

Dental Anxiety and Fear among a University Population in a Sample from Yemen

Ahmed A. Madfa (✉ ahmed_um_2011@yahoo.com)

University of Hail <https://orcid.org/0000-0001-6124-0129>

Saad M. Al-Zubaidi

University of Hail

Ahmed H. Shibam

University of Science and Technology

Waled A. Al-ansi

University of Science and Technology

Lamis A. AL-Beshari

University of Science and Technology

Arwa M. Al-Haj

University of Science and Technology

Khaled A. AL-Jawfi

University of Science and Technology

Research article

Keywords: Undergraduate Students, Dental Anxiety, Dental Fear, Education, Yemen

Posted Date: January 21st, 2020

DOI: <https://doi.org/10.21203/rs.2.21375/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Many patients and clinicians consider dental fear to be a major challenge. Knowledge about dental students' own experiences with dental anxiety is very important. The present study, therefore, aimed to examine the levels of dental anxiety and fear among students in relation to their field of study and gender.

Methods: This cross-sectional study involved 720 (360 women and 360 men) recruited from the College of Dentistry and the College of the Humanities and Social Sciences at the University of Science and Technology in Sana'a, Yemen. Corah's Dental Anxiety Scale (DAS) and Dental Fear Survey (DFS) were used to measure anxiety and fear among the study population. Spearman's correlation was applied to analyse the relationships among the anxiety measurements and the relationship between the DAS and DFS tests. Chi-square tests and linear regression analyses were applied to analyse the associations between dental anxiety or fear and contextual variables.

Results: Out of the 720 students enrolled, 713 students (354 men and 359 women) completed and returned the questionnaire, yielding a response rate of 99.03%. The associations among dental anxiety measurements and the DAS and DFS was statistically significant ($p < 0.01$). Students from the dental colleges had less anxiety and fear than did those from the humanities and social sciences college ($p < 0.05$). Men were less anxious and fearful than women ($p < 0.05$). Dental anxiety and fear were more associated with women than were other contextual variables [for fear (OR = 1.14, $p = 0.001$); for anxiety (OR = 1.90, $p = 0.001$)].

Conclusions: Dental anxiety was found to be related to dental fear. Women were more anxious and fearful than men. Dental students were less anxious and fearful than those from the humanities and social sciences college. A lack of suitable dental health education may result in higher levels of anxiety and fear among students from non-dental colleges in Yemen.

Background

Oral health is an important part of general well-being and a substantial public health issue. Despite increased awareness among dentists as well as patients about preventive methods for oral diseases and dental equipment revolutions and pain reduction, dental anxiety is still an important problem in clinical dentistry [1].

Generally, the definition of anxiety is an imaginary threat when we deal with unknown and unfamiliar processes. Anxiety is also described as a vague, unpleasant feeling that is accompanied by the premonition that undesirable things are going to happen. Anxiety is a response to a perceived danger that is unknown to the individual. Fear is a biological reaction to a particular threat and is a reaction to a known danger or threat [2,3]. Klingberg and Broberg [4] described dental anxiety as a state of unreasonable and excessive apprehension that something terrible is going to occur in relation to dental treatment; it is associated with the sense of losing control. Alternatively, Cianetti et al. [1] described dental

fear as a normal unpleasant emotional reaction in a dental situation to a perceived threat or danger. Many studies in dentistry frequently reference the concepts of dental anxiety and fear, indicating the strength of the negative feelings that can accompany dental treatment [1,4, 5].

Dental anxiety associated with dental procedures is a major problem for both patients and dentists worldwide. Despite the revolutions in dental technologies and materials and improved knowledge, a significant percentage of patients still suffer from dental anxiety [6]. This anxiety includes apprehension regarding dentistry and receiving dental care, which normally leads to the avoidance of dental treatment and poor oral health and may cause the deterioration of oral health-related quality of life [7–9]. Many investigators have reported that anxious patients have worse periodontal health, fewer filled teeth, and more decayed and missing teeth than non-anxious patients do [10–12].

Many scales have been used to evaluate the level of anxiety level and dental fear so that appropriate management strategies can be used. These scales include the Dental Anxiety Scale (DAS), the Modified Dental Anxiety Scale (MDAS), the Dental Fear Survey (DFS), the Chotta Bheem-Chutki Scale (CBCS), the General Geer Fear Scale (GGFS), Venham's Pictorial Scale (VPS), the State-Trait Anxiety Scale (STAI), the Facial Image Scale (FIS), and the Getz Dental Belief Survey (GDBS) [13–16]. Even though none of these scales is considered to be the gold standard [11], the DAS [17], MDAS [18], and DFS [19] are the most frequently used instruments in studies that investigate dental anxiety and fear in populations worldwide [11, 20, 21].

