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The Effect of Previous Dental Visits And Socioeconomic Level on Dental Fear and Anxiety Among Duhok City Primary School Children and its Relation to Oral Health Status

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ABSTRACT

Introduction: Dental fear and anxiety (DFA) are common emotional challenges among children. These psychological responses can persist into adulthood and impact oral health by discouraging regular dental visits, leading to disease progression, and reliance on emergency treatment.

Aim: This study assessed dental fear and anxiety among Duhok primary school children and their association with oral health, socioeconomic status, and dental visit history.

Material and Methods: A cross-sectional study was conducted involving 420 randomly selected students from 10 primary schools located in socioeconomically diverse areas of Duhok city. DFA was assessed using the Index of Dental Anxiety and Fear (IDAF-4C+, a standardized child dental anxiety questionnaire and its relation to previous dental visits and socioeconomic level. Oral health status was evaluated based on WHO criteria for DMFT (Decayed, Missing, and Filled Teeth) in permanent teeth and dmft (decayed, missing, filled teeth) in primary teeth, along with the Plaque Index. Data analysis was performed using SPSS software.

Results: 62.6% of children had no or little DFA, 26.4% had low fear, 6.9% had moderate, and 4.0% had high fear. No statistically significant differences were found between DFA and DMFT ($p = 0.126$), dmft ($p = 0.956$), or plaque index ($p = 0.439$). DFA was significantly associated with school location ($p = 0.046$) and prior dental visits ($p = 0.027$). Children attending western (higher socioeconomic) schools and those who had never visited a dentist before exhibited higher levels of DFA.

Conclusion: Low to moderate levels of DFA were found among children in Duhok city. Which related to school location and previous dental visits, with no effect on the oral health status. These findings highlight the effect of socioeconomic environment and dental visit experience on the DFA level.

Keywords: Dental fear, Dental anxiety, oral health, socioeconomic status, children

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INTRODUCTION

Dental fear and anxiety (DFA) represent significant psychological conditions affecting individuals of all ages, but they are particularly prevalent among children. DFA is defined as an emotional response to perceived threats in a dental setting, often triggered by a combination of environmental, cognitive, behavioral, and physiological factors.[6,7] DFA are common psychological challenges encountered by children during dental visits. These conditions not only affect the child's emotional well-being but also hinder their access to essential dental care, leading to long-term oral health problems.[27]

Fear and anxiety about dental treatment often originate in childhood and may persist into adulthood, significantly impacting oral health outcomes, This is particularly concerning in pediatric populations, where early dental experiences shape long-term attitudes toward oral fear and a tendency to avoid dental visits, which can lead to untreated dental problems and poorer oral health indices.[5] Alshahrani et al. reported that dental fear and anxiety have a significant detrimental effect on children's oral health-related quality of life, highlighting the serious impact of these conditions.[3]

Dental caries represents the most prevalent chronic disease affecting children worldwide, affecting nearly 60–90% of school-aged populations worldwide.[35] In pediatric patients, caries progress more rapidly due to the thinner enamel and dentin layers in primary teeth, making timely diagnosis and management essential.[35, 12] The etiology of dental caries is multifactorial, involving fermentable carbohydrate intake, cariogenic microorganisms (notably Streptococcus mutans), poor oral hygiene, and time.[35,17] Although periodontal disease is more common in adults, it also affects children and adolescents, often beginning as gingivitis.[31] Gingivitis is the most prevalent periodontal condition in children, primarily caused by inadequate plaque control and poor oral hygiene habits.[31] Their study observed that increased plaque accumulation and bleeding on probing were significantly associated with younger age groups, indicating that early intervention and oral health education are essential to prevent the progression of gingival inflammation. Similarly, a higher gingival index was found in children with dental anxiety, suggesting that emotional and behavioral factors may indirectly contribute to poor periodontal health.[14]

