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ORIGINAL ARTICLE

Colored Compomers in Pediatric Dentistry Practice: Can Personality Profile, Parenting Style and Socioeconomic Factors Influence Preference?

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ABSTRACT

Objective: To investigate the preference of parents/caregivers and their children regarding using colored compomer (Twinky Star®, Voco, Germany) as a restorative option and factors associated with its choice. **Material and Methods:** A dental mannequin containing colored compomers and traditional materials (composite resin, glass ionomer cement, and amalgam) was presented to 260 pairs of adults and children aged 5-11 years, who were examined for dental caries to verify the preference of dental materials in two public health services. The parenting style and child personality profiles were assessed. Bivariate analysis and Poisson regression were performed. **Results:** Most adults (74.2%) preferred traditional materials, and family income (p=0.001) and educational level (p<0.001) were associated with this choice. Age up to 7 (p<0.001) was a variable associated with children's choice of colored restorations (72.3%). Children younger than seven years old showed a prevalence of choosing colored compomers 1.20 times higher than their older counterparts. In contrast, adults with children younger than seven years old and less than 11 years of education presented 1.74 and 2.17 higher prevalence of choosing colored compomers, respectively. **Conclusion:** Caregivers with higher educational levels showed more excellent resistance to colored restorations, and children younger than seven years old had better acceptance of the material with playful proposals.

Keywords: Compomers; Composite Resins; Glass Ionomer Cements; Dental Materials; Pediatric Dentistry.

Introduction

Dentists' choice of restorative material is part of the successful treatment [1]. However, the patient usually does not participate as an active agent in this decision despite being the most interested in the definition of the treatment plan [2,3].

Few studies assess the perception of individuals in this choice [4-6]. However, the preference for these dental materials is an exciting point to study, especially considering child patients whose choices depend on their caregivers. Regarding this clinical subject, psychosocial factors such as personality profiles, lifestyles, and sociodemographic and economic characteristics may impact the selection of restorative materials [7].

Various restorative materials are available in pediatric dentistry [8-10]. Among the different restorative options, compomer emerged as an alternative proposal to use composite resins or glass ionomer cement in the expectation of associating mechanical resistance and fluoride release [11]. Colored compomers were introduced in the dental market in the early 2000s. One of these products is the Twinky Star® compomer (Voco, Cuxhaven, Germany), characterized as a radiopaque, light-curing material with a shiny effect during brushing, resulting from the different attractive colors for children [12]. The commercialization of this product occurred in Brazil around 2018, with the proposal to arouse the interest of the child population to enable better acceptance and collaboration during dental treatment and greater cooperation for the maintenance of favorable oral hygiene [13].

Considering the challenge of the management of children's behavior for pediatric dental treatment, this multicolored compomer can be a restorative option for deciduous teeth by presenting a playful and motivational aspect, with the possibility of acting as an auxiliary tool in the control of fear and anxiety related to dental procedures [6].

In the past years, the main concern for repairing teeth due to caries experience was the reparation of form and masticatory function [14]. Therefore, non-aesthetic restorations (e.g., amalgam) were the main restorative material [15]. Over time, aesthetics and the desire for white teeth, in combination with the evolution of dental materials, highlighted the search for aesthetic restorative materials, especially in adult people [9]. On the other hand, in pediatric dentistry, the new colored material is emerging as a restorative alternative that can be an interesting resource in pediatric clinical practice [6,13].

Therefore, the investigation of the preference of parents/caregivers and children regarding the use of this colored compomer Twinky Star® (Voco, Cuxhaven, Germany) as a possible restorative material of choice, as well as the factors associated with its choice becomes the purpose of this present study.

Material and Methods

Study Design and Ethical Clearance

A comparative cross-sectional observational study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [16] guidelines. The present study was approved by the Research Ethics Committee from the Federal University of Minas Gerais, Brazil (protocol# 48809321.3.0000.5149).

Study Population

The study was developed in two different health public services located in the metropolitan region of the city of Belo Horizonte, Brazil: Civil Police Hospital situated in Belo Horizonte, Brazil, and Dental Specialty

Center (SUS - Unified Health System) located in Contagem, Brazil. Considering socioeconomic differences, these locations were selected to broaden the perception of public preference.