A widespread literature review reported that the dental anxiety prevalence among different populations ranged from 2% to 30% depending on the methods applied, the studied individuals, and the cut-off scores used [1,22–24]. Numerous studies have shown that younger subjects are more likely to have dental anxiety than are elderly individuals [25,26]. Many researchers have concentrated on studying dental anxiety in university students [27–37], and the incidence of anxiety ranges from 11% to 27.5% among students at different universities globally [38–40]. Higher dental anxiety has been reported in non-dental students than in dental students, which might be because of inadequate dental health education, which leads to high dental anxiety among undergraduate students from non-dental colleges [27–29], and additional decreases in dental anxiety have been revealed among dental students during the course of their dental training [9,41]. Therefore, for these students, it is necessary to study procedures that can assist them in overcoming such anxiety [28]. Anxiety connected to dental treatment is mystifying for patients, and treating anxious patients is an important point of concern for dental practitioners. Currently, there is plenty of evidence of physiological stress indicators that appear during dental treatment, such as elevated heart rate and increased blood pressure, and thus on which dental experiences provoke similar responses among patients when procedures are being completed [42]. University students are an important group to evaluate, as they are upcoming healthcare providers.

“Yemen is still poor developing country, which situated South-West of Arabian Peninsula to Saudi Arabia Kingdom. For most Yemeni people, dental care does not have the same intuitive quality of life dimension as health care in general”. Additionally, the patient and/or his or her family members may consider dental

care to be unimportant. They are already burdened with the medical expenses that come from having chronic illnesses, and therefore, they are reluctant to spend more on dental care. Additionally, the Yemeni governorates have been grappling with major health problems, such as malnutrition and tuberculosis, and have high mortality rates; as a result, oral health is not yet regarded as a high priority by the governorates [43]. Therefore, dental educational or preventive programmes have not targeted Yemeni populations, and Yemeni populations do not have primary dental healthcare access. Baseline data on oral health status in Yemen as a whole are sparse.

The need for dental health care in Yemen is increasing and is paralleled by an increasing number of dental faculties as well as private dental clinics. Many reports have revealed poor oral health among populations living in Yemen [44–46]. Therefore, dental anxiety and fear affect not only the general adult population but also university students who are going to become health professionals. However, at present, only one study has been performed among the Yemeni population [47]. Hence, the current study assessed dental anxiety levels among medical undergraduate students at Tamar University in Yemen. At present, the dental literature has insufficient information, as it lacks examination of the correlation of students' gender and field of study with dental anxiety levels. No previous studies about this topic have been conducted among Yemeni undergraduate university students, which prompted us to conduct this study. Therefore, the present study aimed to investigate dental anxiety levels among undergraduate students at the University of Science and Technology (UST) in Yemen. In addition, the study explored dental anxiety and sources of fear in relation to gender and study field, as well as the latter group's impact on perceived dental anxiety and fear.

Methods

Study design and location

This was a cross-sectional study based on a random sample of undergraduate students at the University of Science and Technology (UST) in Sana'a City, Yemen. The UST was selected because it attracts many students. These students come from Sana'a City and its surrounding neighbourhoods. Sana'a City is the largest city in Yemen, with approximately 3 million people. Most of the residents are migrants from all across the country.

The scientific committee of UST approved this study, and the participants' anonymity was strictly respected. Participants had a choice to participate in the survey and gave their agreement to participate by signing a participation form. Data were kept confidential and were used only for the purposes of this study. The participants were given an information sheet that explained the aims, objectives and methods of the present investigation.

Sample size and sampling process

The sample size was calculated to obtain a representative sample of the undergraduate students in this municipality. The following formula was used to calculate the sample size:

$$n = z^2 \times p(1-p) / e^2$$

where: n = desired sample size and P = estimated proportion of the outcome in the target population. A previous study by Madfa et al. [47] involving medical undergraduate students at Tamar University reported that the prevalence of dental anxiety was 63%. Therefore, this figure will be used as a reasonable estimate for incidence among Yemeni students.

e = maximum size of standard error, set at 5%.

z = number of standard deviations = 1.96 for 95% confidence level.

$$n = (1.96)^2 \times (0.63) \times (1 - 0.63) / (0.05)^2 = 358 \text{ students.}$$

This study was conducted with 720 undergraduate students (360 men and 360 women) from the College of Dentistry and the College of the Humanities and Social Sciences at UST. The distribution was 360 women (180 dental and 180 humanities and social sciences students) and 360 men (180 dental and 180 humanities and social sciences students); 359 and 354 complete questionnaires were returned, respectively. The final sample in this study was 713 students.

Data collection

Data collection was performed between February 2018 and April 2019. After an explanation about the aims and structure of the investigation, all respondents received an identical blank copy of the questionnaire. The questionnaires were checked to confirm the understanding of the items by the students, the simplicity of answering the questions and the time needed to fill out the questionnaire. The questionnaire distribution to the students was done through college authorities.

The DAS and DFS were used in this study. The present study also recorded data regarding participants' personal information (e.g., gender and field of the study). A draft questionnaire to evaluate dental anxiety and fear was created in English and then translated into Arabic, which is the national language of Yemen. Both English and Arabic versions of the questionnaire were tested by language experts many times to ensure the clarity of the translated version and then verified for face validity by members of the college. The Arabic version of the questionnaire was then administered to all students, who were told that they were free to complete it or not.

