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Color preference and management of pediatric patients using multi-colored dental restorative materials: A cross-sectional observational study

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Abstract
Background: The management of pediatric patients during dental treatment is crucial for promoting positive attitudes and reducing anxiety. This study aimed to evaluate the color choice preferences for multi-colored dental restorative materials in pediatric patients and assess the impact of color selection on their attitude towards dental treatment.
Methods: A cross-sectional observational study was conducted in the Department of Pediatric and Preventive Dentistry, Jaipur, over a two-month period. A total of 60 systemically healthy children aged 4 to 8 years were included. Prior to treatment, the children completed a questionnaire consisting of 10 questions regarding color choice preferences. The children were divided into five groups based on their preferred color: white, pink, blue, green, and yellow. Restorations were performed using the child's preferred color.
Results: The highest color preference (35%) was observed in the pink color restoration group (Group 2). Additionally, 20% of children preferred tooth-colored restorations. The lowest color preference (5%) was found in the yellow color restoration group (Group 5).
Conclusion: The results of this study suggest that pediatric patients have varying color preferences for dental restorative materials. Pink color restorations were the most preferred, followed by blue, white, green, and yellow. Allowing children to choose their preferred restoration color can positively impact their attitude towards dental treatment, enhancing their cooperation and reducing anxiety. The findings highlight the importance of incorporating patient preferences in pediatric dental care to promote a positive dental experience and improve treatment outcomes. Further research is warranted to explore additional factors influencing color preferences and their potential impact on treatment acceptance and long-term maintenance of restorations.

Keywords: Pediatric dentistry, dental restorative materials, color preference, behavior management, dental anxiety, cooperation, treatment

Introduction
Dental fear and anxiety are common challenges encountered in pediatric dentistry, often resulting in non-compliance, poor oral health outcomes, and an increased burden on both the child and the dental healthcare provider. Restorative dental procedures, such as dental fillings, can be particularly distressing for pediatric patients, further exacerbating their anxiety and making it difficult to deliver optimal care. To address this issue, innovative approaches have been explored, including the use of multi-colored dental restorative materials, with the aim of enhancing children's acceptance and cooperation during dental treatment.
The preference for colors is a deeply rooted aspect of human psychology and can significantly influence individual experiences and perceptions. In the context of pediatric dentistry, incorporating colors into restorative materials offers a promising avenue for managing dental anxiety and improving treatment outcomes. By allowing children to choose their preferred colors for their restorations, dental professionals can empower them, increase their sense of control, and potentially alleviate anxiety associated with the dental treatment process.
The use of multi-colored dental restorative materials has gained attention due to their potential to create a more child-friendly and appealing dental environment.

These materials often exhibit glitter effects, vibrant colors, or combinations of colors that mimic popular cartoon characters or playful designs.This approach not only transforms the dental experience into a more engaging and enjoyable one for children but also serves as a valuable communication tool, allowing dental professionals to establish rapport, build trust, and establish a positive dental attitude from an early age.

While the implementation of multi-colored dental restorative materials has shown promise in enhancing pediatric patients' acceptance and cooperation, the specific color preferences among children and their impact on treatment outcomes require further investigation. Understanding which colors are most preferred by pediatric patients can inform dental practitioners in selecting appropriate restorative materials that align with children's preferences, thereby facilitating a more positive and collaborative treatment experience.

In light of these considerations, this cross-sectional observational study aims to explore the color preferences of pediatric patients regarding multi-colored dental restorative materials. By examining the choices made by children in relation to different colors, this study aims to provide valuable insights into the management of pediatric patients, improve treatment outcomes, and contribute to the development of patient-centered approaches in pediatric dentistry.

Materials and Methods

Study Design: This cross-sectional observational study was conducted at the Department of Pediatric and Preventive Dentistry, Rajasthan Dental College and Hospital, Jaipur, India.

Ethical Considerations: Ethical clearance was obtained from the institutional ethical committee board prior to the initiation of the study. Informed consent was obtained from the parents or guardians of the participating children, after explaining the details of the dental procedure and study objectives.

Participants: A total of 60 children, aged 4 to 8 years, who presented to the Department of Pediatric and Preventive Dentistry, Jaipur, were selected for the study. The participants were chosen based on specific inclusion and exclusion criteria.