DFA are closely linked to a higher prevalence of dental caries in children. Children who experience DFA are more likely to avoid routine dental visits, leading to delayed diagnosis and treatment of carious lesions.[13] Children with dental anxiety had significantly increased rates of decay experience, active decay, and visible oral infections such as ulcers, fistulas, or abscesses. These children also had more restorations in their primary teeth, indicating previous untreated decay requiring operative treatment. Avoidance behavior, driven by fear and anxiety, leads to a reliance on emergency care rather than preventive services, which in turn worsens oral health outcomes.[13]

Although DFA are often assumed to be linked with poorer oral health outcomes, evidence from recent adolescent studies presents a more complex picture, adolescents who had received sedation or general anesthesia often required due to severe anxiety—were significantly more likely to have restorations or extractions, suggesting indirect consequences of DFA through treatment avoidance. This supports the "vicious cycle model" in which fear leads to avoidance, ultimately worsening oral health over time.[13] In the region of Duhok, located in the Kurdistan region of Iraq, there has been limited exploration into the prevalence of dental fear and anxiety and its relationship with oral health status among school-aged children. This gap in the literature highlights the need for a localized investigation to understand the extent of the issue and to identify strategies for intervention and prevention. This study aimed to assess the prevalence and severity of dental fear and anxiety among primary school children in Duhok City, Kurdistan Region of Iraq, and to examine their relationship with previous dental visits, socioeconomic status, and oral health status. Oral health was evaluated using the DMFT/dmft indices and the Plaque Index. By exploring these associations, the study aims to clarify how environmental, experiential, and clinical factors contribute to the development of dental fear and anxiety in children, thereby providing evidence to inform preventive and management approaches in pediatric dentistry.

METHODS

A cross-sectional study was carried out in ten randomly selected primary schools in Duhok City to evaluate the prevalence of DFA and examine its association with oral health status in children aged

6 to 12 years. The study population consisted of students from ten primary schools, selected through random sampling and distributed equally across the eastern and western sectors of Duhok City. The sample size was determined based on the total number of primary school students in Duhok City, which was approximately 29,800, according to data obtained from the General Directorate of Education in Duhok. Using the Raosoft Sample Size Calculator, a sample of 420 students was selected to be representative of the target population. The adequacy of this sample size was further confirmed using the G*Power statistical software to ensure sufficient power for the intended analyses.[2] The total sample size of 420 students, comprising 210 boys and 210 girls, was proportionally distributed across ten randomly chosen primary schools located in different geographic zones of Duhok City. Equal representation of both genders was ensured. According to data provided by the Department of Planning at the Duhok Directorate-General for Health in October 2024, the city's layout is broadly categorized into two main sectors: the eastern and western parts.

Ethical approval for the study was obtained from the Research Ethics Committee.

Permissions were also secured from the General Directorate of Education in Duhok to conduct the study in the selected schools, Parents provided informed consent. Privacy and confidentiality of all participants were strictly maintained; data were anonymized and used only for research purposes. Data collection tools, Kobo Toolbox were used for secure and efficient mobile-based data collection. This enables real-time data storage, reducing errors and ensuring confidentiality and data analysis. All students were asked about demographic information (name, age, gender, school location, previous dentist visit).

Dental fear and anxiety were assessed using the Index of Dental Anxiety and Fear (IDAF-4C+), a validated psychometric instrument developed to provide a comprehensive and theoretically robust measure of dental anxiety in both clinical and epidemiological research.[20]

The IDAF-4C+ was selected over other commonly used tools, such as the Modified Dental Anxiety Scale (MDAS) and the Children's Fear Survey Schedule–Dental Subscale (CFSS-DS), because it captures multiple components of anxiety rather than focusing solely on symptoms. In this study, only the core module was administered, using the validated Turkish children's version, which has demonstrated high internal consistency and construct validity for pediatric populations.[4,11]

The core module of the IDAF-4C Index consists of eight items, each addressing one of the four dimensions of dental anxiety: behavioral, emotional, cognitive, and physiological—two items per component. Responses are rated on a 5-point Likert scale, ranging from 'Disagree' (1) to 'Strongly agree' (5), with higher scores reflecting greater levels of dental fear and anxiety. Based on mean total scores, dental fear and anxiety was categorized as follows: 1–1.5 (no or minimal fear and anxiety), 1.51–2.5 (low fear and anxiety), 2.51–3.5 (moderate fear and anxiety), and above 3.5 (high fear and anxiety). While the phobia and stimulus exposure modules are intended for broader clinical and epidemiological use, this study employed only the core anxiety and fear module, utilizing the validated Turkish children's version of the IDAF-4C.10 As no validated Kurdish version of the IDAF-4C was available, the scale was translated and culturally adapted following standard guidelines: forward and backward translation by independent bilingual experts, expert committee review, and pilot testing with 15 Kurdish-speaking children, with minor wording adjustments made based on feedback.

