

Prevalence of Dental Fear and its Association with Painful Oral Conditions in Adolescents

Isla Camilla Carvalho Laureano¹, Lunna Farias¹, Liege Helena Freitas Fernandes³, Alessandro Leite Cavalcanti¹

¹Department of Dentistry, School of Dentistry, State University of Paraíba, Campina Grande, PB, Brazil.

²School of Dentistry, University of Pernambuco, Arcoverde, PE, Brazil.

Correspondence: Isla Camilla Carvalho Laureano, Programa de Pós-graduação em Odontologia, Departamento de Odontologia, Universidade Estadual da Paraíba, Rua das Baraúnas, S/N, Bairro Universitário, Campina Grande, PB, Brazil. 58429-500. **E-mail:** carvalhoisla@gmail.com

Academic Editor: Wilton Wilney Nascimento Padilha

Received: 16 August 2023 / **Review:** 19 September 2023 / **Accepted:** 05 October 2023

How to cite: Laureano ICC, Farias L, Fernandes LHF, Cavalcanti AL. Prevalence of dental fear and its association with painful oral conditions in adolescents. *Pesqui Bras Odontopediatria Clín Integr.* 2023; 23:e230195. <https://doi.org/10.1590/pboci.2023.075>

ABSTRACT

Objective: To estimate the prevalence of dental fear and evaluate its association with dental caries and with Molar Incisor Hypomineralization (MIH) in schoolchildren aged 11-14 years. **Material and Methods:** A cross-sectional study was conducted with 375 adolescents in Campina Grande, Brazil. Socioeconomic and oral health information was collected, while dental fear was measured using the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS). The diagnosis of dental caries and MIH was performed by three trained examiners ($\kappa \geq 0.61$) using the International Caries Detection & Assessment System – ICDAS II and a previously validated index, respectively. Data were descriptively analyzed using the Chi-Square, Fisher's Exact, and Poisson regression tests with robust variance ($p < 0.05$). **Results:** The prevalence of dental fear was 18.4%, and the mean CFSS-DS total score was 28.96 ± 8.92 . After adjusting for covariates family structure, schooling of parents/guardians, type of dental health service and dental pain in the last six months, the prevalence of dental fear was associated with dental pain in the last six months ($PR=2.03$; $95\%CI=1.31-3.16$; $p=0.002$). **Conclusion:** Although no association was found between dental fear, dental caries and MIH in adolescents, those who experienced dental pain in the last six months had a higher prevalence of dental fear.

Keywords: Dental Anxiety; Dental Caries; Molar Hypomineralization; Epidemiology.

Introduction

Dental fear represents a major obstacle for dentists worldwide, especially when dealing with young patients [1]. It is an emotional and natural reaction to stimuli from the dental environment that can be frightening and unpleasant for some patients [2]. It is a problem that has been the subject of research and deserves attention since it is complex and multifactorial [2,3] and varies widely in different geographic regions and age groups [4]. According to a recent systematic review, the global prevalence of dental fear among children and adolescents is 23.9%, with prevalence values in preschool, school children, and adolescents of 36.5%, 25.8%, and 13.3%, respectively [5].

Currently, there is no single explanation for the emergence of dental fear and its etiology is not yet fully understood [6]. Researchers have proposed that fear can be acquired from previous painful experiences, learning through information from other individuals, observation of other people in dental offices, verbal threats made by an authority figure, or contact with the fear of one of the parents, especially the mother, among others [7]. Its origin is also associated with factors related to patients' behavioral aspects and personality [6] and the socioeconomic profile [6,8,9].

Despite the declining trend of dental caries in recent years [10], it is still considered one of the main reasons patients seek dental care [11], mainly due to the acute pain it can cause. As a consequence, therapeutic interventions can be traumatic and painful, especially if effective control of symptoms is not carried out, which can contribute to developing or worsening dental fear [12]. These carious lesions may have contributed to mask teeth with Molar Incisor Hypomineralization (MIH) [13], as a high percentage of children with this enamel development defect has been observed in recent years [14]. Just like the relationship between dental fear and dental caries, the relationship between the presence of fear and MIH is not conclusive [9,15-19], but some authors have reported that the negative impact of MIH on patients' oral health can lead to the development of fear, anxiety and behavioral problems [15,16].

Dental fear can have serious consequences on people's lives, leading to the postponement of treatment and less frequent visits to the dentist, which can worsen dental problems [20] and harm oral health-related quality of life [21]. Furthermore, it is related to non-collaborative or problematic behaviors that can compromise the quality of dental care [4,11]. In some cases, fear can even evolve into a dental phobia in adulthood, further harming the oral health and general well-being of individuals [22].

Mitigating prejudice related to dental fear, with the early identification of associated factors, is essential for the development of effective management and treatment strategies, guaranteeing patients adequate oral health. Therefore, this study aimed to estimate the prevalence of dental fear and evaluate its association with dental caries and MIH in school children aged 11-14 years.