The DAS contains 4 questions with 5 choices, measured with scores of 1 to 5:

- "If you had to go to the dentist tomorrow, how would you feel about it?"
- "When you are waiting in the dentist's office for your turn in the chair, how do you feel?"

- “When you are in the dentist’s chair waiting while he or she gets the drill ready to begin working on your teeth, how do you feel?”
- “You are in the dentist’s chair to have your teeth cleaned; while you are waiting and the dentist is getting out the instruments which will be used to scrape your teeth around the gums, how do you feel?”

The scores for each of the 4 questions were summed to find the level of dental anxiety. The overall maximum score was 20:

a = 1, b = 2, c = 3, d = 4, e = 5 Total possible = 20

Anxiety rating

- “5 - 8 = low anxiety”
- “9 - 12 = moderate anxiety”
- “13 - 14 = high anxiety”
- “15 - 20 = severe anxiety (or phobia)”

The DFS consists of 26 questions with four choices, measured with scores of 0 to 3. The scores for each of the 26 questions were summed to find the level of dental fear. The maximum score was 78. A score of less than 26 indicates a low fear concern, a score between 26 and 52 is referred to as a medium fear concern, and a score of 52 or above indicates a high fear concern.

Statistical analysis

All returned forms were coded by a single operator, and the data were checked and entered into a personal computer. The collected information was investigated using the Statistical Package for Social Science (SPSS) program (version 21; IBM Inc., Chicago. IL). Descriptive statistics in terms of central tendency measures, frequencies and charts were used in the data analysis. Spearman’s correlation was applied to evaluate associations among the dental anxiety measurements. The interrelationships between the DAS and DFS were examined with Spearman’s correlation. Chi-squared and Fisher’s exact tests for independence were utilized to check the significance of differences between the measured variables. Regression analyses were executed to analyse the relationship between the self-administered questionnaire variables and the recorded response from participants in this study. The significance threshold for all tests was set at $p < 0.05$ with a 95% confidence interval.

Results

The prevalence of dental anxiety and fear among the variables are demonstrated in Fig. 1. For dental anxiety, 38.0% of participants had moderate anxiety, 33.8% had low anxiety and 16.7% had high anxiety. A minority of respondents reported severe anxiety (11.5%). With respect to dental fear, the majority of the

sample (64.2%) reported moderate fear, while 32.6% mentioned that their fear level was high. The small minority of responses (3.2%) stated that their fear level is low. Local anaesthesia injection was the most fearful situation of all dental procedures (56.6%), followed by the drilling of teeth (49.1%).

Spearman's correlation was applied to analyse the interrelationships among the dental anxiety measurements (Table 1). A positive correlation was found among items ($p < 0.01$). Spearman's correlation was also applied to examine the relationship between the DAS and DFS tests, between which the interrelationships were statistically significant ($p < 0.01$), as shown in Table 2.

The effects of gender and field of study on the prevalence of dental anxiety and fear are shown in Tables 3 and 4. Women had higher levels of anxiety and fear than did men. There were significant differences between men and women regarding dental anxiety and fear ($p < 0.01$). Humanities and social sciences students revealed higher levels of anxiety and fear than did dental students. There were statistically significant differences between students in the different colleges ($p < 0.01$).

For dental students, students from the clinical class showed low dental fear and anxiety when compared to those from the preclinical class (Table 5). However, there were no statistically significant differences regarding the year of study of dental students ($p > 0.05$).

Table 6 displays the results of the linear regression analyses for the overall sample. According to the regression model, the prevalence of dental anxiety and fear was significantly associated with contextual variables. There were statistically significant associations between the occurrence of dental anxiety or fear and the relative factors (gender and field of study) ($p < 0.05$). Women were more likely to be effected by dental fear and anxiety [for fear (OR = 1.14, $p = 0.001$); for anxiety (OR = 1.90, $p = 0.001$)].

For dental students, no contextual variables were independently related to the outcome in the final model. There were no statistically significant associations between the prevalence of dental anxiety or fear and either gender or level of study ($p > 0.05$), as revealed in Table 7.

Discussion

Dental anxiety is one of the major worries in repetitive dental practice, and it should be handled and managed in order to ensure appropriate oral healthcare [48,49]. For this reason, the current study was carried out to assess dental anxiety and fear among undergraduate students at UST University in Yemen by utilizing DAS and DFS questionnaires.

Many questionnaires and scales have been established to investigate dental anxiety and fear [27,28,30,32,35,37]. The DAS is perhaps the most commonly used; it is a four-item, multiple-choice questionnaire that assesses the degree of anxiety. It is very reliable and has established predictive validity [50,51]. It is extensively applied for clinical purposes and surveys; however, it has been criticized for not including all aspects of dental fear and because its response alternatives differ between items [52]. The MDAS contains one more question about dental injection anxiety, with the other 4 questions being

identical to those in the DAS. The question on dental injection perhaps also replicates the general phobia of syringes among participants and thus incorporates that phobia with the total score. As the distribution of any kind of phobia is as of yet unidentified in the young Yemeni population, the DAS was considered to be the most appropriate measurement for the current study population of students. This scale has been used in other recent studies [53]. In addition, adaptation tables can be utilized to compare the present results with the MDAS findings of other studies [54]. Moreover, the DFS questionnaire is comprehensive, comprising 26 questions; therefore, we used it in this study. The tool can be routinely used by oral health care professionals on their patients to measure dental fear. The DFS evaluates more stimuli and its increased comprehensiveness may be favourable for research purposes [55,56]. In addition, the DFS is more likely to include items describing specific stimuli that fearful patients may find anxiety-provoking.