Inclusion Criteria

- Primary molars requiring restorative treatment.
- Children aged 4-8 years.
- Teeth showing no pulp involvement.
- Moderate occlusal caries.

Exclusion Criteria

- Anterior teeth.
- Healthy teeth without caries.
- Grossly decayed teeth.
- Systemically ill children.
- Children with special needs.

Group Allocation: The participants were divided into six groups based on their acceptance of preferred color restorations. The groups and corresponding restorative materials used were as follows:

Group 1: White (tooth-colored Filtek Z350 nanocomposite).
Group 2: Pink (Voco Twinky Star Compomer).
Group 3: Blue (Voco Twinky Star Compomer).
Group 4: Green (Voco Twinky Star Compomer).
Group 5: Yellow (Voco Twinky Star Compomer).

Restorative Procedure

1. Rubber dam isolation was performed to isolate the affected tooth in all selected participants.
2. Carious lesions were removed using a rotating high-speed handpiece, and the cavity was prepared.
3. Prior to the final restoration, an acid etchant (Prime Dental Etching Liquid) and bonding agent (Ivoclar Vivadent Te-Econom Bond) were applied to the prepared cavity, following the manufacturer's instructions.
4. Restorations were performed using the child's preferred colored restorative material. Each layer of the restorative material was polymerized for 40 seconds using an LED light-curing device.
5. Occlusion was checked using articulating paper, and adjustments were made as necessary.

Data Analysis: The collected data was tabulated and analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 22.0 for Windows (IBM Corp., Armonk, NY, USA). The level of significance was set at $p<0.05$.

Results: A total of 60 children aged 4-8 years were included in the study. Among them, 35 children (58.3%) were in the age group of 4-6 years, and 25 children (41.7%) were in the age group of 7-8 years.

Table 1: A total of 60 children aged 4-8 years were included in the study

Age group	No. Of children	Percentage
4-6 years	35	58.3%
7-8 years	25	41.7%
Total	60	100.0%

Regarding gender distribution, 34 children (56.7%) were female, while 26 children (43.3%) were male. This indicates a higher inclination of girls towards colored restorations compared to boys.

Table 2: A higher inclination of girls towards colored restorations compared to boys

Gender	No of children	Percentage
Male	26	43.3%
Female	34	56.7%
Percentage	60	100.0%

The color preference for dental restorations varied among the children. The highest preferred color was pink, chosen by 21 children (35%). It was followed by blue, preferred by 17 children (28.3%). White was the third preferred color, chosen by 12 children (20%). Green and yellow were less preferred colors, chosen by 7 children (11.7%) and 3 children (5%) respectively.

Table 3: The color preference for dental restorations varied among the children

Groups/ color of restoration	No. Of children	Chi. Square	Df	P value
Group 1: white	12	17.77	4	0.00
Group 2: pink	21			
Group 3: blue	17			
Group 4: green	7			
Group 5: yellow	3			
Total	60			

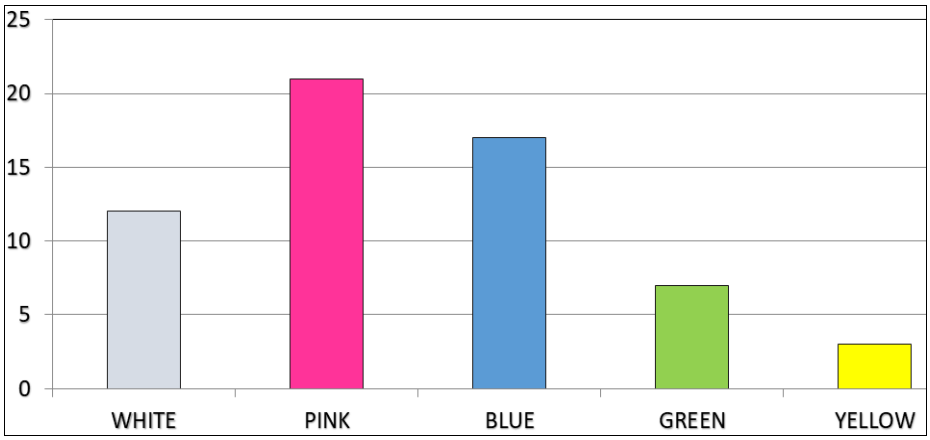

Fig 1: The color preference for dental restorations varied among the children

Statistical analysis using chi-square test revealed significant differences in color preferences among the groups ($p< 0.05$). The distribution of color preferences across age groups also showed some variations, but the differences were not statistically significant (p> 0.05).

