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Exploring Influences on Children's Behavior toward Dental Prophylaxis

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Authors' contributions

This work was carried out in collaboration among all authors. Author MEDRR wrote the first draft of the manuscript, performed the statistical analysis, managed the analyses of the study, reviewed and edited the final version of the manuscript. Author LEO performed the statistical analysis. Authors NA and CAMD wrote the first draft of the manuscript and managed the literature review. Authors RR, LFA, DSBdO, DCdL managed the formal analysis and supervised the manuscript. Author HdSG designed the study, managed the formal analysis and reviewed, edited and supervised. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Children's behavior can vary according to several factors associated with individual characteristics and external factors such as social and family issues. This study aimed to analyze and compare the behavior of children undergoing dental prophylaxis using a low-rotation handpiece versus a toothbrush, while also examining the relationship with their oral health status, as well as demographic and socioeconomic factors.
Study Design: This was a cross-sectional study.
Place and Duration of Study: The study included children aged between 4 and 12 years who were seen at the Pediatric Dentistry clinic of the Faculty of Dentistry at the Federal University of Alfenas (UNIFAL-MG) from March to July, 2023.
Methodology: These questions were evaluated using Frankl's Behavior Rating Scale, to assess children's behavior, the DMFT/dmft index to assess the oral condition, and a questionnaire to assess socioeconomic and demographic conditions. The data was analyzed using IBM SPSS software version 22.0 ($P<0.05$), using the Kruskal-Wallis and Chi-Square tests.
Results: A total of 153 children were included, 52.3% (n=80) of whom underwent prophylaxis using toothbrush. The mean age of the children was 7.62 (±2.32) years, of which 53.6% (n=82) were male. In this analysis, an association was observed between definitely negative behavior with children of single parents (P=.01), with higher severity of caries disease (P=.02), with a greater number of decayed teeth (2.39 (±3.26), P=.005), with a high DMFT index (5.13 (±3.50), P=.04) and with children who had primary teeth (P=.01).
Conclusion: The method of dental prophylaxis did not significantly impact the children's behavior in this sample. However, children who exhibited uncooperative behavior had more decayed teeth and worse oral condition severity. Knowing this, it is possible to choose some methods more accurately so that the child feels more welcome at the first visit, such as the use of management techniques like the tell-show-do technique, the modeling technique and also the use of distractions, such as videos, books and other media.

Keywords: Child behavior; dental prophylaxis; oral health; pediatric dentistry.

1. INTRODUCTION

Child behavior corresponds to how children express their feelings and identify through actions and reactions [1]. It is in childhood that behavioral patterns are shaped, and it can be said that they are reflections of the child's experience, influenced by the environment in which they are inserted, ranging from family relationships, genetics, socioeconomic condition, quality of life to adverse situations that occur around them [2-4].

The prevalence of negative behavior in Brazilian children during dental care varies between 9.3% and 66.6% [5], which has been associated with fear, anxiety and dental stress [5]. These characteristics develop in childhood and can therefore link these negative feelings to dental treatment difficulty [6,7].

Children who have never had negative experiences with dentists are more likely to show positive behavior than children who have had negative experiences [8,9]. However, other factors that can also influence children's behavior during dental care, such as the professional's posture, way of acting and speaking, the office environment, the duration and complexity of the treatment, as well as other external factors, such as age, socioeconomic issues and family relationships [4,9].

A study of 118 preschool children on child behavior during the first dental experience found that the variables that most influenced behavior were child anxiety, maternal anxiety, past experience of pain by the child, the child's age and previous medical experiences. It was found that children over 54 months old, who were not anxious, were born to mothers with a low level of anxiety, had never experienced toothache and had positive previous medical experiences, were more likely to behave positively at the first appointment [4].

Therefore, dental care for children is complex, given the need to understand them in an integral way, inserted in their context and reality, to understand which factors may be associated and influence their behavior, especially during the consultation, so that treatment can be a

welcoming and peaceful moment. Thus, this study was carried out in an attempt to understand the possible factors that may be related to children's behavior during dental care, whether there was a difference when using low rotation or a toothbrush to carry out prophylaxis, and to understand how the condition of oral health, specifically the presence of caries, and the socioeconomic and demographic conditions can also serve as an influencing factor.

