess the magnitude of the relationship between various taste attributes and the overall treatment experience. Each measure estimates the proportion of variance explained by the treatment in ANOVA. Questions regarding sweetness (Q1) and bitterness (Q3) of the solution exhibited larger effect sizes (Eta-squared of 0.215 and 0.302, respectively), indicating a stronger impact on the experience. Other questions, such as those regarding sourness (Q2), saltiness (Q5), and irritation (Q10), showed smaller effect sizes, reflecting a more modest influence on the treatment experience. Overall, the results suggest that sweetness and bitterness significantly influenced participants' perceptions, while other taste attributes had a lesser effect.

DISCUSSION

Oral irrigants are essential in paediatric pulpectomy procedures for cleansing and disinfecting root canals, which is crucial for treatment success. However, these irrigants can alter taste perception in young children, potentially causing vomiting and behavioural issues that may hinder the completion of the procedure. As research in this area is limited, it is important to recognise that changes in taste perception can occur. Creating a supportive and child-friendly environment during treatment is vital to improve both clinical outcomes and the overall experience for young patients [11].

In this study, significant differences were found in taste alteration scores across the various oral irrigants used during paediatric pulpectomy, with chlorine dioxide having the most substantial effect on taste perception, followed by chlorhexidine, saline, and sodium hypochlorite, thus rejecting the null hypothesis. Sweetness and bitterness were the key taste attributes influencing the overall treatment experience. Meanwhile, the study by Ilangovan DG and Govindaraju L aimed to identify the preferred irrigants for primary teeth pulpectomy. It found that the combination of saline and EDTA was most effective in smear layer removal and was preferred due to its biocompatibility and minimal adverse effects, though it did not specifically alter taste [12].

The study by Rolls ET et al., revealed that young participants exhibited stronger neural responses in the agranular insula and anterior midcingulate cortex to disliked vegetable juice, reflecting its unpleasantness, while areas associated with pleasantness, such as the amygdala and orbitofrontal cortex, showed reduced activation compared to orange drinks, highlighting age-related differences in food acceptability [13].

The study by Timothy CN et al., found saline to be the most commonly used irrigant in primary teeth pulpectomies, particularly for single-visit treatments, with sodium hypochlorite being the least used. This highlights the preference for saline, especially in younger patients, as an irrigant solution [14]. Toonen J et al., conducted a randomised clinical trial assessing user preferences for fluoride mouthwashes and reported that participants favoured less astringent, more palatable solutions, which directly influenced their willingness to continue use, highlighting the importance of taste in long-term compliance [15]. Similarly, Braud and Boucher, through a systematic review, emphasised that intraoral trigeminal-mediated sensations significantly affect taste perception during dental procedures, as many irrigants stimulate somatosensory nerves and contribute to altered flavour perception [16]. Midwood highlighted the broader clinical implication of multi-sensory experiences in dentistry, suggesting that enhancing sensory comfort-including taste-can improve the overall treatment experience and patient satisfaction [17].

This study found that different oral irrigants affected taste perception, with chlorine dioxide having the most substantial impact, particularly influencing sweetness and bitterness. The work of Mennella and Bobowski highlights that children have a natural preference for sweet tastes and a strong aversion to bitterness, which is biologically protective. These taste preferences influence their experiences during dental treatments and shape their dietary choices, which can impact their overall health and behaviour [9].

Gokul G and Lakshmanan R conducted a study involving 100 patients to assess the impact of chlorhexidine mouthwash on taste perception. Their results demonstrated that taste alteration occurred, with 63% of participants reporting a moderate decrease and 4% a severe decrease in bitterness, while 58% reported a mild decrease and 26% a severe decrease in saltiness perception. These observations emphasise the potential sensory side effects associated with chlorhexidine use and the importance of considering patient comfort when prescribing oral rinses [18].

A systematic review by Alkuhl H et al., links genetic taste sensitivity (via the PROP test) to dental caries risk, showing that non tasters-who are less sensitive to bitterness-have higher DMFT/DMFS scores. This suggests that taste preferences may influence caries development. The findings support future research combining genetic testing with dental treatments to assess how taste sensitivity affects children's responses to irrigants [19].

Proactive counselling, including clear instructions, can greatly enhance the effectiveness of pre-appointment parental guidance in managing uncooperative children. By informing parents and children in advance about potential taste alterations from dental materials-such as irrigants or anaesthetics-and aligning this with the child's known taste preferences, clinicians can reduce fear and anxiety. Providing pre-appointment counselling instructions helps children feel more prepared and in control, thereby improving cooperation and comfort during treatment [20].