Table 4: Statistical analysis using chi-square test revealed significant differences in color preferences among the groups (p < 0.05)

Groups		Age group		Total	Chi square	DF	P value
		4-6 years	7-8 years				
Group 1: white	Count	8	4	12	3.52	4	0.47
	% of count	13.3%	6.7%	20.0%			
Group 2: pink	Count	9	12	21			
	% of count	15.0%	20%	35.0%			
Group 3: blue	Count	12	5	17			
	% of count	20%	8.3%	28.3%			
Group 4: green	Count	4	3	7			
	% of count	6.7%	5.0%	11.7%			
Group 5: yellow	Count	2	1	03			
	% of count	3.3%	1.7%	5.0%			
Total	Count	35	25	60			
	% of count	58.3%	41.7%	100.0%			

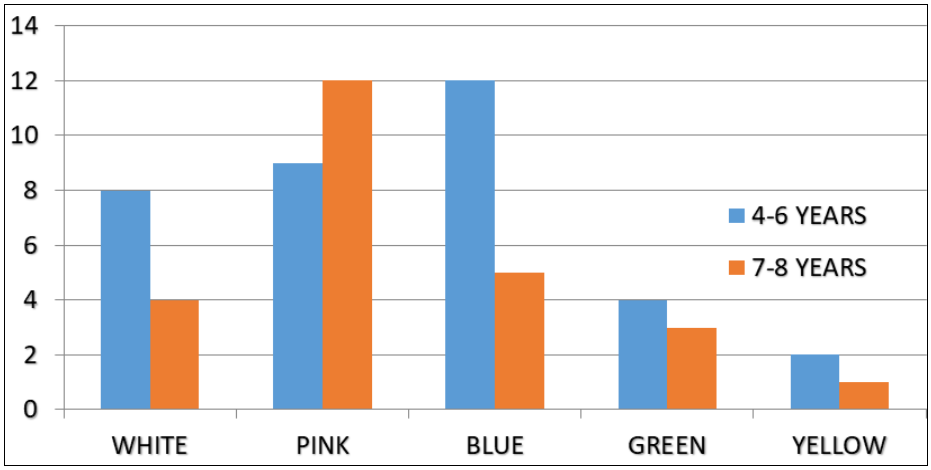

Fig 2: Statistical analysis using chi-square test revealed significant differences in color preferences among the groups ($p < 0.05$)

These findings suggest that pink-colored restorations were the most preferred by pediatric patients, followed by blue, white, green, and yellow. The color preference for dental restorations can play a role in managing pediatric patients and improving their acceptance of dental treatment.

Please note that these results are based on a cross-sectional observational study and further research with a larger sample size and longitudinal design is needed to validate these findings.

Discussion

The present cross-sectional observational study aimed to evaluate the color preference and management of pediatric patients using multi-colored dental restorative materials. Dental fear and anxiety are common issues among children, leading to avoidance of dental visits and compromised oral health. Restorative dental procedures can be particularly challenging for children, often resulting in increased anxiety and negative experiences. Therefore, the use of multi-colored restorative materials has been proposed as a strategy to alleviate anxiety, improve cooperation, and enhance the overall dental experience for pediatric patients.

The results of this study were consistent with previous research conducted by Nicholson, Güngör *et al*., Melebari *et*

al., Juliet and Gurunathan, and Fishman *et al*. These studies also reported a significant tendency among children to choose multi-colored restorations over conventional tooth-colored restorations. The high clinical success rates of colored compomers, which are commercially available and have attractive colors due to the addition of glitter particles, make them a suitable alternative for restoring primary teeth.