2. METHODOLOGY

2.1 Ethical and Legal Considerations

A cross-sectional study was carried out at the Pediatric Dentistry Clinic of the School of Dentistry at the Federal University of Alfenas-MG (UNIFAL-MG), in which the behavior of 153 children between the ages of 04 and 12 was evaluated.

Before starting the study, the children and their parents/guardians were invited and agreed to take part in the study and signed the Informed Consent Form (ICF), as did the children themselves, by filling in the Informed Consent Form, for literate children, and Consent Form for non-literate children. Those children and guardians who did not agree with the terms, or who did not fit into the ASA classification and age group were excluded from the study.

2.2 Data Collection

Socioeconomic and demographic conditions: After agreeing to take part and filling in the consent form, the parents/guardians answered some questionnaires, which referred to socioeconomic data and issues related to the child's health [10].

Dental caries: After signing a consent form, the children underwent dental prophylaxis. After this, an intraoral clinic examination was carried out using a flat mouth mirror number 5, a WHO probe, and clinical tweezers (Golgran, São Caetano do Sul, São Paulo- Brazil), by previously trained and calibrated professionals (kappa=.85) to assess the dmft/DMFT index [11].

Children's behavior: At the end of the procedure, the Frankl's Behavior Rating Scale was used to analyze the children's behavior, which was answered by the professional who performed the prophylaxis.

Frankl's Behavior Rating Scale [12] is commonly used in pediatric dentistry to assess a child's behavior during dental visits. It helps the reader understand how cooperative a child is and guides the dentist in managing their care. The scale also categorizes a child's behavior into four distinct groups:

Rating 1- Definitely Negative (- -): The child is completely uncooperative, often crying, screaming, or showing intense fear and resistance.

Rating 2- Negative (-): The child is uncooperative but not as intense as in Rating 1. They might be reluctant, fearful, and not willing to comply with instructions, though not completely disruptive.

Rating 3 - Positive (+): The child is generally cooperative, follows instructions with some reservation, but is relatively calm and willing to undergo the treatment.

Rating 4 Definitely Positive (+ +): The child is completely cooperative, enjoys the interaction, and may even actively engage in the dental procedure, showing interest and enthusiasm.

This scale is widely used because it's simple yet effective in assessing and managing children's behavior during dental procedures.

2.3 Data Analysis

The data obtained was tabulated and recorded in a Microsoft Excel 365 speadsheet, version 16.72 [13]. Descriptive and bivariate analyses were then carried out using IBM SPSS version 22.0 statistical software [14], with a significance level of 5% and the Kruskal-Wallis and Chi-Square tests, enabling the study variables to be compared. The Jamovi software [15] version 2.3 was used to create the graphs.

In order to assess the presence and severity of caries, the variable was dichotomized into three different groups. The first was the "caries-free" group, corresponding to children who had no caries lesions, the second was "low severity" group which had 1 to 5 caries lesions, and the third 'high severity" group, corresponding to those with more than 5 caries lesions [16].

The age of the child was also a variable that was dichotomized into two groups, the first with children up to 6 years old, and the second with children over 6 years old. In addition, the oral health condition was divided according to the type of dentition. The first group included children with deciduous teeth, the second, mixed dentition, and the third, only permanent teeth.

3. RESULTS AND DISCUSSION

The sample consisted of 153 children-parents/guardians. Within the group of children, 53.6% (n=82) were male and the mean age of the participants was 7.62 (±2.32) years. They were divided into two groups according to age: the first group was made up of children up to 6 years old (23.5%, n=36), and the second, corresponding to the majority (76.5%, n=117), was made up of children over 6 years old.