A study using surface electromyography found that different tastes affect chewing muscle activity, revealing a connection between taste and muscle function, which is important for children's comfort during dental procedures. Understanding the link between taste and muscle activity can help tailor paediatric dental care-especially when using flavoured materials like irrigants-by selecting taste profiles that promote better muscular relaxation and reduce discomfort, ultimately improving treatment compliance and experience in young patients [21].

The studies by Forestell CA and Coe J et al., helped to enhance our understanding of how children develop taste preferences, which is useful when choosing dental irrigants for children. Coe J et al., found that when young children explore different foods using their senses in a fun and positive way, they become more open to trying new tastes. Forestell's research showed that babies exposed to certain flavours in the womb or through breast milk are more likely to accept those flavours after birth. This suggests that if dental irrigants taste more like flavours children are already familiar with-such as sweet or fruity ones-they may feel more comfortable and cooperative during treatment. Creating a calm and positive environment when using these irrigants can also make a significant difference in how well children accept them [22,23].

This study excluded the use of a rubber dam to avoid interfering with taste perception, as rubber dams can block the tongue's contact with solutions used, making it harder for children to properly sense flavours. This might cause discomfort or affect their responses, especially when taste perception is being studied. Children aged six to nine were chosen for the study instead of younger ones, as they have more developed taste senses and can better differentiate between sweet, sour, salty, and bitter flavours. They are also more capable of understanding questions and providing accurate answers, thereby making the data more reliable [24-27].

Clinicians should consider clinical recommendations advising on strategies to mitigate taste alteration. Irrigants can be used effectively with careful management to minimise taste-related discomfort; however, practitioners should be mindful of their potential to cause bitterness and discomfort, particularly in children who are sensitive to taste alterations. Since taste alteration is a significant concern in children, pre-procedural counselling for both parents and children is essential. Explaining the potential for taste alterations can help manage expectations and improve the overall treatment experience.

Limitation(s)

The reliance on subjective taste perception data, which can vary greatly depending on individual sensitivity, mood, prior experiences, and psychological factors, presents several challenges. The sample size and demographic focus may not adequately represent the broader paediatric population, affecting the robustness and generalisability of the findings. Cultural, dietary, and genetic differences may also influence taste perception, acting as confounding variables. Future research should aim to include a larger and more diverse sample, control for these variables, assess long-term effects on treatment compliance, and explore alternative formulations. The integration of objective taste testing methods (e.g., chemical taste threshold analysis) alongside subjective evaluations can enhance the accuracy and reliability of results.

CONCLUSION(S)

This study explored the impact of taste perception alterations caused by oral irrigants during paediatric pulpectomy, highlighting the significant role of sweetness and bitterness in shaping the treatment experience. Chlorine dioxide was identified as having the most pronounced effect, emphasising the need for more patient-friendly formulations. While the findings offer valuable insights, further research is needed to understand the long-term effects and generalise the results across diverse populations. Incorporating clinical efficacy with enhanced patient comfort will guide the development of improved practices in paediatric dentistry.

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APPENDIX 1

Taste Preference Evaluation Questionnaire for Children

Q1. I liked the sweet taste of the solution

Q2. The sour taste of the solution was enjoyable

Q3. I found the solution to be bitter

Q4. I prefer the solution to taste more sweet

Q5. I found the solution to be more salty

Q6. I found the solution to be more pleasant

Q7. The flavour of the solution was more palatable

Q8. I think the taste of the solution was the best of my experience

Q9. I would recommend having the solution again.

Q10. The taste was irritating and made the treatment feel longer.

Q11. The taste of the solution was too strong for me (Didn't directly align with the main objective of measuring general taste perception)

Q12. I felt comfortable with the taste of the solution (Overlapped with existing questions in terms of assessing the overall acceptability)

Q13. I found the solution to be refreshing ("Refreshing" is a subjective term and could be interpreted differently by participants, making it harder to quantify or link to the specific taste attributes that the study aimed to measure).

Q14. The taste of the solution made me feel nauseous (Didn't directly align with the main objective of measuring taste perception during the procedure)

Q15. The solution's taste did not bother me at all (Overlapped with existing questions in terms of assessing the overall acceptability or comfort level with the taste).

Instructions: Please circle the option that best describes how you feel about each statement.

1. **Strongly Disagree;**
2. **Disagree;**
3. **Neutral;**
4. **Agree;**
5. **Strongly agree**

The five additional questions were likely excluded due to their redundancy with existing questions, limited relevance to the primary study focus, and potential participant fatigue. Some questions overlapped with constructs already assessed, while others could have evoked unnecessary negative emotions, such as nausea. Additionally, including too many questions may have reduced the sensitivity of the measure or led to less accurate responses, particularly in the paediatric population.