The findings of this study revealed interesting insights into the color preferences of pediatric patients when it comes to restorative materials. Among the participants, the highest color preference was observed for pink-colored restorations, followed by blue, white, green, and yellow. These results indicate that children have varied preferences for colors, and the use of a diverse range of multi-colored restorative materials can cater to individual preferences and enhance patient satisfaction. Pink-colored restorations were the most preferred choice, which could be attributed to its association with femininity and cultural influences. The high preference for blue-colored restorations may be linked to its calming and soothing effect, as blue is often associated with tranquility and relaxation.

It is worth noting that tooth-colored restorations were also preferred by a significant proportion of the children in this study. This finding highlights the importance of offering a range of options to cater to individual preferences. While multi-colored restorative materials may have their advantages in reducing anxiety and enhancing acceptance, it is crucial to consider the preferences and desires of each child. Some children may still prefer a more natural-looking restoration, and the clinician should take this into account when selecting the appropriate material.

The use of multi-colored restorative materials in pediatric dentistry has several potential benefits. Firstly, it can empower children by allowing them to actively participate in the decision-making process. When children are given the opportunity to choose the color of their restorations, it instills a sense of control and ownership over their dental treatment, ultimately reducing their anxiety and fear. Secondly, the vibrant and visually appealing nature of multi-colored restorative materials can create a positive and enjoyable dental experience for children. The use of glitter effects in these materials adds an element of fun and excitement, further enhancing the child's engagement and cooperation during the treatment.

Implementing multi-colored restorative materials in pediatric dental practices may require additional considerations. Dentists and dental teams should ensure that these materials are safe, durable, and biocompatible for use in the oral cavity of pediatric patients. It is essential to follow the manufacturer's instructions regarding the proper handling and application of these materials to ensure optimal clinical outcomes. Regular monitoring and evaluation of the longevity and performance of multi-colored restorations are also necessary to assess their effectiveness and durability in the long term.

While this study provides valuable insights into the color preferences of pediatric patients, it is important to acknowledge certain limitations. The study was conducted at a single dental institution, which may limit the generalizability of the findings to other populations or settings. Additionally, the study focused solely on color preference and did not assess the long-term clinical outcomes or patient-reported outcomes related to the use of multi-colored restorative materials. Future research should explore these aspects to gain a more comprehensive understanding of the impact and effectiveness of these materials in pediatric dental care.

In conclusion, the findings of this study suggest that pediatric patients exhibit diverse color preferences when it comes to multi-colored dental restorative materials. Pink-colored restorations were the most preferred choice, followed by blue, white, green, and yellow. The use of multi-colored restorative materials has the potential to improve the management of pediatric patients by reducing anxiety, enhancing cooperation, and providing a positive dental experience. Dentists should consider incorporating these materials into their clinical practice while taking into account individual preferences and ensuring the safety and durability of the restorations. Further research is warranted to evaluate the long-term clinical outcomes and patient-reported outcomes associated with the use of multi-colored restorative materials in pediatric dentistry.

Conclusion

The findings of this cross-sectional observational study highlight the preference for multi-colored restorative materials over conventional tooth-colored restorations among pediatric patients. The use of colored restorations, particularly Twinky star compomer, was well-received and favored by the participants.

The ease of manipulation and placement, along with the favorable consistency of Twinky star compomer, contributed to its selection as the material of choice for colored restorations in pediatric patients. Its efficient handling characteristics, including reduced sticking and shorter polishing time, make it suitable for use in dental procedures involving children.

By allowing children to actively participate in the decision-making process and choose the color of their restorations, this study aimed to cultivate a positive attitude towards dental treatment. Empowering children with the authority to select their preferred color may help create a sense of ownership and anticipation for their dental appointments, potentially improving their overall experience and cooperation during treatment.

It is important to note that this study focused solely on color preference and management using multi-colored restorative materials in pediatric patients. Further research is warranted to explore the long-term durability, clinical performance, and psychological impact of these restorations on children's dental experiences.

In conclusion, incorporating multi-colored restorative materials, such as Twinky star compomer, into pediatric dental practices can enhance the acceptance and engagement of young patients, promoting positive dental experiences and potentially reducing anxiety associated with dental treatments.

Conflict of Interest

Not available

Financial Support

Not available

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