The high anxiety levels among students from Yemen might result from a lack of dental health education, which, in turn, might result in poor attitudes and compliance, or such anxiety could be connected to personality features, fear of pain, dentally anxious family members or peers, or earlier traumatic dental experiences, especially in childhood. Highly anxious patients are more difficult to deal with, thus leading to an increase in dental profession-related stress levels [41, 57].

The prevalence of dental anxiety in this study was 55.1%, which suggests that regardless of the technological advancements of modern dentistry, dental anxiety accompanying dental treatment was still widespread in the studied population. These findings are consistent with the results found by Saatchi et al. [58], who reported that dental anxiety was 58.8%. These figures are still higher than those reported in another study in which dental anxiety was 23% [6]. This difference could be partly due to differences in methods or to geographical variations. The incidence of dental fear in the current study was 96.8%. These findings are consistent with other researchers' findings, which found the prevalence of dental fear to be 96% [28].

In the general population and among health care professionals, dental anxiety and fear are considered major, if not commonly encountered, problems. In the current study, we reported relationships between dental anxiety and fear. Many previous researchers have found that earlier unpleasant dental experiences may be the most commonly stated single reason for dental anxiety [59–64]. On the other hand, Davey [65] suggested that a history of positive or neutral dental experiences may act as a buffer against the development of traumatic associations or experiences. Van Wijk and Hoogstraten [66] proposed that individuals are likely to exaggerate their fear of dental pain if they have not experienced the specific pain itself. When patients have experienced to the feared pain, they find it less painful than they expected, and this might reduce their anxiety levels.

This study noticed that dental students have less dental anxiety and fear than humanities and social science students. These results are consistent with other reports that dental anxiety in dental students is less prevalent [28]. A lack of dental education might be an unfortunate factor in anxiety, and thus, dental anxiety may be related to the field of study, as dental students have more dental knowledge, education,

awareness, professional development and acquired clinical experience dental than students in other fields do [67].

In this study, the dental students who were in their last two years of study (clinical class) had lower dental anxiety than those in their first three years (preclinical class). These findings support those of other investigators who argued that dental fear and anxiety are reduced as years of study increase [12, 25, 28]. During university study, dental students begin practical training with artificial teeth models in their third year. Much later in the same year, students move on doing simple treatment procedures on each other, such as administering anaesthesia. This gives them a gradual level of experience in dental treatment that the other student group obviously lacks. Some studies have found that behavioural techniques that contain exposure for patients are most frequently applied to treat patients with phobias. The treatment decreases the fear of the frightening stimuli by removing avoidance behaviours, and thereby, recurrent exposure helps patients experience reduced anxiety in situations they formerly feared [68,69]. This is significant because avoidance behaviours can be seen as a critical mechanism in maintaining phobias. As in exposure techniques, dental students are gradually be exposed to a hierarchy of potentially anxiety-provoking situations. This might begin with reading dental anatomy and training with dolls and end with performing dental examinations and administering anaesthesia on other students (including being exposed to such events). Other reasons for dental anxiety differences might be that dental students from the preclinical class are more susceptible to stress and anxiety because they are dealing with unfamiliar study situations. Students who are just beginning their studies can experience extra stress because of the transitioning challenge from high school to university. Earlier reports have shown that students in earlier years of study have been found to have higher stress responses than those in later years [41, 70]. Decreasing stress because of settling into university life could be a nonspecific reason that anxiety is reduced.

Many investigators have stated that dental anxiety is more common in women [6, 33, 71–73]. Our study results agree with recent studies showing that women exhibit more dental anxiety than men. Both faculties' female students displayed greater DAS scores than did male students. These results are in agreement with those of previous reports [27, 30–37]. This may be attributed to the fact that women are less emotionally stable than men [74–76]. It has been suggested that women are more vulnerable to observed danger or threats and that they might express their fears more openly, but men may be more emotionally tolerant and may hide their anxieties [77]. Nevertheless, some studies have found no differences regarding sex [27,34,35] and have mentioned that a possible explanation is cultural characteristics [35]. The reason behind this difference may be that women are more capable of expressing their feelings of fear. In addition, physiological conditions such as panic, stress, depression, social phobia, and fear are more common in women, and dental anxiety may be related to such emotions [71].