The presence of dental caries was evaluated through clinical examination using the Decayed, Missing, and Filled Teeth (DMFT) index, based on the guidelines outlined by the World Health Organization (WHO).[37] Each student was examined in their school setting using a headlight for illumination, while seated on an ordinary classroom chair. Disposable mouth mirrors, dental probes, gloves, and face masks were utilized to maintain infection control protocols.[21] In this study, dental caries were defined as lesions extending into the dentin layer, by the WHO criteria, which characterize caries as cavitated lesions with a softened dentin base. For each participant, the DMFT index was used to assess permanent teeth and the dmft index for primary teeth. The number of decayed (D/d), missing due to caries (M/m), and filled (F/f) teeth were recorded separately. These values were then summed (D+M+F for permanent teeth, and d+m+f for primary teeth) to yield the individual's DMFT or dmft

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score. The overall mean DMFT/dmft score was calculated by averaging the individual scores across the sample. Teeth missing for reasons other than caries were excluded from the analysis.

The Palmer Notation System was employed to identify permanent (adult) teeth, with third molars and supernumerary teeth excluded from the assessment.[36] The clinical examination followed a systematic approach, beginning with the upper right first permanent molar and proceeding in a conventional sequence, concluding with the lower left first molar. Tooth status was recorded using the numerical coding system recommended by the WHOπ, and all findings from the examination were documented in a standardized chart.

Dental plaque was assessed using the Plaque Index developed by Silness and Löe, which evaluates plaque accumulation on the gingival third of the tooth surface.[28] The evaluation involved gently passing a probe along the buccal and lingual surfaces of six specific index teeth: the upper right first molar, upper right lateral incisor, upper left first premolar, lower left first molar, lower left lateral incisor, and lower right first premolar (teeth numbers 16, 12, 24, 36, 32, and 44). If any of these teeth were missing, they were not replaced by alternate teeth.

The oral hygiene status of children was assessed using a modified Simplified Oral Hygiene Index (OHI-S), tailored specifically for primary (deciduous) teeth. This adapted OHI-S was employed as the reference standard for oral hygiene evaluation in the current validation study. Plaque accumulation was measured on the buccal surfaces of six designated index teeth: upper right second primary molar (tooth 55), upper right central primary incisor (tooth 51), upper left second primary molar (tooth 65), lower right second primary molar (tooth 85), lower left central primary incisor (tooth 71), and lower left second primary molar (tooth 75).[16]

All data were entered and analyzed using IBM SPSS version.[27] Descriptive statistics, including frequencies and percentages for categorical variables, were computed to summarize the sample's demographic characteristics, oral health indices, and levels of dental fear and anxiety. Inferential analyses using the Chi-square test and Fisher's exact test were performed to examine associations between sociodemographic factors and fear/anxiety levels, as well as between children's oral health status and their dental fear and anxiety. A P value of less than 0.05 was considered statistically significant.

RESULTS

A total of 420 children participated in this study. Table 1 summarizes the prevalence of dental fear and anxiety levels among these primary school children. The majority of the children (62.6%) had no or minimal DFA, 26.4% had low DFA, 6.9% had moderate DFA, and 4.0% were classified as having high DFA.

