

Dental Anxiety and Fear in 13-Year-Old School Students and Their Relationship to Dental Caries

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KEYWORDS

Dental anxiety, dental fear, dental caries, dental phobia

ABSTRACT

Despite receiving school dental service programme since primary school, adolescents were reported to have high prevalence of dental anxiety and fear (DAF) and caries. This study aimed to determine prevalence of DAF and its association with caries among the 13-year-old school students. A cross sectional study was conducted at a secondary school in Kota Bharu, Kelantan. Data was collected using a validated Malay version of the DAF questionnaires (IDAF4C+). Sociodemographic profiles were obtained and caries prevalence was determined using Decayed, Missing and Filled Teeth Index (DMFT). Chi-square analysis were conducted with significant level set at $p < 0.05$. A total of 196 Malay schoolchildren participated with higher proportion of males (54.6%). The mean score of IDAF-4C was 2.24 (SD 0.76). The prevalence of DAF was high at 19.9% (95%CI:14.3%, 25.5%). Having treatment under unsympathetic or unkind dentist was reported as the most anxiety-eliciting [mean (SD)=3.89(1.38)]. Prevalence of dental caries was 48.0% (95%CI:40.9%, 55.0%). Students with untreated caries, missing and filled teeth were 23%, 2.6% and 39.3% respectively. No significant association between DAF and caries prevalence was observed. Strategies in helping adolescents to cope with their DAF should be employed to prevent the progression of DAF into adulthood.

INTRODUCTION

In Malaysia, adolescents aged 13 to 17 years receive oral health services under the School Dental Service (SDS) programme organised by the government. This programme aims to deliver systematic and comprehensive dental care effectively [1]. Although these adolescents have been continuously exposed to oral health services since primary schools, Malaysian school-leavers are found to experience dental anxiety and fear (DAF) [2]. Studies show that individuals with DAF are more likely to delay the dental visits, with some even regularly cancelling or failing to attend appointments [3-5]. This behaviour leads to low utilisation of widely available and accessible dental services [6]. Furthermore, patients, who endure dental pain and postpone their visits for extended

periods often require more invasive treatments [3]. This perpetuates a vicious cycle of DAF, where heightened anxiety leads to continued dental avoidance [3]. Ultimately, the underutilisation of oral healthcare services result in greater burden of preventable oral diseases.

Previous studies conducted in Malaysia among 16-year-old adolescents [7] and 10- to 12-year-old school students [8] reported high prevalence rates of DAF at 98.2% and 81.9%, respectively. Another local Malaysian study by Asma' and Saub found that school children in the Federal Territory of Kuala Lumpur with parental incomes below MYR 2500 were significantly associated with higher caries experience [9]. Controlling DAF among school students is therefore crucial, as Silvera et al. also established links between worse dental caries outcomes and dental fear, poor self-rated oral health, and lack of dental visit in the previous year [10].

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Despite the high prevalence of DAF and dental caries, there are still minimal studies assessing the relationship between DAF and dental caries among adolescents in Malaysia. Hence, this study was conducted to determine the prevalence of DAF and its association with caries among 13-year-old school students in a secondary school located in the capital city of a state in the northeastern coast of Malaysia. Fully recognising and understanding DAF among adolescents will provide valuable insights into implementing targeted interventions to assist them overcome DAF before they leave the secondary schools.

MATERIALS AND METHODS

Ethics approval was obtained from the Universiti Sains Malaysia Ethics Committee (Human), USM [USM/JEPeM/18010055], and the Malaysia Ministry of Education [KPM. 600-3/2/3-eras (1296)]. This cross-sectional study involved 13-year-old school students from a secondary school located on the northeastern coast of Malaysia. Students who were Malaysian citizens and able to comprehend either Malay or English were included in the study. Those who were medically compromised and physically handicapped were excluded.

Eligible students, based on the inclusion and exclusion criteria, were selected using simple random sampling. A list of all students in Form 1 was obtained, and each name was assigned a unique number. A total of 215 students were randomly selected using SPSS software to participate in the study.