Material and Methods

Study Design and Population

This work was developed according to guidelines established by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [23]. A cross-sectional study was carried out involving a representative sample of students aged 11-14 years enrolled in the municipal elementary school network of the city of Campina Grande, Paraíba, Brazil. The city had a population of approximately 407,472 inhabitants and a Human Development Index (HDI) of 0.72 [24].

Sample calculation was carried out using the infinite population formula considering prevalence of dental fear of 21.6% [9], confidence level of 95%, standard deviation of 1.96, sampling error factor of 5% and

correction factor of 1.4, totaling 364 students. An additional 10% was added to this value to compensate for possible losses, with the final sample estimated at 405 adolescents. Two public schools from each of the six urban Health Districts were drawn, totaling 12 institutions. Thus, the sample was distributed among districts, maintaining proportionality in the number of public schools in each district. All students aged 11-14 years of both sexes who presented all of their first permanent molars fully erupted in the oral cavity were included. The exclusion criteria were adolescents with intellectual disabilities or neurodevelopmental disorders, with neuropsychiatric disorders [25] and those undergoing fixed orthodontic treatment at the time of evaluation.

Training

Three examiners were trained in two stages – theoretical and practical – by gold-standard researchers in the diagnosis of dental caries and MIH. For dental caries, examiners initially received online theoretical training on the website <https://www.iccms-web.com/> and then participated in the face-to-face stage that included discussion on the clinical diagnosis of the condition based on the study of Pitts [26]. The practical stage was carried out in a public school. For MIH, theoretical training addressed the clinical presentation of the defect and listed the main characteristics that differentiate it from other enamel defects and white spot lesions from dental caries [27,28]. *In lux* calibration, the criteria proposed by Ghanim et al. [29]. Inter- and intra-examiner agreements were calculated using Cohen's Kappa coefficient ($\kappa \geq 0.61$). A pilot study with forty-nine students, selected for convenience and who were not included in the main sample, confirmed the adequacy of the proposed methodology and simple adjustments were performed to the socioeconomic questionnaire.

Data Collection

Data collection was carried out between September and December 2019 in the school environment. Initially, envelopes were delivered to students containing the consent form and socioeconomic questionnaires, which addressed the demographic, socioeconomic and oral health characteristics of adolescents and were sent to their parents or guardians.

On a second visit to the school, if there was any incomplete information, questionnaires were resent to avoid loss of information. With parents' authorization and adolescents' assent, the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) questionnaire [25] was answered with the assistance of three researchers, who did not influence their answers. CFSS-DS is an instrument for measuring dental fear, which contains 15 items that evaluate different aspects of dental and medical treatment – sensory stimuli, instruments and interventions. These items are answered using a 5-point Likert scale, with 1 = no fear and 5 = much fear. The total score ranged from 15 to 75 and adolescents who achieved a CFSS-DS score ≥ 38 were considered to have dental fear. The level of dental fear was classified as low in adolescents with a score < 32 , moderate for those with a score between ≥ 32 and ≤ 38 , while a score > 38 was considered high [25].

Before intraoral physical examinations, students received hygiene kits, oral hygiene guidance and participated in supervised brushing. Examinations were carried out using headlamps (JWS Lanternas, São Paulo, SP, Brazil), mouth mirrors (Golgran Indústria e Comércio de Instrumental Odontológico, São Caetano do Sul, SP, Brazil) and WHO millimeter probes (Trinity Indústria e Comércio Ltda, São Paulo, SP, Brazil), together with sterile gauze pads, to dry the teeth. During examinations, researchers used all personal protective equipment (PPE).

To determine the presence and severity of dental caries and MIH, the International Caries Detection and Assessment System II (ICDAS II) and the index proposed by Ghanim et al. [27] and validated by Ghanim

et al. [28], respectively, were used. Dental caries was considered present for ICDAS code >0 and severity was classified as: healthy – code 0; initial stage – codes 1 and 2; moderate stage – codes 3 and 4; advanced stage – codes 5 and 6. The diagnosis of MIH was established by the presence of at least one hypomineralized first permanent molar and its severity was classified as: mild, only color changes – cream, white, yellow, orange or brown – and severe – fracture and/or atypical restoration/atypical caries/loss due to MIH. To determine the dental caries and MIH severity in each adolescent, the ICDAS codes and the most severe MIH defects were considered [30]. The differential diagnosis of MIH was performed in the presence of other enamel developmental defects and white dental caries spots.

Statistical Analysis

Data were analyzed using the IBM SPSS software (version 22.0 for Windows, IBM Corp., Armonk, NY, USA). The following variables were dichotomized: schooling of parents or guardians – ≤ 8 years of study and > 8 years of study –, dental pain in the last six months – yes, no/does not know –, tooth sensitivity in the last six months – yes, no/ does not know – and dental caries severity – initial stage for ICDAS codes 1 and 2, and moderate/advanced stage, for ICDAS codes 3-6.