Individuals were randomly selected from March 2022 to March 2023. Sociodemographic data, parental style, child personality profile, and dental caries were collected to verify the preference for colored or traditional restorative materials, according to the preference of children and their parents or caregivers.

The sample of this cross-sectional study was comprised of 260 children, aged between 5 and 11 years old, of both sexes, who received pediatric dental treatment and respective parents/caregivers. As non-inclusion criteria, children with cognitive alterations reported by their caregivers, as well as parents/caregivers with cognitive alterations or incapable of understanding the instruments applied, were considered.

A sample size calculation was performed based on the pilot study, and the parameters used were parents/caregivers and children's preference in relation to restorative materials, assuming a 5% significance level and 80% study power, reaching a value of n=130 for each of the groups tested.

Data Collection

The studied dependent variable was the preference for colored compomer or traditional restorative materials for both children and their parents/caregivers.

Different instruments checked the independent variables. The Brazilian version of the Parents' Style and Dimensions Questionnaire (PSDQ) was applied to determine the parenting style [17]. Still, the Brazilian version of the Eysenck Personality Questionnaire Junior (EPQ-J) was selected to assess child personality profiles only for parents/caregivers of children aged between 5 and 6 years old [18]. Furthermore, a questionnaire prepared by the researchers was developed to collect economic and sociodemographic data, and dmtf / DMTF indexes were used to register dental caries [19].

The validated Brazilian version of the Parents' Style and Dimensions Questionnaire (PSDQ) is a self-report instrument for parents to measure the parenting styles of school children [17]. This instrument presents 32 questions and assesses parenting styles such as indulgent/democratic, authoritarian, and permissive [20], and the questions use a five-point response scale [21]. Yet, the Brazilian version of the Eysenck Personality Questionnaire Junior (EPQ-J) is based on the model of the three super factors, known as the PEN model (Psychoticism, Extraversion, and Neuroticism), consisting of 19 items and answered on a three-point scale [18].

The preference for restorative materials was applied to children aged between 5 and 11 years in the dental environment and similarly to their parents/caregivers. To this, participants observed a dental mannequin containing occlusal-proximal restorations made with different materials: resin-modified glass ionomer Riva Light Cure® (SDI, Bayswater, Australia), composite resin Filtek Z250® (3M ESPE, St. Paul, USA), amalgam Permite® (SDI, Bayswater, Australia) and colored compomers Twinky Star® (Voco, Cuxhaven, Germany), present in deciduous molars. The restorative options were divided into two groups: 1) colored compomers: pink, green, yellow, gold, blue, and orange of the Twinky Star® compomer and 2) traditional materials, including amalgam, resin, and resin-modified glass ionomer (Figure 1). After this step, parents/caregivers answered specific questionnaires regarding subjective measurements.

All children were submitted to caries detection using the dmft for deciduous teeth and the DMFT index for permanent teeth following the WHO guideline [19]. Calibration was performed by an *inlux* training. Kappa values were obtained within a period of 7 days, obtaining outstanding reliability (intra and inter-examiner values were 1.00 and 0.90, respectively).

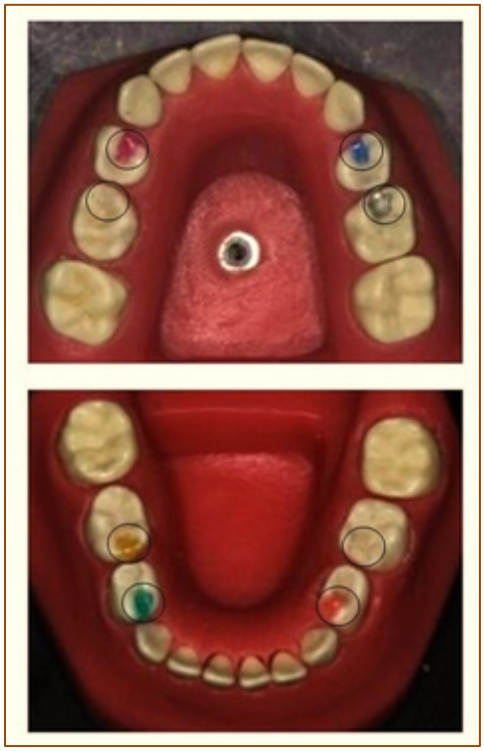

Figure 1. Restorative materials were used in the study.