Among the group of parents/legal guardians, the most prevalent sex was female (88.2%, n=135), with a mean age of 35.58 (±9.43) years (Table 1). Most guardians were married (43.1%, n=66) and single (35.9%, n=55), 9,2% were separated (n=14), 5.2% were widowed (n=8), 5.2% answered as other (n=8), and the rest (1.3%) did not want to or could not answer (n=2). The mean family income was R$2530.85 (±1811.48) (Table 1).

The majority received prophylaxis using a toothbrush (52.3%, n=80). An analysis of the children's oral health condition showed that the mean number of decayed teeth was 2.39 (±3.26) per child, with a DMFT index of 5.13 (±3.50) teeth. The children were divided into three groups according to the type of dentition, deciduous (23.5%, n=36), mixed (69.9%, n=107) and permanent (6.5%, n=10). According to the severity of the caries disease, they were divided into three groups. The majority (49,7%, n=76) were considered to be of low severity (1 to 5 caries lesions), followed by 30.7% (n=47) children who were caries-free, and 19.6% (n=30) with high severity (more than 5 caries lesions).
There was a higher prevalence of children with positive behavior (79.7%, n=122), followed by definitely positive behavior (15%, n=23) negative behavior (2.6%, n=4) and definitely negative behavior (1.3%, n=2). Two children were excluded from the analysis for not carrying out the procedure (1.3%).

No statistically significant association was found between the respondent's age (*P*=.52, Kruskal-Wallis), gender (*P*=.83, Chi-Square) and family income (*P*=.05, Kruskal-Wallis) and the child's behavior. When analyzing the respondent's marital status in relation to the child's behavior, it can be seen that this may influence the child's behavior during dental care, with a statistically significant association (*P*=.01, Chi-Square). The children who showed the most definitely negative behavior (3.7%) and negative behavior (1.9%) were the children of single parents and the negative behavior of others (12.5%) (Table 2).

When associating age in years (*P*=.12, Kruskal-Wallis) and group (*P*=.06, Chi-Square), the child's sex (*P*=.99, Chi-Square) and the way in which prophylaxis was carried out (P=.36, Chi-Square) with the child's behavior, no statistically significant relationship was obtained. On the other hand, the relationship between the oral health condition and the child's behavior during dental care was found to be statistically significant with the number of decayed teeth (*P*=.005, Kruskal-Wallis) (Fig. 1) and the total DMFT (*P*=.04, Kruskal-Wallis) (Fig. 2), with the severity of caries (*P*=.02, Chi-Square), as well as with the child's type of dentition (*P*=.01, Chi-Square) (Table 2).

This study evaluated children's dental behavior in relation to prophylaxis procedures using low rotation and toothbrushes. It was found that children's behavior is associated with their parents' marital status and child's oral health condition, especially the presence of caries.

Table 1. Descriptive characteristics of the research participants and their association with the child's behavior

Variables	Mean (SD)	*P*-value
Children		
Age	7.62 (±2.32)	.12
Tooth decay	2.39 (±3.26)	.005*
dmft/DMFT	5.13 (±3.50)	.04*
Adults		
Age	35.58 (±9.43)	.52
Family income	2530.85 (±1811.48)	.05

*Source: Author (2024). *Statistically significant association using the Kruskal-Wallis test*