Descriptive statistics of data were performed, which corresponded to the calculation of absolute and relative frequencies for categorical variables and measures of central tendency and variability for quantitative variables. Pearson's Chi-square or Fisher's exact tests were used to identify possible associations between the occurrence of dental fear and independent variables related to socioeconomic profile, previous dental exposure, history of pain and tooth sensitivity, dental caries experience and presence of MIH. In the multivariate analysis, a robust Poisson regression analysis was performed. All variables with $p < 0.20$ in the bivariate analysis were included in the multivariate analysis with adjustment factors. A significance level of 5% was adopted.

Ethical Aspects

This study received approval from the Human Research Ethics Committee of the State University of Paraíba (Number: 3.155.847) and was conducted in accordance with guidelines of Resolution 466/12 of the National Health Council, Ministry of Health, and with the Declaration of Helsinki.

Results

A total of 770 adolescents were identified as potential study participants, with 405 of them obtaining consent from their parents or legal guardians (52.6%). Of the 405 dental fear questionnaires answered, 16 were excluded due to the presence of intellectual disability or neurodevelopmental disorders, and 14 due to the presence of neuropsychiatric disorders. The final sample consisted of 375 adolescents (92.6%), of which 131 (34.9%) aged 12 years, 236 (62.9%) were female and 139 (37.1%) were male.

Regarding the socioeconomic profile, there was a predominance of adolescents inserted in a nuclear family structure (50.7%) and who have parents or guardians with ≤ 8 years of schooling (59.0%), who live with a family monthly income of up to 1 Brazilian minimum wage (84.7%) and receive financial benefits from the Brazilian government (61.2%). Concerning clinical variables, the majority of adolescents had already visited the dentist at some time in their lives (76.5%), and public service was the type of service most cited (77.2%). Dental pain was observed in 37.2% of adolescents and tooth sensitivity in 49.1%, both in the last six months prior to data collection.

The prevalence of dental caries was 76.3%, with a predominance of moderate/advanced stage lesions (96.2%). There were 43 adolescents diagnosed with MIH (11.5%), and the majority of defects were classified as serious (53.5%). The average number of affected teeth was 3.51 ± 3.56 and 2.81 ± 2.06 due to dental caries and MIH, respectively.

The prevalence of dental fear was 18.4%, and the mean CFSS-DS total score was 28.96 ± 8.92 , with a minimum score of 15 and a maximum score of 63. According to CFSS-DS, most adolescents had low dental fear (67.2%); however, 64 (17.1%) had high dental fear.

Table 1 presents the means and standard deviations of adolescents' answers to the CFSS-DS items. The following CFSS-DS items obtained the highest mean values: "Having somebody put instruments in your mouth" (2.88 ± 1.40), "Injections" (2.58 ± 1.41), "The dentist drilling" (2.35 ± 1.42), "Having a stranger touch you" (2.24 ± 1.36) and "Choking" (2.18 ± 1.39).

Table 1. Means and standard deviations of adolescents' answers to CFSS-DS items.

Items	Mean (SD)
Dentists	1.77 (0.97)
Doctors	1.55 (0.88)
Injections	2.58 (1.41)
Having someone examine your mouth	1.39 (0.76)
Having to open your mouth	1.27 (0.66)
Having a stranger touch you	2.24 (1.36)
Having somebody look at you	1.97 (1.20)
The dentist drilling	2.35 (1.42)
The sight of the dentist drilling	1.99 (1.24)
The noise of the dentist drilling	1.99 (1.25)
Having somebody put instruments in your mouth	2.88 (1.40)
Choking	2.18 (1.39)
Having to go to the hospital	1.26 (0.76)
People in white uniforms	1.40 (0.83)
Having the nurse clean your teeth	1.96 (1.18)

SD, Standard Deviation.

Table 2 shows the distribution of the occurrence of dental fear according to socioeconomic and oral health variables of adolescents; in the bivariate analysis, dental fear was associated with the non-nuclear family structure ($p=0.046$), with schooling of parents/guardians ≤ 8 years of study ($p=0.031$) and with the presence of dental pain in the last six months ($p=0.001$).

Table 2. Dental fear distribution according to socioeconomic and oral health variables of adolescents.