Noticeably, the stimuli for fear vary because every individual has unique fear responses because of different stimuli during dental treatments. Local anaesthesia injection was found to be the most fearful situation among all dental events, followed by the drilling of teeth. This study revealed that seeing the

anaesthetic needle and feeling the needle injection and drilling were the most common fears out of all dental procedures. In the case of local anaesthesia injections, the incidence of extreme anxiety among students was 56.6%. For the drilling of teeth, however, 49.1% of all students were extremely anxious. Normally, the phobia of needles is related to age, but it should be considered a separate phenomenon [78] that is not particular to dental anxiety and is associated with other painful treatments [79]. The results of our study are in agreement with previous studies that have reported these two procedures as the most feared by all respondents worldwide [80–82]. The third and fourth most-feared items in the present study were pain during dental treatment and having instruments in the mouth, respectively.

Undesirable and unsupportive clinician behaviour has been found to be a substantial issue in anxiety development [83], and more empathic behaviour has been related to reduced anxiety [84]. Students from dental colleges with dental anxiety are acquainted with the undesirable concerns of unfortunate clinician behaviour, which might motivate them to work towards a more patient-centred style [85–87].

There are some limitations of this study that should be considered. The present work is a cross-sectional study; therefore, no causal relationships in the relationship between dental anxiety or fear and the factors investigated or trends in the frequency of dental anxiety and fear over time can be determined. However, the present findings could show that educational programme structure can be an important aspect in reducing fear and anxiety. Moreover, the study used a self-administered questionnaire study, and thus, the participants might have hidden their true feelings and underreported their dental anxiety and fear or the unpleasantness they associate with seeking and receiving dental care. Furthermore, the current study may be limited by the fact that only university students from the UST contributed in this study, which makes it challenging to generalize our findings to the young Yemeni population. Therefore, further research on the subject is needed. Although Arabic versions of the DAS and DFS questionnaires were tested several times by language experts for clarity in the translated version and then verified for face validity by the college members, a more thorough testing of the instrument's reliability and validity is necessary. In addition, oral diseases are significant public health worries, and their occurrence is increased due to dental anxiety, thus affecting quality of life. These findings highlight the necessity for population-based studies to identify the associations of dental and fear anxiety for better dental health in Yemen. Furthermore, it is suggested that the university syllabus be adjusted to comprise sufficient dental education for various fields. Additionally, the implication of oral health education at the school level can be very supportive in this issue.

Conclusions

Within the limitations of the study, it can be concluded that the students from dental college had lower dental fear and anxiety levels than did students from the humanities and social sciences college. Final-year dental students showed lower dental anxiety and fear than did those without clinical experience. Men demonstrated lower anxiety levels than did women. The DAS score was positively related to the DFS. Major sources of dental fear were local anaesthesia and tooth drilling. The overall fear and anxiety of dental treatment was high, which indicates the necessity of more prevention protocols and the

inculcation of dental health in educational syllabi. Additionally, exposure to clinical procedures at earlier phases of dental training might help to decrease the level of fear and anxiety among dental students.

List Of Abbreviations

DFS: Dental Fear Survey; DAS: Corah's Dental Anxiety Scale; MDAS: Modified Dental Anxiety Scale; GGFS: General Geer Fear Scale; CBCS: Chotta Bheem-Chutki Scale; VPS: Venham's Pictorial Scale; FIS: Facial Image Scale; STAI: State-Trait Anxiety Scale; GDBS: Getz Dental Belief Survey; UST: University of Science and Technology; n: desired sample size; P: estimated proportion; e: maximum size of standard error; z: number of standard deviations; SPSS: Statistical Package for the Social Sciences.

Declarations

Acknowledgements

The authors would like to acknowledge the co-operation received from the staff of Dental Polyclinics of the Dental College, UST during data collection.

Funding

This work was not supported by any organization.

Availability of data and material

Data and material are available from the corresponding author on reasonable request.

Authors' contributions

AAM contributed with research concept, sample collection, technical steps, data collection, statistical analysis, writing the original draft and reviewing and editing the final manuscript. SMA contributed with research concept and writing the original draft. AHS contributed with sample collection, data collection, writing the original draft. LAA contributed with sample collection, data collection, writing the original draft. WA contributed with statistical analysis and writing the original draft. AMA contributed with research concept and writing the original draft. KAA contributed with research concept and writing the original draft. All authors read and approved the final manuscript.

Authors' information

¹Department of Restorative Dental Science, Collage of Dentistry, Hail University, Hail, Kingdom of Saudi Arabia. ²Department of Conservative Dentistry, Faculty of Dentistry, Thamar University, Dhamar, Yemen.

³Internship Program, Collage of Dentistry, University of Science and Technology, Yemen. ⁴Department of Restorative and Prosthodontics, Collage of Dentistry, University of Science and Technology, Yemen.

⁵Department of Community Dentistry, Collage of Dentistry, University of Science and Technology, Yemen.

⁶Department of Oral Pathology, Collage of Dentistry, University of Science and Technology, Yemen.

Ethics approval and consent to participate

The present study was approved by the Medical Ethics Committee of Faculty of Medicine and Health Sciences at University of Science and Technology, Sana'a, Yemen. It was mandatory for the study participants to carefully read and sign the consent form before being included in this study.