Statistical Data Analysis

All collected data were transcribed into a database, and analyses were performed using the statistical software SPSS for Windows, version 24.0 (IBM Corp, Armonk, NY, USA). Data were analyzed descriptively, using frequencies and percentages for categorical variables and mean and standard deviation for numerical measures. For inferential analysis, Pearson's Chi-Square statistical tests and Fisher's exact test were used for categorical variables and the Mann-Whitney test for quantitative variables after concluding the Kolmogorov–Smirnov normality test ($p<0.001$). Variables with $p<0.05$ were considered associated with the outcome. Multivariate analysis was performed using the Poisson regression model, considering the prevalence ratio as the measure to be interpreted. The variables that presented $p<0.20$ in the unadjusted model were incorporated into the adjusted model. Variables that presented $p<0.05$ were considered significantly associated with the outcome. The confidence interval was 95%.

Results

The characterization of the adult population of parents/caregivers studied in the two different public health services is presented in Table 1. The sample consisted predominantly of female participants, involving greater maternal participation. The brown race was predominant among the interviewees, who presented democratic as their main parental style. The median parameter was used to define the cutoff point for educational level and family income.

The characterization of the child population included in the study can also be observed in Table 1. There was a similar distribution between the sexes, with a mean age of around seven and well-distributed personality profiles among the different types. Previous caries experience was identified in deciduous teeth in most of the population, in contrast to the experience in permanent teeth.

Table 1. Characterization of the participants and preference for restorative materials.

Variables	N (%)	Mean (SD)
Caregiver's Gender		
Male	63 (24.20)	
Female	197 (75.80)	
Caregiver Age		40.26 (9.87)
Caregiver Color		
White	71 (27.30)	
Brown	138(53.10)	
Black	43 (16.50)	
Yellow	8 (3.10)	
Parenting Style (PSDQ)		
Authoritarian		2.03 (0.58)
Democratic/Authoritative		4.28 (0.44)
Permissive		2.5 (0.67)
Family Income/Month		
≤4 BMW† (US$941.35)	134 (51.50)	
>4 BMW† (US$941.35)	126 (48.50)	
Caregiver Education		
≤ 11 years of study	148 (57.00)	
> 11 years of study	112 (43.00)	
Caregiver's Favorite Restorative Material		
Colored	67 (25.7)	
Traditional	193 (74.2)	
Child's Gender		
Male	63 (24.20)	
Female	197 (75.80)	
Child Age		7.43 (2.01)
Child Personality Profile (EPQ-J)		
Psychoticism		5.80 (3.97)
Neuroticism		5.61 (4.22)
Extroversion		5.87 (3.90)
Child Caries Experience		
Deciduous teeth††	125 (56.30)	
Permanent teeth§	21 (10.09)	
Child's Favorite Restorative Material		
Colored	154 (72.3)	
Traditional	72 (27.7)	

†BMW: Brazilian Minimum Wage; ††dmtf n=184; §DMTF n= 156.

Considering the restorative materials selected for the study, parents/caregivers preferred traditional materials instead of colored materials, which were more unwanted by the public. On the other hand, the opposite context was observed in the child population. Analyzing different factors possibly associated with the preference of the adult population for restorative materials (traditional or colored), it was possible to verify that parents/caregivers responsible for children aged 7 years or older (p=0.006), with higher monthly family income (p=0.001) and with a higher level of education (p<0.001) had a preference for traditional restorative materials (Table 2). Regarding the preference for the same restorative materials (traditional or colored) by the child population, children under 7 years of age (p<0.001) or without previous restorative experience in permanent teeth (p=0.026) showed a greater preference for colored restoratives (Table 2).

In the multivariate analysis regarding children's preference, individuals younger than seven years old showed a prevalence of choosing colored compomer 1.20 times higher than their older pairs (PR=1.20; 95% CI 1.01-1.44; p=0.037) (Table 3).

Table 2. Bivariate analysis regarding parents/caregivers and children.