Variables	Dental Fear		p-value
	Yes N (%)	No N (%)	
Sex (n=375)			
Female	48 (20.3)	188 (79.7)	0.207 ⁺
Male	21 (15.1)	118 (84.9)	
Age (n=375)			
11	24 (19.5)	99 (80.5)	0.673 ⁺
12	27 (20.6)	104 (79.4)	
13	12 (14.6)	70 (85.4)	
14	6 (15.4)	33 (84.6)	
Family Structure (n=373)			
Not nuclear	41 (22.3)	143 (77.7)	0.046 ⁺
Nuclear	27 (14.3)	162 (85.7)	

Schooling of parents/guardians (n=368)			
≤ 8 years of schooling	48 (22.1)	169 (77.9)	0.031 [†]
> 8 years of schooling	20 (13.2)	131 (86.8)	
Monthly family income (n=333)			
Up to 1 minimum wage*	51 (18.1)	231 (81.9)	0.556 [†]
More than 1 minimum wage*	11 (21.6)	40 (78.4)	
Receives financial benefit [‡] (n=374)			
Yes	39 (17.0)	190 (83.0)	0.374 [†]
No	30 (20.7)	115 (79.3)	
Visited the dentist some time in life (n=375)			
Yes	51 (17.8)	236 (82.2)	0.570 [†]
No	18 (20.5)	70 (79.5)	
Type of dental health service consulted (n=272)			
Public	43 (20.5)	167 (79.5)	0.179 [†]
Private	8 (12.9)	54 (87.1)	
Dental pain in the last 6 months (n=368)			
Yes	36 (26.3)	101 (73.7)	0.001 [†]
No / Don't know	29 (12.6)	202 (87.4)	
Dental sensitivity in the last 6 months (n=373)			
Yes	37 (20.2)	146 (79.8)	0.329 [†]
No / Don't know	31 (16.3)	159 (83.7)	
Dental caries (ICDAS >0) (n=375)			
Present	53 (18.5)	233 (81.5)	0.906 [†]
Absent	16 (18.0)	73 (82.0)	
Severity of dental caries (n=286)			
Initial stage (ICDAS 1 and 2)	3 (27.3)	8 (72.7)	0.433 [‡]
Moderate / advanced stage (ICDAS 3-6)	50 (18.2)	225 (81.8)	
MIH (n=375)			
Absent	7 (16.3)	36 (83.7)	0.703 [†]
Present	62 (18.7)	270 (81.3)	
Severity of the MIH (n=43)			
Mild	3 (15.0)	17 (85.0)	1.000 [‡]
Severe	4 (17.4)	19 (82.6)	

*Brazilian minimum wage in force at the time of the research equivalent to US \$ 264; [‡]Family government benefit (Welfare); [†]Pearson's Chi-Square test; [‡]Fisher's Exact Test; p<0.05.

A multiple regression model was used to evaluate the associations of variables (Table 3). In the adjusted analysis, the association between dental fear and dental pain in the last six months maintained its significance; the prevalence of dental fear was 103% higher among adolescents with dental pain in the last six months (PR=2.03; 95%CI=1.31-3.16; p=0.002).

Table 3. Poisson multiple regression model between dental fear and independent variables.

Variables	Dental Fear			
	PR Crude (CI 95%)	p-value	PR Adjusted (CI 95%)	p-value
Family Structure				
Not nuclear	1.38 (0.89-2.13)	0.146	1.30 (0.83-2.01)	0.249
Nuclear	1		1	
Schooling of parents/guardians				
≤ 8 years of schooling	1.28 (0.81-2.01)	0.291	-	-
> 8 years of schooling	1			
Type of dental health service consulted				
Public	1.30 (0.69-2.43)	0.412	-	-
Private	1			
Dental pain in the last 6 months				
Yes	2.09 (1.35-3.25)	0.001	2.03 (1.31-3.16)	0.002
No / Don't know	1		1	

PR: Prevalence Ratio; CI: Confidence Interval; p<0.05.

Discussion

Dental fear is a common health problem [5] and can have different prevalences in different population groups [4]. In this study, it was found that the prevalence of dental fear in adolescents was 18.4%, and the mean CFSS-DS total score was 28.96. It is important to highlight that, in Brazil, the prevalence of dental fear varies considerably, but the rate found is considered moderate compared to other regions of the world. While the prevalence of dental fear is 5.7% in Danish children [31], it can reach 65.6% in children born in Indonesia [32]. This variability may be due to the way studies were conducted, since factors such as type of sampling, the instrument used to measure dental fear, method of application and the respondent can directly influence the results obtained [5]. Therefore, it is important to consider these aspects when interpreting data and when making comparisons with findings described in the literature.

Using CFSS-DS, a systematic review found a pooled prevalence of 12.2% and a mean total score of 26.20 among children and adolescents aged 0-13 years [4]. It was observed that the prevalence decreased with the increase in age and that its frequency was higher in females [4]. Another recent systematic review using different instruments to assess dental fear, also observed that children seem to be more affected by the condition than adolescents [5]. In a previous study, with school children aged 8-10 years, the prevalence of dental fear was 21.6% and the mean CFSS-DS score was 29.97 [9]. These results corroborate the findings of Cianetti et al. [4] and Grisolia et al. [5], who indicated a tendency for fear to decrease as age increases.