A validated questionnaire, "The Index of Dental Anxiety and Fear" questionnaire (IDAF-4C⁺), developed for Malaysian secondary school children by Baharuddin et al. was used in this study [11]. The IDAF-4C⁺ comprises three modules. The first module includes eight items measuring DAF responses, with every two items assessing emotional, behavioural, physiological, and cognitive components. The second module contains five items measuring dental phobia using DSM-IV diagnostic criteria (IDAF-P). The third module includes ten items evaluating potential anxiety-inducing stimuli (IDAF-S). The scoring and interpretation method of the questionnaire is detailed below:

a) The first module (IDAF-4C)

The eight items are scored on a scale ranging from "disagree" to "strongly agree," with scores assigned from 1 to 5. The total score is calculated by

summing the individual item scores, resulting in possible range of 8 to 40. However, a mean score of all items is recommended for an overall total score. A mean score of 1.0 - 2.99 (no to low-moderate anxiety) is categorised as non-dentally anxious, while a score 3.0 to 5.0 (high to extreme anxiety) is classified as having DAF [12].

b) Second module (IDAF-P)

The definition of a "marked fear", as outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM), can be operationally assessed using a cut-off point from the IDAF-4C score. Following the recommendation by Armfield, a mid-point score of 3.0 on the IDAF-4C was used in this study [13]. Diagnosing dental phobia non-clinically requires meeting the following criteria based on the DSM-IV for dental phobia:

1. An indication of "marked fear" on the IDAF-4C
2. A "yes" response to items 1, 2, and 3.
3. A "no" response to items 4 and 5.

c) Third module (IDAF-S)

Ten items are used to assess the extent of anxiety among respondents regarding various dental stimuli. The scale ranges from "not at all" to "very much" and is designed to provide depth and context to the IDAF-4C or IDAF-P, helping to identify specific area of concern. Each of the ten items is analysed individually; there is no overall total score or mean score for this module.

The IDAF4C⁺ questionnaire was distributed to all eligible and consented 13-year-old school students. Researchers were present to assist students with any doubts or clarifications regarding the questionnaires. The time required to complete the questionnaire was approximately 20 minutes.

Following the completion of the questionnaire, a clinical oral examination was conducted in a classroom setting by a single examiner. The examination used a disposable probe and mouth mirror, with the students seated upright on a dental chair under a portable dental light. The dental probe was used to remove the food debris.

The Decayed, Missing and Filled Teeth Index (DMFT) was employed to quantify caries prevalence [14,15], estimating the severity of caries in permanent dentition, involving 28 permanent teeth and excluding all wisdom teeth. This method involved calculating the number of: Decayed (D) teeth, defined as those with carious lesions except for incipient caries; Missing (M) teeth, defined as those extracted teeth due to caries; and Filled (F)

teeth, defined as those restored with fillings or crowns.

Data entry and analysis were performed using SPSS version 22. Numerical data were presented as mean and standard deviation (SD) or as median and interquartile range (IQR). Categorical data were summarised as frequency and percentage. A Chi-square test was conducted, with statistical significance set at $p < 0.05$.

RESULTS

A total of 196 13-year-old school students participated in this study, with a response rate of 91.6%. Nineteen students (8.84%) were unavailable during data collection, or parental consent was not obtained. All respondents were Malays, with the majority being male (54.6%). Most parents or guardians had completed their education at the secondary level, and the median (IQR) monthly household income was MYR2000 (4000). The majority of students (81.6%) reported receiving oral health information from doctors, nurses, healthcare personnel, while about 10 students (5.1%) did not receive oral health information from any sources (Table 1).