Consent for publication

The manuscript does not contain any individual person's data in any form.

Competing interests

The authors declare that they have no competing interests.

References

1. Cianetti S, Lombardo G, Lupatelli E, et al. Dental fear/anxiety among children and adolescents. A systematic review. *Eur J Paediatr Dent*. 2017;18:121-30.
2. Rubin JG, Slovin M, Krochak M. The psychodynamics of dental anxiety and dental phobia. *Dent Clin North Am*. 1988;32:647-56.
3. Chadwick BL. Assessing the anxious patient. *Dent Update*. 2002;29:448-54.
4. 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;17:391-406.
5. Eli I, Uziel N, Blumensohn R, Baht R. Modulation of dental anxiety – The role of past experiences, psychopathologic traits and individual attachment patterns. *Br Dent J*. 2004;196:689-94.
6. do Nascimento DL, da Silva Araújo AC, Gusmão ES, Cimões R. Anxiety and fear of dental treatment among users of public health services. *Oral Health Prev Dent* 2011;9:329-37.
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;2:642-53.
8. Crofts-Barnes NP, Brough E, Wilson KE, Beddis AJ, Girdler NM. Anxiety and quality of life in phobic dental patients. *J Dent Res*. 2010;89:302-6.

9. Walsh LJ. Anxiety prevention: Implementing the 4 S principle in conservative dentistry. *Auxilliary*. 2007;17:24-6.
10. Esa R, Savithri V, Humphris G, Freeman R. The relationship between dental anxiety and dental decay experience in antenatal mothers. *Eur J Oral Sci*. 2010;118:59-65.
11. Armfield JM, Slade GD, Spencer AJ. Dental fear and adult oral health in Australia. *Community Dent Oral Epidemiol*. 2009;37:220-30.
12. Liu Y, Huang X, Yan Y, et al. Dental fear and its possible relationship with periodontal status in Chinese adults: a preliminary study. *BMC Oral Health*. 2015;15:18.
13. Klages U, Einhaus T, Seeberger Y, Wehrbein H. Development of a measure of childhood information learning experiences related to dental anxiety. *Community Dent Health* 2010;27:122-8.
14. Al-Namankany A, Ashley P, Petrie A. The development of a dental anxiety scale with a cognitive component for children and adolescents. *Pediatr Dent*. 2012;34:e219-24.
15. Sadana G, Grover R, Mehra M, Gupta S, Kaur J, Sadana S. A novel Chotta Bheem-Chutki scale for dental anxiety determination in children. *J Int Soc Prev Community Dent*. 2016;6:200-5.
16. Bonafe FS, Campos JA. Validation and Invariance of the Dental Anxiety Scale in a Brazilian sample. *Braz Oral Res* 2016;30:e138.
17. Corah NL. Development of a dental anxiety scale. *J Dent Res*. 1969;48:596.
18. Humphris GM, Morrison T, Lindsay SJ. The modified dental anxiety scale: validation and UK norms. *Community Dent Health*. 1995;12:143-50.
19. Kleinknecht RA, Klepac RK, Alexander LD. Origins and characteristics of fear of dentistry. *J Am Dent Assoc*. 1973;86:842-8.
20. Kanaffa-Kilijanska U, Kaczmarek U, Kilijanska B, Frydecka D. Oral health condition and hygiene habits among adult patients with respect to their level of dental anxiety. *Oral Health Prev Dent*. 2014;12:233-9.
21. Beaton L, Freeman R, Humphris G. Why are people afraid of the dentist? Observations and explanations. *Med Princ Pract*. 2014;23:295-301.
22. Vassend O. Anxiety, pain and discomfort associated with dental treatment. *Behav Res Ther*. 1993;31:659-66.
23. Quteish Taani DS. Dental fear among a young adult Saudian population. *Int Dent J*. 2001;51:62-6.
24. Svensson L, Hakeberg M, Boman UW. Dental anxiety, concomitant factors and change in prevalence over 50 years. *Community Dent Health*. 2016;33:121-6.
25. Schuller AA, Willumsen T, Holst D. Are there differences in oral health and oral health behavior between individuals with high and low dental fear? *Community Dent Oral Epidemiol*. 2003;31:116-21.
26. Armfield JM. Predicting dental avoidance among dentally fearful Australian adults. *Eur J Oral Sci*. 2013;121:240-6.
27. Storjord HP, Teodorsen MM, Bergdahl J, et al. Dental anxiety: a comparison of students of dentistry, biology, and psychology. *J Multidiscip Healthc*. 2014;7:413-8.