Variables	Traditional N (%)	Colored N (%)	p-value
Parents/Caregivers' Preference			
Child's Gender†			
Male	102 (73.0)	37 (26.6)	0.777
Female	91 (75.2)	30 (24.8)	
Child Age†			
< 7 years old	97 (67.4)	47 (32.6)	0.006
≥ 7 years old	96 (82.8)	20 (17.2)	
Caregiver Age†			
< 40 years old	100 (71.4)	40 (28.6)	0.320
≥ 40 years old	92 (77.3)	27 (22.7)	
Family Income/Month†			
≤4 BMW ‡	87 (64.9)	47 (35.1)	0.001
>4 BMW ‡	106 (84.1)	20 (15.9)	
Caregiver Race†			
White	59 (83.1)	12 (16.9)	0.056
Non-White	134 (70.9)	55 (29.1)	
Caregiver Education†			
≤ 11 years of study	97 (65.5)	51 (34.5)	<0.001
> 11 years of study	96 (85.7)	16 (14.3)	
Parenting Style (PSDQ)§ Mean (SD)			
Authoritarian	1.98 (0.57)	1.97 (0.57)	0.814
Democratic/Authoritative	4.31 (0.39)	4.22 (0.49)	0.325
Permissive	2.51 (0.70)	2.45 (0.73)	0.469
Children's Preference			
Child's Gender†			
Male	43 (30.9)	96 (69.1)	0.215
Female	29 (24.0)	92 (76.0)	
Child Age¶			
< 7 years old	27 (18.8)	117 (81.3)	<0.001
≥ 7 years old	45 (38.8)	71 (61.2)	
Family Income/Month†			
≤4 BMW‡	34 (25.4)	100 (74.6)	0.408
>4 BMW‡	38 (30.2)	88 (69.8)	
Caregiver Education†			
≤ 11 years of study	39 (26.4)	109 (73.6)	0.675
> 11 years of study	33 (29.5)	79 (70.5)	
dmtf ††			
Absence of caries	29 (29.9)	68 (70.1)	0.360
Presence of caries	30 (24.0)	95 (76.0)	
DMTF‡‡			
Absence of caries	52 (27.8)	135 (72.2)	0.026
Presence of caries	11 (52.4)	10 (47.6)	
Personality Profile (EPQ-J)§ §§			
Psychoticism	8.20 (3.01)	7.71 (3.36)	0.525
Neuroticism	2.72 (2.69)	1.60 (2.03)	0.060
Extroversion	0.97 (0.59)	1.07 (0.60)	0.491

Fisher's exact test; ‡BMW: Brazilian Minimum Wage; §Mann-Whitney test; ¶Chi-Square test; ††dmtf n=184; ‡‡DMTF n= 156; §§Only for 5-6 years old children.

Considering the multivariate analysis results regarding the preference of parents/caregivers, parents whose children were younger than seven years old had a prevalence of choosing colored compomers 1.74 times higher than older children (PR=1.74; 95%CI: 1.10-2.75; p=0.017). Yet, parents/caregivers that have less than 11 years of education present a prevalence of choosing colored compomers 2.17 higher when compared to their counterparts (PR=2.17; 95%; CI: 1.30-3.63; p=0.003) (Table 4).

Table 3. Multivariate model of the association between independent variables with children's preference for colored compomers.

Variables	Children's Preference for Restorative Materials	
	PR† Adjusted (95% CI‡)	p-value*
Child Age		
< 7 years old	1.20 (1.01-1.44)	0.037
≥ 7 years old	1.00	
DMTF		
Absence of caries	1.44 (0.91-2.27)	0.118
Presence of caries	1.00	

†PR: Prevalence ratio; ‡CI: Confidence interval; *Poisson regression with robust variance.

Table 4. Multivariate model of the association between independent variables with parents' preference for colored compomers.

Variables	Parent's Preference for Restorative Materials	
	PR† Adjusted (95% CI‡)	p-value*
Child Age		
< 7 years old	1.74 (1.10-2.75)	0.017
≥ 7 years old	1.00	
Caregiver Color		
White	0.69 (0.40-1.19)	0.178
Non-White	1.00	
Caregiver Education		
≤ 11 years of study	2.17 (1.30-3.63)	0.003
> 11 years of study	1.00	

†PR: Prevalence ratio; ‡CI: Confidence interval; *Poisson regression with robust variance.