Table 1 Sociodemographic profiles of the adolescent (n = 196)

Sociodemographic profiles	n (%)
Gender	
Male	107 (54.6)
Female	89 (45.4)
Education level	
Father (n = 169)	
Tertiary	42 (24.9)
Diploma/ Pre-university	37 (21.9)
Secondary school	81 (47.9)
Primary school and below	9 (5.3)
Mother (n = 191)	
Tertiary	43 (22.5)
Diploma /pre- university	49 (25.7)
Secondary school	91 (47.6)
Primary school and below	8 (4.2)
Guardian (n = 12)	
Tertiary	2 (16.7)
Diploma/pre- university	2 (16.6)
Secondary school	7 (58.4)
Primary school and below	1 (8.3)
Monthly Household Income (RM)	2000 (4000) ^a
Sources of oral health information	
No	10 (5.1)
Doctors/Nurses/Healthcare personnel	160 (81.6)
Television / Radio	52 (26.5)
Newspaper / Reading material	15 (7.7)
Internet	33 (16.8)
Family members / Friends	59 (30.1)
Others	1 (0.5)

^aMedian (IQR)

Dental anxiety and fear

As shown in Table 2, most school students reported that their "heart beats faster when going to the dentist," with a mean score of 2.84 (SD 1.31), followed by "feeling anxious shortly before going to the dentist" with the mean score of 2.81 (SD 1.25). The total mean IDAF-4C score was 2.24 (0.76).

Table 2 Mean score for each item in IDAF-4C

IDAF-4C items	Mean (SD)
(a) I feel anxious shortly before going to the dentist	2.81 (1.25)
(b) I generally avoid going to the dentist because I find the experience unpleasant or distressing	1.80 (1.08)
(c) I get nervous or edgy about upcoming dental visits	2.31 (1.30)
(d) I think that something really bad would happen to me if I were to visit a dentist	1.65 (0.97)
(e) I feel afraid or fearful when visiting the dentist	2.61 (1.28)
(f) My heart beats faster when I go to the dentist	2.84 (1.31)
(g) I delay making appointments to go to the dentist	2.01 (1.31)
(h) I often think about all the things that might go wrong prior to going to the dentist	1.92 (1.12)
Total mean score of each item (IDAF-4C)	2.24 (0.76)

The prevalence of DAF (high to extreme DAF; score 3.0-5.0) was 19.9 % (95% CI: 14.3%, 25.5%) (Table 3). Based on dental phobia criteria, only two out of 196 (1.0%) met all three criteria but were non-clinically diagnosed with dental phobia (Table 4).

Table 3 The prevalence of DAF

DAF	n (%)	(95% Confidence interval)
Non-dentally anxious ^a	157 (80.1)	(74.5, 85.7)
Dentally anxious ^b	39 (19.9)	(14.3, 25.5)

^aNon dentally anxious: 1.0-2.99 (no- low-moderate)

^bDentally anxious: score 3.0-5.0 (high to extreme)

Table 4 Dental Phobia Module, IDAF-P

Dental Phobia	n (%)
Yes	2 (1.0)
No	194 (99.0)

Table 5 shows that the most anxiety-eliciting dental stimuli (IDAF-S) were undergoing treatment with an unsympathetic or unkind dentist, followed by needles or injections, with mean (SD) scores of 3.89 (1.38) and 3.59 (1.44), respectively, out of a total possible score of five.

Table 5 Potential anxiety-inducing stimuli, IDAF-S

Stimuli	Mean (SD)
(1) Painful or uncomfortable procedures	2.95 (1.12)
(2) Feeling embarrassed or ashamed	1.85 (1.03)
(3) Not being in control of what is happening	2.90 (1.28)
(4) Feeling sick, queasy or disgusted	2.39 (1.35)
(5) Numbness caused by the anaesthetic	2.48 (1.38)
(6) Not knowing what the dentist is going to do	2.85 (1.34)
(7) The cost of dental treatment	2.29 (1.31)
(8) Needles or injections	3.59 (1.44)
(9) Gagging or choking	2.92 (1.40)
(10) Having an unsympathetic or unkind dentist	3.89 (1.38)

Score: 1 (Not at all); 2 (A little); 3 (Somewhat); 4 (Moderately); 5 (Very much)

Prevalence of caries experience and its association with DAF

The prevalence of dental caries among the students was 48.0% (95% CI: 40.9%, 55.0%). The percentage of students with untreated dental caries, missing and filled teeth were 23%, 2.6%, and 39.3%, respectively (Table 6). There was no significant association between DAF (IDAF-4C score) and caries experience ($p=0.411$) (Table 7).