Table 1. Prevalence of dental fear and anxiety among primary school students in Duhok

Total Dental Fear and Anxiety Level	Frequency	Percent%
No or little DFA (1- 1.5)	263	62.6 **%**
Low DFA (1.51- 2.5)	111	26.4 **%**
Moderate DFA (2.51- 3.5)	29	6.9 **%**
High DFA >3.5	17	4.0 **%**

Table 2 shows the distribution of the sample study to the demographic data and the association between children's variables and their level of fear and anxiety. A total of 420 children participated in the study. They were distributed across demographic and behavioral variables as follows: 48.3% of participants were in the early childhood group (6–8 years), while 51.7% were late childhood (9–12 years). Equal distribution of males (n = 210) and females (n = 210). Also, Equal representation from western schools (n = 210) and eastern schools (n = 210) in Duhok city.

Neither age group (p = 0.861) nor gender (p = 0.648) was significantly associated with fear and anxiety levels. Regarding School Location, a significant association was observed (p = 0.046), children from western schools reported higher levels of fear and anxiety than those from eastern schools. The history of dental visits was significantly related to fear and anxiety levels (p = 0.027), with those who had not visited a dentist before more likely to show high fear and anxiety.

Table 2. Fear and anxiety level of children and their relation to their sociodemographic characteristics and previous dental visit

	Total N (%)	Category	Fear and Level				P-Value
			No or little fear (1 - 1.5)	Low fear (1.51-2.5)	Moderate fear (2.51-3.5)	High fear >3.5	
Age	203 (48.3) 217 (51.7)	Early Childhood 6-8 Late Childhood 9-12	130 (49.4) 133 (50.6)	50 (45) 61 (55)	14 (48.3) 15 (51.7)	9 (52.9) 8 (47.1)	0.861*
Gender	210 (50) 210 (50)	Male Female	133 (50.6) 130 (49.4)	58 (52.3) 53 (47.7)	12 (41.4) 17 (58.6)	7 (41.2) 10 (58.8)	0.648*
School Location	210 (50) 210 (50)	Western Schools Eastern Schools	124 (47.1) 139 (52.9)	54 (48.6) 57 (51.4)	20 (69) 9 (31)	12 (70.6) 5 (29.4)	0.046*†
Have you visited the dentist before?	256 (61) 164 (39)	Yes No	155 (58.9) 108 (41.1)	79 (71.2) 32 (28.8)	15 (51.7) 14 (48.3)	7 (41.2) 10 (58.8)	0.027*†

* for Chi-square, ** for Fisher's exact
† Statistically significant at $P < 0.05$

Table 3 illustrates the relationship between the children's oral health status and their level of DFA. No statistically significant differences in DFA levels were observed across different caries experience categories of permanent teeth (DMFT, p = 0.126) or primary teeth (dmft, p = 0.956). Similarly, there was no significant association between plaque index categories (reflecting oral hygiene status) and fear levels (p = 0.439). Thus, in this sample, dental fear and anxiety did not differ appreciably based on the children's caries experience or oral hygiene level.

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Table 3. Association between children's Oral health status and their level of fear and anxiety

	Total N (%)	Category	Dental Fear and anxiety Level				P-Value
			No or little DFA (1-1.5)	Low DFA (1.51- 2.5)	Moderate DFA(2.51 - 3.5)	High DFA >3.5	
DMFT	384 (91.4)	Low	244 (92.8)	100 (90.1)	24 (82.8)	16 (94.1)	0.126**
	31 (7.4)	Moderate	16 (6.1)	11 (9.9)	3 (10.3)	1 (5.9)	
	5 (1.2)	High	3 (1.1)	0 (0)	2 (6.9)	0 (0)	
dmft	201 (47.9)	Low	122 (46.4)	56(50.5)	14 (48.3)	9 (52.9)	0.956*
	85 (20.2)	Moderate	56 (21.3)	19 (17.1)	7 (24.1)	3 (17.6)	
	134 (31.9)	High	85 (32.3)	36 (32.4)	8 (27.6)	5 (29.4)	
Plaque index level	1 (0.2)	Excellent hygiene	0 (0)	1 (0.9)	0 (0)	0 (0)	0.439**
	343 (81.7)	Good hygiene	216 (82.1)	87 (78.4)	26 (89.7)	14 (82.4)	
	75 (17.9)	Fair hygiene	47 (17.9)	22 (19.8)	3 (10.3)	3 (17.6)	
	1 (0.2)	Poor hygiene	0 (0)	1 (0.9)	0 (0)	0 (0)	

* for Chi-square, ** for Fisher's exact
† Statistically significant at $P < 0.05$

DISCUSSION

This study was conducted to investigate the potential factors contributing to dental fear and anxiety among children in Duhok, Iraq. A total of 420 children, both male and female, aged between 6 and 12 years, were included in the sample.