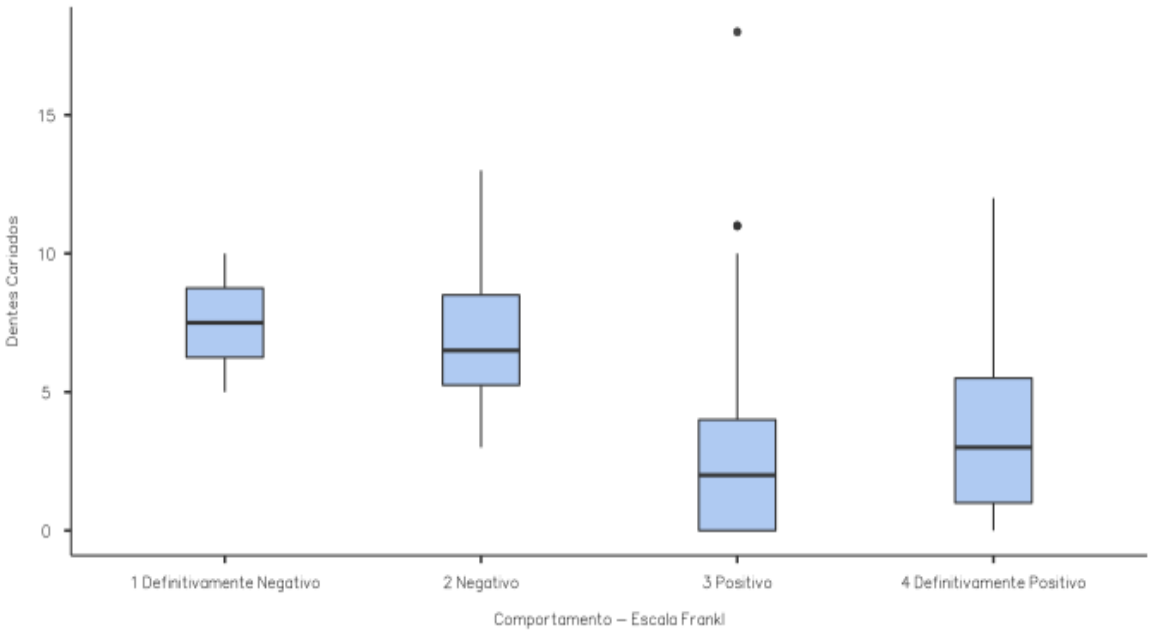

Fig. 1. Comparison between the child's behavior (Frankl Scale) and the number of decayed teeth

Source: Author (2024). Kruskal-Wallis test Box Plot

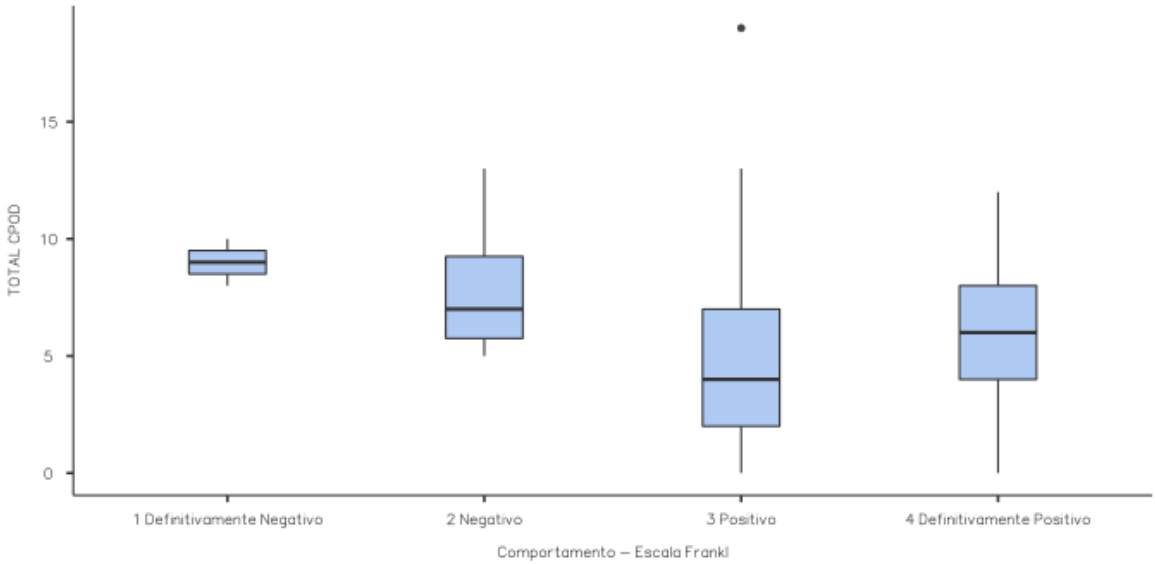

Fig. 2. Comparison between the child's behavior (Frankl Scale) and the DMFT index

Source: Author (2024). Kruskal-Wallis test Box Plot

A positive association between oral health status and behavior was observed, in which the poorer the oral health, the worse the behavior, obtaining results similar to other authors [17-18], when they found that all the children who did not cooperate with the extraction procedure were those who had at least one decayed deciduous tooth. Other studies relating fear to behavior have also observed that children with greater experience with dental caries have higher levels of fear [19-23], which can affect behavior.