Table 6 Prevalence of caries experience (DMFT)

Caries experience	n (%)	95% Confidence interval
DMFT > 0	94 (48.0)	40.9, 55.0
DMFT = 0	102 (52.0)	45.0, 59.1
Decay (D)	45 (23.0)	-
Missing (M)	5 (2.6)	-
Filling (F)	77 (39.3)	-

Table 7 Association between DAF and caries experience

DAF	n (%)	Caries experience		χ^2 -stats (df)	p-value
		Yes (DMFT > 0)	No (DMFT = 0)		
Yes	39 (19.9)	21 (53.8)	18 (46.2)	0.676 (1)	0.411
No	157 (80.1)	73 (46.5)	84 (53.5)		

DISCUSSION

This study was conducted at one of the secondary school under the SDS programme on the north-eastern coast of Malaysia, involving 196, 13-year-old adolescents. The majority of participants were Malay, reflecting the ethnic composition of Kelantan, where Malays make up 92.2% of the total population [16]. The school is located in an urban Ann Dent UM. 2024, 31: 64-71

area. However, most parents had only completed secondary education, with household incomes varying widely. Most students had received oral health information from healthcare personnel through the SDS programme.

Socioeconomic factors play a significant role in influencing DAF. Armfield et al. reported that individuals from lower socioeconomic backgrounds are more likely to experience higher levels of dental fear and increased oral disease prevalence compared to those from higher socioeconomic (SES) groups [17]. Additionally, dental caries resulting from dental avoidance might be linked to parental and economic factors [18]. Furthermore, parents' educational level and oral health knowledge significantly influence their children's oral health status, as they are the primary decision-makers regarding their child's first dental visit and need for dental treatment [19].

Dental Anxiety and fear

The mean IDAF-4C score obtained in this study (2.24) was notably higher compared to studies conducted in other countries. For example, a study in Australia involving 1,084 adults reported a mean score of 1.80 [20], a study in Finland among 172 dental students reported a score of 1.45 [21], and a study among 231 Spanish undergraduate students found a mean score of a 1.98 [22]. Additionally, the prevalence of DAF in this study was relatively higher at 19.9% (95% CI: 14.3%, 25.5%) compared to other countries. A study conducted in Dunedin, New Zealand, among 18-year-old adolescents reported a prevalence of 12.5% [23], while in Australia, the prevalence of high dental fear, including children and adults, was 16.1% [17].

In Malaysia, since the SDS programme has been made compulsory for all primary and secondary school students from the aged 7 to 17, these findings were unexpected. It was hypothesised that student would have relatively low levels of DAF due to continuous exposure to incremental dental care services from a young age.

When reviewing the factors contributing to the high prevalence of DAF, many studies suggest that children's or adolescent's perceptions of the dental environment play a significant role in influencing DAF [24]. Additionally, Humphris and King et al. reported that students with history of distressing dental experience were two and a half times more likely to exhibit high DAF [25].

The results of IDAF-S module, in this study revealed that most school students ranked direct negative

experiences, such as receiving treatment from an unsympathetic or unkind dentist, as the most anxiety-inducing dental stimulus. This was followed by other invasive procedures, such as needles or injections. These findings align with previous research indicating that dentists' attitudes are among the most fear-stimulating factors, along with invasive procedures like extractions and injections [26]. Moreover, a systematic review of 11 publications, Zhou et al. concluded that there is a relationship between dental staff behaviour and child DAF, with punishing behaviours being strongly associated with higher DAF in children [27].