Adolescents, as they have greater cognitive capacity [6] and better understand dental procedures [33], may be less likely to express dental fear. Furthermore, fear may be related to previous experience with dental treatments [8], and it is likely that adolescents have had more opportunities to experience it, while younger children may not have been yet exposed to these procedures. In fact, as shown in this study, the majority of participants reported having visited the dentist at least once in their lives. Another difference is related to the type of fear experienced by children and adolescents, in which younger children tend to be afraid of being separated from their parents during treatment, while adolescents tend to be afraid of the social aspects of treatment [34].

Adolescence can also affect the tendency to report dental fear [35], since, in general, individuals become more reserved at this stage, underestimating the prevalence found. Therefore, it is important for dentists and family members to be aware of the signs of dental fear and create a welcoming and safe environment so that they can feel comfortable sharing their concerns and receiving appropriate treatment. Nevertheless, implementing dental education programs in schools and increasing access to oral health care can have a beneficial effect, reducing dental fear [36].

In literature, most studies on factors associated with dental fear are focused on preschool children [35]. In this sense, this study is justified by seeking to understand the occurrence of dental fear in early adolescence, a critical phase of transition from childhood to adulthood, which involves physical, social and psychological changes with significant implications for behaviors and experiences related to oral health. The results can help dental professionals develop more effective strategies to reduce fear and improve dental care at all stages of life.

The CFSS-DS items that obtained the highest mean values were: "Having someone put instruments in your mouth", "Injections", "The dentist drilling", "Having a stranger touch you" and "Choking"; thus, as in other studies, these items were among the most feared, in different orders [15,16,25,33,37,38]. These results indicate that individuals have similar fears regarding specific dental procedures, regardless of culture [37], suggesting that invasive procedures may be the main triggers of dental fear [38]. It is possible that the high scores in items referring to sensory stimuli and instruments were influenced by the physical proximity of the professional during

dental care, making some individuals feel invaded or uncomfortable, as well as the variety of instruments that are introduced into the patient's oral cavity, the presence of excess saliva and the sensation of suffocation, which can cause a choking sensation.

Although dental caries is the main reason for dental pain [39] and, therefore, a potential factor in the development of dental fear [8,18], several studies, including the present study, have found no association between dental fear and dental caries [6,9,11,37]. Despite the high prevalence of dental caries and more serious carious lesions, capable of causing intense pain and contributing to the development of dental fear, it could be inferred that these adolescents were affected by other factors [9], such as cultural [2,8,11] and psychosocial [33] factors, and by socioeconomic status [8,9]. Furthermore, the presence of advanced carious lesions in the chronic phase [18] may also have influenced the results.

To date, there are few studies that have investigated the association between dental fear and MIH [9,15-19]. However, they present inconclusive evidence due to limitations regarding the completion of questionnaires by parents [15,18], collection of secondary oral health data, dental care regularity, fear uniformity [15,16] and lack of sample representation [19]. Most of them were also conducted with children aged 8 years [18], 9 years [15], 8 and 9 years [19] and 8-10 years [9].

There was no association between dental fear and MIH, corroborating previous studies [9,15-19]. Although most MIH defects were severe, there was an approximately equal distribution of adolescents with dental fear, according to the MIH severity, which may support the findings of this study. Another possible explanation is based on the fact that the prevalence of this type of fear tends to be lower in adolescents [18], as previously mentioned. Additionally, it has been reported that mild injuries generate fewer clinical implications compared to severe injuries [18]. However, in this study, although a slightly higher frequency of serious defects was observed, no association was found, probably due to the small number of diagnosed cases. Further studies are needed to evaluate this relationship.

After adjusting for socioeconomic covariates, dental fear remained associated with dental pain in the last six months, indicating that pain had a strong association with dental fear in the age group under study. On the other hand, demographic variables referring to family and adolescents did not maintain associations. Painful symptoms are common in individuals with dental caries [39] and MIH [40], conditions that, in turn, were not associated with dental fear. The information provided by parents about adolescents' dental pain may not have been a reliable source for inferring the participants' real condition. In another perspective, it is possible that adolescents felt more comfortable expressing their pain to their parents than reporting their fear regarding dental treatment in the questionnaire. This may be related to cultural and social issues [35]. One possibility to be considered is that if adolescents are fearful due to pain, they may end up avoiding treatment for dental caries and MIH lesions, further worsening their oral health condition and perpetuating a vicious circle of dental fear.





It is important for dentists to be aware of this relationship between dental fear, pain, and oral health, especially when encountering cases of MIH. Lacking confidence in diagnosing and treating this condition can lead to issues in patient care, consequently heightening patient fear. Therefore, it is essential for dentists to be well-prepared to handle MIH, receiving proper training during their education and participating in continuing education courses throughout their careers [41]. This not only benefits the quality of care provided but also helps create a more welcoming and trustworthy environment for patients. Additionally, promoting proper oral hygiene habits, scheduling regular checkups, creating a playful environment, and employing behavioral management techniques from childhood [42] can help prevent dental fear.