Analyzing the age of the children, even though this study showed no significant association between age and behavior, it can be seen that children up to six years old had more definitely negative and negative behavior than older children, which may be related to the association found between the type of dentition and the children's behavior, where those who had definitely negative behavior were only the children who had deciduous teeth, and the highest percentage of negative behavior as well, compared to those who had mixed or permanent dentition. In this respect, some authors report that age can interfere with behavior [24-28], in which they say that the younger the child, the more likely they are to exhibit negative behavior. This is because they may feel unprotected and threatened, demonstrating the child's relationship of maternal dependence on the mother [29], which is associated with the type of dentition as younger children have milk teeth.

Some studies have analyzed the biological sex of children in relation to their behavior and found that the variables were not associated [17,27-28,30-33], similar to the research that also found no relationship between the two factors. However, there are studies that show that girls may have more frequent behavioral changes, due to their greater sensitivity to pain and fear, showing the relationship between pain, fear, gender and behavior [31-33]. However, as shown in the results, it can be seen that, for this study, regardless of the gender of the child, whether female or male, they were not affected in their behavior.

Table 2. Association between independent variables and children's behavior

Variables	Child Behavior				*P*-value
	Definitively Negative	Negative	Positive	Definitively Positive	
Children					
Age					.06
≤ 6 years	2.9% (n=1)	8.6% (n=3)	74.3% (n=26)	14.3% (n=5)	
>6 years	0.9% (n=1)	0.9% (n=1)	82.8% (n=96)	15.5% (n=18)	
Sex					.99
Female	1.4% (n=1)	2.9% (n=2)	81.4% (n=57)	14.3% (n=10)	
Male	1.2% (n=1)	2.5% (n=2)	80.2% (n=65)	16.0% (n=13)	
Prophylaxis					.36
Low rotation	2.7% (n=2)	1.4% (n=1)	79.5% (n=58)	16.4% (n=12)	
Toothbrush	0% (n=0)	3.8% (n=3)	82.1% (n=64)	14.1% (n=11)	
Severity					.02*
Caries free	0% (n=0)	0% (n=0)	93.5% (n=43)	6.5% (n=3)	
Low severity	1.3% (n=1)	1.3% (n=1)	78.7% (n=59)	18.7% (n=14)	
High severity	3.3% (n=1)	10.0% (n=3)	66.7% (n=20)	20.0% (n=6)	
Dentition					.01*
Deciduous	5.7% (n=2)	8.6% (n=3)	71.4% (n=25)	14.3% (n=5)	
Mixed	0% (n=0)	0.9% (n=1)	82.1% (n=87)	17.0% (n=18)	
Permanent	0% (n=0)	0% (n=0)	100% (n=10)	0% (n=0)	
Parents/guardians					
Sex					.83
Female	1.5% (n=2)	3.0% (n=4)	80.5% (n=107)	15.0% (n=20)	
Male	0% (n=0)	0% (n=0)	83.3% (n=15)	16.7% (n=3)	
Marital status					.01*
Marriage	0% (n=0)	3.0% (n=2)	84.8% (n=56)	12.1% (n=8)	
Single	3.7% (n=2)	1.9% (n=1)	79.6% (n=43)	14.8% (n=8)	
Separate	0% (n=0)	0% (n=0)	100% (n=14)	0% (n=0)	
Widower	0% (n=0)	0% (n=0)	71.4% (n=5)	28.6% (n=2)	
Other	0% (n=0)	12.5% (n=1)	25.0% (n=2)	62.5% (n=5)	