Dental Caries Experience

The prevalence of dental caries in the current study was higher (48.0 %) compared to data from the national survey conducted by the Malaysian Ministry of Health (MOH) in 2016, which reported that only 42.2 % of 12-year-old students had caries [28]. Despite being exposed to the SDS programme, the high caries experience, particularly untreated dental caries (23%) among our study population warrants attention. In comparison, the National Australian Child Dental Survey conducted from 2000 to 2004 reported a relatively similar caries prevalence, with 40-57% of 12- to 15-year-old adolescents experiencing caries [29].

Previous studies have reported that individuals with dental anxiety are more likely to have greater number of decayed [31] and missing teeth [38] than non-anxious individuals [9,32]. However, this study found no significant association between DAF and caries experience, which aligns with findings from studies in Jeddah, Saudi Arabia [33], Puducherry, India [34] and Norway [35].

Nevertheless, some studies present conflicting results, suggesting that DAF is directly associated with irregular visit patterns, negative behaviours during dental examinations [33], deterioration in oral health status, and reduced oral health-related quality of life [36-38]

In addition, it was found that the caries experience among dentally anxious adolescents was higher but not significantly worse than that of their non-anxious counterparts. This may be attributed due to the multifactorial aetiology of dental caries. Another possible explanation is that the school students recruited in this study had been continuously exposed to the systematic and comprehensive care provided under the SDS programme [1]. Despite having high DAF, these students are compelled to attend the compulsory SDS programme to receive preventive treatment.

However, after the age of 17, the adolescents no longer receive dental care under the SDS programme and are not obligated to attend regular dental check-ups. This create acute concern, especially for school-leavers entering adulthood with high DAF, as they are more likely to delay or avoid dental visits in the future [3,17]. Dental avoidance and irregular dental attendance, potentially originating from DAF experienced during childhood and adolescence, which states that around 47% of adults had their last dental visit more than two years ago [39]. Similarly, a study involving 407 Malaysian adults reported a DAF prevalence of 94.1%, with individuals exhibiting higher levels of fear being about six times more likely to cancel dental appointments compared to those with lower levels of fear [40].

Oral health providers should prioritise developing strategies to help adolescents cope with their DAF [41]. A patient-friendly environment in the dental office is particularly crucial as it can significantly reduce DAF. Dental professionals must act professionally and ethically [42], fostering strong rapport and mutually respectful relationships with their patients by showing empathy and providing their utmost attention [3,43]. Importantly, two-way communication strategies should be employed [43].

Dentist should be patient, calm, and non-judgemental listeners [44], ensuring that patients are well-informed about their current dental problems, treatment options, and preventive procedures before initiating any treatment [3,43]. During procedures, dentists are obligated to provide moral support, inquire about any discomfort, and reassure patients that their concerns are being addressed, heling them feel well-prepared for upcoming dental procedures. Ultimately, this approach allows for successful phased and long-term treatment plans to be implemented in an environment free from dental anxiety and fear [44].

However, this study has several limitations. The cross-sectional study design was limited to a group of 13 years old school students from a single school, which may restrict the generalisability of the findings to other states in Malaysia. Given Malaysia's multi-ethnic population, future studies on DAF should be expanded to include other states and groups from diverse socio-economic backgrounds. This would provide a more comprehensive understanding, essential for aiding policymakers in designing intervention programmes address barriers faced by secondary

school leavers suffering from DAF. Additionally, this study may be susceptible to recall bias, as the school students may have faced difficulty accurately recalling and agreeing on experiences related to DAF as captured in the questionnaire.

CONCLUSION

The prevalence of DAF among adolescents was 19.9%, with the most anxiety-eliciting stimuli being unsympathetic dentists and needles. Dental caries prevalence was 48.0%, but no significant association was found between DAF and caries. Strategies to address DAF are essential to prevent future dental avoidance and improve oral health outcomes.

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DECLARATION OF INTEREST

Authors declare no conflict of interest.

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