This study has some limitations, such as the impossibility of establishing a cause and effect relationship due to its cross-sectional design and the reporting of adolescents' dental pain by their parents/guardians. However, its strengths include the possibility of generalizing the results to the target population, the use of a validated questionnaire, examinations carried out by trained professionals, the execution of a pilot study and dental fear self-reported by adolescents. Furthermore, the sample of school children may better represent data on dental fear, as it involves individuals who avoid treatment and do not attend dental offices due to fear, but who attend schools. In addition, prospective cohort studies are recommended to identify risk factors.

Conclusion

The findings revealed no association between dental fear, dental caries, and MIH in adolescents. However, the prevalence of dental fear was higher among adolescents who reported dental pain in the last six months.

Authors' Contributions

ICCL		https://orcid.org/0000-0002-6621-1834	Methodology, Formal Analysis, Investigation, Data Curation, Writing - Original Draft and Writing - Review and Editing.
LF		https://orcid.org/0000-0002-4077-6706	Methodology, Investigation, Data Curation and Writing - Review and Editing.
LHFF		https://orcid.org/0000-0001-6431-7857	Methodology, Investigation, Data Curation and Writing - Review and Editing.
ALC		https://orcid.org/0000-0003-3572-3332	Conceptualization, Methodology, Writing - Review and Editing, Supervision and Project Administration.

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

Financial Support

This work was supported by Coordination for the Advancement of Higher Education Personnel (CAPES) (Financing Code 001), National Council for Scientific and Technological Development (CNPq) – Research Productivity Scholarship (Process Number 302850/2016-3) and the State of Paraíba Research Assistance Foundation (FAPESQ/PB) (concession term 021/2018, Protocol 005/2018 – SEIRHMACT/FAPESQ/ PB), Brazil.

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.

Acknowledgements

The authors thank Colgate-Palmolive Company for donating oral hygiene kits.

References

- [1] Mobin T, Khan T, Mobin A, Ali M, Munir R, Aslam A, et al. Evaluating dental fear and anxiety in pediatric patients visiting a private and a public dental hospital in Lahore, Pakistan. *Cureus* 2023; 15(2):e35243. <https://doi.org/10.7759/cureus.35243>
- [2] Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *Int J Paediatr Dent* 2007; 17(6):391-406. <https://doi.org/10.1111/j.1365-263x.2007.00874.x>
- [3] Gao S, Lu J, Li P, Yu D, Zhao W. Prevalence and risk factors of children's dental anxiety in China: a longitudinal study. *BMJ Open* 2021; 11(4):e043647. <https://doi.org/10.1136/bmjopen-2020-043647>
- [4] Cianetti S, Lombardo G, Lupatelli E, Pagano S, Abraha I, Montedori A, et al. Dental fear/anxiety among children and adolescents. A systematic review. *Eur J Paediatr Dent* 2017; 18(2):121-30. <https://doi.org/10.23804/ejpd.2017.18.02.09>
- [5] Grisolia BM, dos Santos APP, Dhyppolito IM, Buchanan H, Hill K, Oliveira BH. Prevalence of dental anxiety in children and adolescents globally: A systematic review with meta-analyses. *Int J Paediatr Dent* 2021; 31(2):168-83. <https://doi.org/10.1111/ipd.12749>