28. Al-Omari WM, Al-Omiri MK. Dental anxiety among university students and its correlation with their field of study. *J Appl Oral Sci.* 2009;17:199-203.
29. Gunjal S, Pateel DGS, Parkar S. Dental Anxiety among medical and paramedical undergraduate students of Malaysia. *Int J Dent.* 2017;2017:5.
30. Pohjola V, Rekola A, Kunttu K, et al. Association between dental fear and oral health habits and treatment need among University students in Finland: a national study. *BMC Oral Health.* 2016;16:26.
31. Sghaireen MG, Zwiri AM, Alzoubi IA, et al. Anxiety due to dental treatment and procedures among university students and its correlation with their gender and field of study. *Int J Dent.* 2013;2013:647436.
32. Abu Hantash RO, Abu Younis MH, Aker MM. Dental anxiety and fear among medical field students at Al Quds University. *Br J Med Med Res.* 2014;4(12):2312-21.
33. Quteish Taani DS. Dental anxiety and regularity of dental attendance in younger adults. *J Oral Rehabil.* 2002;29:604-8.
34. Kirova DG. Dental anxiety among dental students. *J Imab.* 2011;17:137-9.
35. Hawamdeh S, Awad M. Dental anxiety: prevalence and associated factors. *Eur J Gen Dentistry.* 2013;2:270-3.
36. Jankovic SM, Aleksic D, Bahtijari Z, et al. Risk factors for severe dental anxiety among medical students. *Vojnosanit Pregl.* 2014;71:16-21.
37. Hakim H, Razak IA. Dental fear among medical and dental undergraduates. *The Scientific World Journal.* 2014;2014:747508.
38. Serra-Negra J, S. M. Paiva, M. Oliveira, E. Ferreira, F. Freire- Maia, and I. Pordeus. Self-reported dental fear among dental students and their patients. *Int J Environ Res Public Health.* 2012;9: 44– 54.
39. M. A. Shaikh and A. Kamal. Over dental anxiety problems among university students: perspective from Pakistan. *J Coll Physicians Surg Pak.* 2011;21:237–238.
40. J. Cesar, A. B. de Moraes, P. Milgrom, and R. A. Kleinknecht. Cross validation of a Brazilian version of the Dental Fear Survey. *Community Dent Oral Epidemiol.* 1993; 21: 148– 150.
41. Peretz B, Mann J. Dental anxiety among Israeli dental students: a 4-year longitudinal study. *Eur J Dent Educ.* 2000;4:133-7.
42. L. Randy, — Stress in dentistry—it could kill you!, Oral Health Group, <http://www.oralhealthgroup.com/features/stress-indentistry- it-could-kill-you/>.
43. Elgazzar HA. Raising returns: The distribution of health financing and outcomes in Yemen. World Bank Washington, DC, USA; 2011.
44. Ali AA. Qat habit in Yemen society: a causative factor for oral periodontal diseases. *Int J Environ Res Public Health.* 2007; 4:243-7.
45. Halboub E, Dhaifullah E, Yasin R. Determinants of dental health status and dental health behavior among Sana'a University students, Yemen. *J Investig Clin Dent.* 2013;4:257-64.

46. Dhaifullah E, Al-Maweri SA, Al-Motareb F, Halboub E, Elkhatat E, Baroudi K, et al. Periodontal health condition and associated factors among University Students, Yemen. 2015.
47. Madfa AA, Amran AG, Al-Sanabani FA, Alhaji MN, Al-Qudaimi NH, AL-Malahy NA, Al-washali HA, Yue X-G. Prevalence of dental anxiety and fear among medical students at University of Tamar. *Am J Health Res.* 2015; 3:5-9.
48. DeDonno MA. Dental anxiety, dental visits and oral hygiene practices. *Oral Health Prev Dent.* 2012;10(2):129-33.
49. Kesim S, Unalan D, Esen C, Ozturk A. The relationship between periodontal disease severity and state-trait anxiety level. *J Pak Med Assoc.* 2012;62(12):1304-8.
50. Schuurs AHB, Hoogstraten J. Appraisal of dental anxiety and fear questionnaires: a review. *Community Dent Oral Epidemiol.* 1993; 21: 329-39.
51. Haugejorden O, Klock KS. Avoidance of dental visits: the predictive validity of three dental anxiety scales. *Acta Odontol Scand.* 2000; 58:255-259.
52. Corah NL. Dental anxiety. *Dent Clin North Am.* 1988; 32: 779-90.
53. Drachev SN, Brenn T, Tordis A, Trovik TA. Prevalence of and factors associated with dental anxiety among medical and dental students of the Northern State Medical University, Arkhangelsk, North-West Russia, *Int J Circumpolar Health.* 2018; 77:1, 1454786.
54. Freeman R, Clarke HM, Humphris GM. Conversion tables for the Corah and modified dental anxiety scales. *Community Dent Health.* 2007;24:49-54.
55. Schuurs AHB, Hoogstraten J. Appraisal of dental anxiety and fear questionnaires: a review. *Community Dent Oral Epidemiol.* 1993; 21:329-39.
56. Newton JT, Buck DJ. Anxiety and pain measures in dentistry: a guide to their quality and application. *J Am Dent Assoc.* 2000; 131:1449-57.
57. Acharya S, Sangam DK. Dental anxiety and its relationship with self-perceived health locus of control among Indian dental student. *Oral Health Prev Dent.* 2010; 8(1): 9-14.
58. Saatchi M, Abtahi M, Mohammadi G, Mirdamadi M, Binandeh ES. The prevalence of dental anxiety and fear in patients referred to Isfahan dental school. *Iran Dent Res J (Isfahan).* 2015;12:248-53.
59. Doerr PA, Lang WP, Nyquist LV, Ronis DL (1998) Factors associated with dental anxiety. *J Am Dent Assoc* 129, 1111-19.
60. Locker D, Shapiro D, Liddell A. Negative dental experiences and their relationship to dental anxiety. *Community Dent Health.* 1996; 13: 86-92.
61. Poulton R, Thomson WM, Davies S, Kruger E, Brown RH, Silva P. Good teeth, bad teeth and fear of the dentist. *Behav Res Ther.* 1997; 35: 327-34.
62. Klages U, Ulusoy O, Kianifard S, Wehrbein H. Dental trait anxiety and pain sensitivity as predictors of expected and experienced pain in stressful dental procedures. *Eur J Oral Sci.* 2004; 112: 477-83.
63. Vika M, Skaret E, Raadal M, Ost L-G, Kvale G. Fear of blood, injury, and injections, and its relationship to dental anxiety and probability of avoiding dental treatment among 18-year-olds in