The findings of the present study in Duhok city Table 1, which showed that 62.6% of children experienced no or little DFA, are In line with study findings, Eric et al. (2025) observed a moderate level of dental fear among Bosnian schoolchildren in the 6–12 year age bracket.[40] This similarity may be attributed to increased parental awareness, improved access to preventive dental care, and positive early dental experiences in both settings. In contrast, a study carried out in Dharan, Nepal, revealed a much higher prevalence of DFA, with 44.7% of children exhibiting high DFA, and 28.8% showing moderate DFA, meaning over 70% experienced considerable anxiety.[7,15] This stark difference may stem from limited access to routine dental services, delayed treatment-seeking behavior, and a tendency to visit the dentist only during emergencies, often associated with pain and negative experiences. These comparisons highlight how cultural norms, health system accessibility, and the nature of prior dental encounters play crucial roles in shaping children's dental fear and anxiety across different populations. The study revealed that neither age group (p = 0.861) nor gender (p = 0.648) was significantly associated with DFA levels (Table 2). Age not related to degree of DFA this could be explained by the fact that, all ages may develop DFA and the DFA is more related to other, These findings agreed with previous findings reported by Boka et al., 2017 who showed that age does not significantly correlated with dental anxiety and they concluded that age cannot be a reliable predictor of dental anxiety in children because oral status and the influence of cultural differences significantly affect the child's age or development and

thus dental anxiety.[7,10] However, some studies show different results. In preschoolers, age often emerges as a factor, as younger children tend to exhibit more dental fear and anxiety. For instance, the Hong Kong kindergarten study observed that three-year-olds showed higher dental fear and anxiety than older children.[39]

The current study showed no significant differences between boys and girls, this could be related to the culture of Duhok city which does not make any differences in both genders, these findings come in agreement with the findings of Pinkham etal.,1995 and Singh et al.,2010 who have found no effect of gender on dental fear and anxiety,[26, 29] In contrast, several studies have found higher dental fear and anxiety in girls than in boys.[17] This difference may reflect cultural considerations, as Arabic boys are typically raised to be brave and are not expected to declare their fears, unlike girls.[18] In this study 61% of children had visited the dental clinic before, while 39% had never visited a dental clinic before. The history of dental visits was significantly related to dental fear and anxiety levels ($p = 0.027$), with those who had not visited a dentist before more likely to show high fear dental fear and anxiety. This is because children who have never visited the dentist usually have incorrect thoughts about dental procedures (fear of the unknown).[7,23]

In contrast to the current findings, a study conducted in Jeddah, Saudi Arabia, reported that visiting the dental clinic was a major source of fear and anxiety for most children.[8] This may be attributed to the tendency among parents in many developing countries to seek dental care only when oral problems arise, particularly when the child is in pain. Such patterns of irregular and pain-driven visits can negatively shape children's dental experiences and potentially heighten their levels of dental fear and anxiety.[7,9] Additionally, a history of pain during previous dental appointments is considered a more accurate predictor of dental anxiety than merely having visited a dentist.[1,7] One demographic factor that did show a significant relationship in current study was school location. Children from the “west area”, those living in high socio-economic areas of Duhok city, had higher dental fear and anxiety levels than those from the “east”, [41] those living in low socio-economic areas ($p = 0.046$). This finding could reflect underlying differences in exposure or environment. This may be related to more indulgent and protective child-rearing styles common in higher socio-economic families, where children may have limited exposure to challenging or uncomfortable experiences, thereby heightening their fear response during dental treatment. By contrast, [34] the researchers who examined the impact of various risk factors on dental anxiety found no evidence of heightened dental anxiety among children from lower socioeconomic backgrounds. [34] In this study, Table 3 revealed that no statistically significant association was found between children’s dental fear and their oral health status. Table 3 shows that specifically, neither the DMFT index for permanent teeth ($p = 0.126$) nor the dmft index for primary dentition ($p = 0.956$) showed significant correlation with dental fear and anxiety levels. Although there was a non-significant trend suggesting that higher caries experience may correspond to higher dental fear and anxiety, this relationship did not reach statistical significance.