- [6] Abanto J, Vidigal EA, Carvalho TS, Sá SN, Bönecker M. Factors for determining dental anxiety in preschool children with severe dental caries. *Braz Oral Res* 2017; 31:e13. <https://doi.org/10.1590/1807-3107BOR-2017.vol31.0013>
- [7] Carter AE, Carter G, Boschen M, AlShwaimi E, George R. Pathways of fear and anxiety in dentistry: A review. *World J Clin Cases* 2014; 2(11):642-53. <https://doi.org/10.12998/wjcc.v2.i11.642>
- [8] Torriani DD, Ferro RL, Bonow ML, Santos IS, Matijasevich A, Barros AJ, et al. Dental caries is associated with dental fear in childhood: Findings from a birth cohort study. *Caries Res* 2014; 48(3):263-70. <https://doi.org/10.1159/000357471>
- [9] Laureano ICC, Farias L, Fernandes LHF, Alencar CRB, Forte FDS, Honorio DR, et al. Dental fear in children: Association with dental caries and molar incisor hypomineralization. *Braz Dent J* 2020; 31(6):673-9. <https://doi.org/10.1590/0103-6440201803247>
- [10] Gimenez T, Bispo BA, Souza DP, Viganó ME, Wanderley MT, Mendes FM, et al. Does the decline in caries prevalence of Latin American and Caribbean children continue in the new century? Evidence from systematic review with meta-analysis. *PLoS One* 2016; 11(10):e0164903. <https://doi.org/10.1371/journal.pone.0164903>
- [11] Boka V, Apostathis K, Karagiannis V, Kotsanos N, Van Loveren C, Veerkamp J. Dental fear and caries in 6-12 year old children in Greece. Determination of dental fear cut-off points. *Eur J Paediatr Dent* 2017; 18(1):45-50. <https://doi.org/10.23804/ejpd.2017.18.01.10>
- [12] Dou L, Vanschaayk MM, Zhang Y, Fu X, Ji P, Yang D. The prevalence of dental anxiety and its association with pain and other variables among adult patients with irreversible pulpitis. *BMC Oral Health* 2018; 18(1):101. <https://doi.org/10.1186/s12903-018-0563-x>
- [13] Farias L, Laureano ICC, Alencar CRB, Cavalcanti AL. Hipomineralização molar-incisivo: Etiologia, características clínicas e tratamento. *Rev Ciênc Méd Biol* 2018; 17(2):211-9. [In Portuguese].
- [14] Mittal R, Chandak S, Chandwani M, Singh P, Pimpale J. Assessment of association between molar incisor hypomineralization and hypomineralized second primary molar. *J Int Soc Prev Community Dent* 2016; 6(1):34-9. <https://doi.org/10.4103/2231-0762.175409>
- [15] Jälevik B, Klingberg GA. Dental treatment, dental fear and behaviour management problems in children with severe enamel hypomineralization of their permanent first molars. *Int J Paediatr Dent* 2002; 12(1):24-32.
- [16] Jälevik B, Klingberg G. Treatment outcomes and dental anxiety in 18-year-olds with MIH, comparisons with healthy controls: a longitudinal study. *Int J Paediatr Dent* 2012; 22(2):85-91. <https://doi.org/10.1111/j.1365-263X.2011.01161.x>
- [17] Kosma I, Kevrekidou A, Boka V, Arapostathis K, Kotsanos N. Molar incisor hypomineralisation (MIH): Correlation with dental caries and dental fear. *Eur Arch Paediatr Dent* 2016; 17(2):123-9. <https://doi.org/10.1007/s40368-016-0221-4>
- [18] Menoncin BLV, Portella PD, Ramos BLM, Assunção LRDS, de Souza JF, Menezes JVNB. Dental anxiety in schoolchildren with molar incisor hypomineralization-A population-based cross-sectional study. *Int J Paediatr Dent* 2019; 29(5):615-623. <https://doi.org/10.1111/ipd.12503>
- [19] Vanhée T, Poncellet J, Cheikh-Ali S, Bottenberg P. Prevalence, caries, dental anxiety and quality of life in children with MIH in Brussels, Belgium. *J Clin Med* 2022; 11(11):3065. <https://doi.org/10.3390/jcm11113065>
- [20] Armfield JM, Stewart JF, Spencer JA. The vicious cycle of dental fear: Exploring the interplay between oral health, service utilization and dental fear. *BMC Oral Health* 2007; 7(1):1. <https://doi.org/10.1186/1472-6831-7-1>
- [21] Queiroz MF, Verli FD, Marinho SA, Paiva PCP, Santos SMC, Soares JA. Pain, anxiety and quality of life related to the oral health of patients treated in a dental emergency clinic. *Cien Saude Colet* 2019; 24(4):1277-86. <https://doi.org/10.1590/1413-81232018244.33802016>
- [22] Yahyaoglu O, Baygin O, Yahyaoglu G, Tuzuner T. Effect of dentists' appearance related with dental fear and caries status in 6-12 years old children. *J Clin Pediatr Dent* 2018; 42(4):262-8. <https://doi.org/10.17796/1053-4628-42.4.4>
- [23] Vandembroucke JP, von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and elaboration. *Ann Intern Med* 2007; 147(8):W163-W194. <https://doi.org/10.7326/0003-4819-147-8-200710160-00010-w1>
- [24] Brazilian Institute of Geography and Statistics (IBGE). Brasil/Paraíba/Campina Grande. Panorama [Internet]. Available from: <https://cidades.ibge.gov.br/brasil/pb/campina-grande/panorama> [Accessed on April 15, 2023]. [In Portuguese].
- [25] Barbério GS. Reliability and validity of the Brazilian version of the Children's Fear Survey Schedule-Dental Subscale questionnaire for assessing fear and anxiety about dental treatment in children. PhD thesis – Bauru School of Dentistry, University of São Paulo, Bauru; 2017. [In Portuguese].
- [26] Pitts N. "ICDAS" - an international system for caries detection and assessment being developed to facilitate caries epidemiology, research and appropriate clinical management. *Community Dent Health* 2004; 21(3):193-8.
- [27] Ghanim A, Elfrink H, Weerheijm K, Mariño R, Manton D. A practical method for use in epidemiological studies on enamel hypomineralisation. *Eur Arch Paediatr Dent* 2015; 16(3):235-46. <https://doi.org/10.1007/s40368-015-0178-8>
- [28] Ghanim A, Mariño R, Manton DJ. Validity and reproducibility testing of the Molar Incisor Hypomineralisation (MIH) Index. *Int J Paediatr Dent* 2019; 29(1):6-13. <https://doi.org/10.1111/ipd.12433>