*Source: Author (2024). *Statistically significant association using Chi-Square*

Some authors report that dental anxiety and fear are related to various factors, such as rotary instruments, tooth extraction and white clothing [34,35]. One study found that children with behavioral management problems who underwent low-rotation prophylaxis had an increase in cortisol during the appointment, thus demonstrating the hormonal change showing the child's fear of prophylaxis [36]. On the other hand, a study of 885 adolescents aged 15 to 16 found no association between the type of procedure performed and dental anxiety, showing no relationship between the use of low rotation and behavior [37]. As with this study, no significant difference was reported between behavior and the use of low rotation as the children did not report fear, anxiety or the presentation of bodily protests.

In this study, it can be seen that the children of single parents were the ones who showed the most definitely negative behavior toward prophylaxis. This finding can be explained by studies that show that single mothers have higher levels of negative maternal behavior when compared to married mothers, due to less time for emotional involvement, control and supervision of their children, as these mothers generally have to work and take care of domestic responsibilities on their own [38]. Concerning fathers, children report feeling distant from them in terms of care and interaction [39]. These characteristics can influence the child's development and directly affect their behavior [40], which was observed from the results found, where the parents' marital status interfered with the child's behavior during dental care.

The child's behavior considering parental accompaniment was evaluated, analyzing the differences between the sex and age of the companion, but for this study, no statistically significant relationship was observed between these variables and the child's behavior. Some studies report that the age of the parents influences their children's behavior, so that the older the parents, the more likely the child is to be introverted [41]. Another study that assessed the relationship between the age of the parents and the child's behavior showed a significant association between the age of the parents and externalizing behavior, but no significant relationship with the child's internalizing behavior [42-43]. Thus, the relationship between the parents' age and gender and the child's behavior is still undefined and contradictory, which reinforces the need for more research analyzing this data to investigate this relationship in depth.

One study showed that children exposed to an environment of greater social vulnerability are more likely to behave negatively considering society's rules. This can happen due to exposure to a stressful environment, where they often have to be concerned about helping with the family's income and having to enter the job market at an early age [44-45]. However, for this study, there was no statistically significant relationship between the socioeconomic status of the families and the children's behavior during dental care, which may be due to the growth of public health policies in Brazil, which has been increasingly raising awareness about the importance and care of general and oral health, thus enabling a life of study and with the basic conditions necessary for the development of each family [46].

This study reveals that factors such as age, guardian’s characteristics, use of rotatory instruments, and socioeconomic status do not have a significant impact on children’s behavior during dental appointments. However, a clear relationship was observed between oral health conditions and behavior, with children displaying more negative behavior correlating with higher numbers of decayed teeth and greater severity of oral conditions. Additionally, children who had not begun losing their deciduous teeth were more likely to exhibit negative or definitely negative behaviors. Future studies should explore additional factors that may influence behavior, such as parental dental anxiety or specific dental procedures. Expanding the sample size and including a broader range of demographics could also provide more comprehensive insights. The findings underscore the importance of addressing oral health conditions to improve children’s behavior during dental visits. Enhanced focus on managing caries and early intervention could potentially lead to better experiences for young patients in dental settings.

4. CONCLUSION

During the dental appointment, the child's behavior can be influenced by various factors, but in this study, factors such as age and gender of the child and guardian, use of rotary instruments and socioeconomic status were not positively associated with behavior. Regarding oral condition, a relationship can be observed between behavior during dental care, and the severity of the oral condition, the number of decayed teeth, the DMFT/ceod index and the type of dentition that showed a statistically

significant association. This demonstrates that the child's behavior inside the dental office is influenced by the presence of caries, in which the more decayed teeth, the worse the child's behavior, and also that children who have not yet started to lose their deciduous teeth are more likely to have negative/definitely negative behaviors.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

CONSENT

As per international standards, parental written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The study was submitted to and approved by the UNIFAL-MG Human Research Ethics Committee under CAAE number: 57180222.6.0000.5142.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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