Similarly, the plaque index was not significantly associated with dental fear and anxiety ($p = 0.439$), indicating that poor oral hygiene alone does not predict elevated anxiety toward dental treatment.

These findings align with previous research. For instance, Yon et al. 2020 found no significant difference in dental fear and anxiety scores between Hong Kong kindergarten children with and without caries. [39] Likewise, Taani et al. 2005 reported no correlation between children’s dental fear and anxiety and DMFT or gingival index scores.30 More recently, Sun et al. 2023 observed that even among preschoolers with severe early childhood caries, DFA levels remained low and unrelated to caries severity, further suggesting that disease burden alone does not determine anxiety.[30]

On the other hand, some research disagrees with the present study's result. In a study involving 1,303 French children aged 5 to 11 years, Nicolas et al.2010 reported that those with at least one decayed tooth exhibited significantly higher levels of DFA compared to caries-free children.[23] Similarly, another study demonstrated that children who expressed DFA of the dentist had significantly higher mean dmft and DMFT scores than those who did not.[22] These findings confirm a significant association between DFA and poor oral health outcomes, particularly the presence of den-

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tal caries and tooth loss due to decay. Children with a higher caries burden tend to utilize emergency dental services more frequently, potentially reinforcing a cycle of pain, fear, and avoidance of routine dental care.[5]

Additionally, the causal direction may be reversed. That is, children with higher DFA may avoid routine visits, resulting in delayed treatment and increased caries, a phenomenon described as the vicious cycle of dental anxiety.[5] This cycle underscores the importance of early identification and management of dental fear and anxiety to prevent the downstream consequences of oral neglect. Also, in a study by Panda et al., 2021 reported that Children experiencing dental fear were 1.8 times more likely to have one or more untreated carious lesions compared to their non-fearful counterparts during oral examinations and dental treatments.[24]

Notably, the lack of a current association between DFA and oral health in current study does not diminish the clinical importance of addressing dental fear. Children with good oral health can still be highly anxious, and if their anxiety is not managed, they are at risk of avoiding dental care in the future, which could eventually lead to deterioration in oral health. Thus, objective oral health measures alone cannot predict which children will experience high dental fear. Dental practitioners should be vigilant in assessing and managing fear in all pediatric patients, regardless of the child's present dental condition. Early identification and intervention for anxious children, such as through desensitization visits, behavioral guidance, and positive reinforcement, are critical to prevent the downstream consequences of the fear-avoidance cycle.

This study has two principal limitations. First, it was conducted in a single geographic area, which may limit the generalizability of the findings. Future research should include multiple centers or more diverse regions to confirm and expand upon these results. Second, information on previous dental visits and certain demographic details was obtained directly from the children, which may introduce recall bias or inaccuracies. To improve data reliability, future studies should verify such information through parents or guardians.

CONCLUSION

The present study revealed a low to moderate prevalence of dental fear and anxiety among children in Duhok city. Associations were observed between DFA and both school location and previous dental visits, while no significant relationships were found with age or gender. Furthermore, dental fear and anxiety levels did not show a significant correlation with oral health indicators. Environmental and experiential factors could lead to the development of dental fear and anxiety.

Based on these findings, we recommend implementing school-based programs that include anxiety-reduction strategies across all socioeconomic groups, with particular attention to children in higher socioeconomic areas where DFA prevalence is greater. Tailored outreach and positive dental exposure for children with limited previous dental experience may help prevent the development of long-term avoidance behaviors and improve oral health outcomes.

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CONFLICT OF INTEREST

There are no conflicts of interest.

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