- [29] Ghanim A, Silva MJ, Elfrink ME, Lygidakis NA, Mariño RJ, Weerheijm KL, et al. Molar incisor hypomineralisation (MIH) training manual for clinical field surveys and practice. *Eur Arch Paediatr Dent* 2017; 18(4):225-42. <https://doi.org/10.1007/s40368-017-0293-9>
- [30] Gambetta-Tessini K, Mariño R, Ghanim A, Calache H, Manton DJ. The impact of MIH/HSPM on the carious lesion severity of schoolchildren from Talca, Chile. *Eur Arch Paediatr Dent* 2019; 20(5):417-23. <https://doi.org/10.1007/s40368-019-00416-w>
- [31] Wogelius P, Poulsen S, Sorensen HT. Prevalence of dental anxiety and behavior management problems among six to eight years old Danish children. *Acta Odontol Scand* 2003; 61(3):178-83. <https://doi.org/10.1080/00016350310003468>
- [32] Setiawan AS, Kendhawati L, Agustiani H. Relational model between parental dental belief and formation of dental fear among preschool children in Indonesia. *Eur J Dent* 2019; 13(3):426-31. <https://doi.org/10.1055/s-0039-1700187>
- [33] Ten Berge M, Veerkamp JS, Hoogstraten J. The etiology of childhood dental fear: the role of dental and conditioning experiences. *J Fear Disord* 2002; 16(3):321-9. [https://doi.org/10.1016/s0887-6185\(02\)00103-2](https://doi.org/10.1016/s0887-6185(02)00103-2)
- [34] Shim YS, Kim AH, Jeon EY, An SY. Dental fear & anxiety and dental pain in children and adolescents; a systemic review. *J Dent Anesth Pain Med* 2015; 15(2):53-61. <https://doi.org/10.17245/jdpm.2015.15.2.53>
- [35] Silveira ERD, Goettems ML, Demarco FF, Azevedo MS. Clinical and individual variables in children's dental fear: A school-based investigation. *Braz Dent J* 2017; 28:398-404. <https://doi.org/10.1590/0103-6440201601265>
- [36] McNeil DW, Randall CL, Cohen LL, Crout RJ, Weyant RJ, Neiswanger K, et al. Transmission of dental fear from parent to adolescent in an Appalachian sample in the USA. *Int J Paediatr Dent* 2019; 29(6):720-7. <https://doi.org/10.1111/ipd.12564>
- [37] Alshoraim MA, El-Housseiny AA, Farsi NM, Felemban OM, Alamoudi NA, Alandejani AA. Effects of child characteristics and dental history on dental fear: cross-sectional study. *BMC Oral Health* 2018; 18:33. <https://doi.org/10.1186/s12903-018-0496-4>
- [38] Ma L, Wang M, Jing Q, Zhao J, Wan K, Xu Q. Reliability and validity of the Chinese version of the Children's Fear Survey Schedule-Dental Subscale. *Int J Paediatr Dent* 2015; 25(2):110-6. <https://doi.org/10.1111/ipd.12106>
- [39] Boeira GF, Correa MB, Peres KG, Peres MA, Santos IS, Matijasevich A, et al. Caries is the main cause for dental pain in childhood: Findings from a birth cohort. *Caries Res* 2012; 46(5):488-495. <https://doi.org/10.1159/000339491>
- [40] Raposo F, de Carvalho Rodrigues AC, Lia ÉN, Leal SC. Prevalence of hypersensitivity in teeth affected by molar-incisor hypomineralization (MIH). *Caries Res* 2019; 53(4):424-30. <https://doi.org/10.1159/000495848>
- [41] Sajadi FS, Hasheminejad N, Mehdizadeh A, Eskandarizadeh A, Rostamizadeh M. Dentists' knowledge and clinical experience towards molar-incisor-hypomineralization in Iran. *Pesqui Bras Odontopediatria Clín Integr* 2021; 21:e0004. <https://doi.org/10.1590/pboci.2021.134>
- [42] Vilas-Boas AM, Vieira JOS, Diniz MB. Child's behavior and its relationship with the level of maternal-child anxiety during dental care. *Pesqui Bras Odontopediatria Clín Integr* 2017; 17(1):e3646. <https://doi.org/10.4034/PBOCI.2017.171.46>