Discussion

The present study sought to explore participants' basis of material selection, focusing on colored compomers. Although it possibly represents the proposal of being an interesting restorative option due to its motivational nature, there is limited scientific evidence supporting its benefits, especially considering aspects of the patient's attitude and perception [7,22]. However, it is also important to highlight the possibility that using these restorative materials could stimulate the creation of conditions for carrying out additional restorations, negatively impacting oral health. In this context, it is important to conduct additional studies evaluating caries' prevalence in younger patients who prefer colored restorative materials, especially those with low income.

The universe of colors is wide and fascinating and influences the impression registered by the human eye, generally arousing the interest of children. In this present investigation, colored materials attracted the attention of children participants, who showed a greater preference for this restorative material. Akhlaghi et al. [7] and Maciel et al. [4] also found similar results corroborating our findings. On the other hand, Fishman et al. [22] detected that the children's public primarily opted for composite resin, despite the alternative of selection by colored compomers, but highlighted, however, the preference of younger children for this material.

The ludic resource is considered an essential tool during dental treatment, especially for young patients. Still, children like colors, and the opportunity to select the color of the restorative material can represent a collaborative factor in reducing anxiety [23]. Yet, exploring colors and brightness has a more significant effect on younger children.

In our results, children under seven years of age preferred colored restorations, demonstrating the influence of this variable on the selection of colored compomers. Other studies also reported this outcome,

considering that age has an important effect on color preferences [2,24]. Accordingly, the opinion may change as children age, corroborating our findings [7] (Table 2).

On the other hand, sex was not associated with material preference. This observation contrasts with the study by Fishman et al. [22] that noted a greater preference of boys for colored compomers, while girls showed a propensity for tooth color restorative material. This finding may support the hypothesis regarding the aesthetic appeal of girls, specifically their dental appearance [25].

Regarding socioeconomic features, family income and parents/caregivers' education were variables associated with a greater preference for traditional materials. These findings are in accordance with other recent investigations where college-graduate parents showed a lower acceptance of silver diamine fluoride than their limited education counterparts [2,26-28]. These results reflect the relationship between social status and esthetic demand. Furthermore, other authors reported a similar finding analyzing composite resin or glass ionomer cement, verifying a greater preference of adults for restorations that presented aesthetic similarity to the natural teeth color [2,4,7,22].

In part, The children's opinions and choices are influenced by their parents/caregivers. In dental clinical practice, selecting the type of restorative material to be used depends on the parents' approval, who strongly influence this choice process, especially considering the similarity or difference in tooth color [4]. Thinking on this subject, this study also investigated the influence of parenting style and personality traits on preferences for different restorative materials.

As verified, neither parenting style nor the different categories of child personality profiles were associated with restorative choices. Despite these results, the analysis of this possible influence stands out as an essential point since the child replicates, in his opinion, the concepts established in his environment, reflecting much of the parents' opinion [4]. In addition, it is interesting to consider that the psychological characteristics presented by young individuals are in the process of formation, with greater susceptibility to changes throughout the life cycle, which could make questionable any association in this aspect [18].

Another important variable analyzed was the experience of caries in children. To this, individuals free of caries in permanent teeth showed a greater preference for colored restorative material than those who had caries experience. Previous contact with other previously known materials may have represented an influencing factor linked to this choice process, considering older children. Avşar and Tuloglu [29] pointed out a different attitude of children, which allows some to prefer restorative materials that are invisible to tooth color. In contrast, others demonstrate satisfaction with the option of colored material. Fishman et al. [22] also emphasized that the subjective aesthetic standard is a relevant aspect children consider when selecting restorative materials.

It is relevant to highlight that the study was carried out considering a local sample and that the choice of restorative material is multifactorial and may be influenced by different contexts, including regional and cultural aspects. This limitation must be considered when interpreting the results. Additional research involving different populations would be desirable.

Conclusion

Children had greater acceptance of colored materials while adults had greater acceptance of traditional materials; younger children accepted the material better with a playful proposal, and parents/caregivers with higher educational levels showed greater resistance to using colored restorations.

Authors' Contributions

FVB	https://orcid.org/0000-0003-1746-2685	Conceptualization, Methodology, Formal Analysis, Investigation and Writing - Original Draft.
CBB	https://orcid.org/0000-0003-4849-8779	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft and Writing - Review and Editing.
MAP	https://orcid.org/0000-0002-3396-4688	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft, Writing - Review and Editing, Visualization and Supervision.

All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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