- Norway. *Int J Pediatr Dent*. 2008;18(3): 163-169.
64. Serra-Negra J, S. M. Paiva, M. Oliveira, E. Ferreira, F. Freire- Maia, and I. Pordeus. Self-reported dental fear among dental students and their patients. *Int J Environ Res Public Health*. 2012;9: 44–54.
 65. Davey GC. Dental phobias and anxieties: evidence for conditioning processes in the acquisition and modulation of a learned fear. *Behav Res Ther*. 1989; 27: 51-58.
 66. van Wijk AJ, Hoogstraten J. Experience with dental pain and fear of dental pain. *J Dent Res*. 2005; 84: 947-50.
 67. Halonen H, Salo T, Hakko H, Räsänen P. Association of dental anxiety to personality traits in a general population sample of Finnish University students. *Acta Odontol Scand*. 2012;70(2):96-100.
 68. Löhr HD, Rosenvinge JH, Wynn R. Integrating psychoeducation in a basic computer skills course for people suffering from social anxiety: participants' experiences. *J Multidiscip Healthc*. 2011;4:311-9.
 69. Pettersen G, Rosenvinge JH, Wynn R. Eating disorders and psychoeducation - patients' experiences of healing processes. *Scand J Caring Sci*. 2010;25(1):12-8.
 70. Misra R, McKean M. College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *Am J Health Stud*. 2000;16(1):41-51.
 71. Arslan S, Erta E, Ülker M. The relationship between dental fear and sociodemographic variables. *Erciyes Med J*. 2011;33:295-300.
 72. Erten H, Akarlan ZZ, Bodrumlu E. Dental fear and anxiety levels of patients attending a dental clinic. *Quintessence Int*. 2006;37:304-10.
 73. Stabholz A, Peretz B. Dental anxiety among patients prior to different dental treatments. *Int Dent J*. 1999;49:90-4.
 74. Bergdahl M, Bergdahl J. Temperament and character personality dimensions in patients with dental anxiety. *Eur J Oral Sci*. 2003; 111: 93-8.
 75. Doerr PA, Lang WP, Nyquist LV, Ronis DL. Factors associated with dental anxiety. *J Am Dent Assoc*. 1998; 129: 1111-19.
 76. Moore R, Birn H, Kirkegaard E, Brødsgaard I, Scheutz F. Prevalence and characteristics of dental anxiety in Danish adults. *Community Dent Oral Epidemiol*. 1993;21:292-6.
 77. Tolvanen M, Hagqvist O, Luoto A, et al. Changes over time in adult dental fear and correlation to depression and anxiety: a cohort study of pregnant mothers and fathers. *Eur J Oral Sci*. 2013;121:264-9.
 78. Veerkamp JS, Majstorovic M. Dental anxiety and needle phobia in children. A relationship? *Nederlands Tijdschrift Voor Tandheelkunde*. 2006; 113: 226-9.
 79. Majstorovic M, Veerkamp JSJ. Relationship between needle phobia and dental anxiety. *J Dent Child*. 2004; 71: 201-5.
 80. Al-Namankany A, Ashley P, Petrie A. The development of a dental anxiety scale with a cognitive component for children and adolescents. *Pediatr Dent*. 2012;34:e219-24.
 81. Taani DSMQ. Dental fear among a young adult Saudian population. *Int Dent J*. 2001;51:62-6.

82. Rantavuori K, Lahti S, Hausen H, Seppä L, Kärkkäinen S. Dental fear and oral health and family characteristics of Finnish children. *Acta Odontol Scand.* 2004; 62: 207-13.
83. Abrahamsson KH, Berggren U, Hallberg L, Carlsson SG. Dental phobic patients' view of dental anxiety and experiences in dental care: a qualitative study. *Scand J Caring Sci.* 2002;16(2):188-96.
84. Corah NL, O'Shea RM, Bissell GD, Thines TJ, Mendola P. The dentist-patient relationship: perceived dentist behaviors that reduce patient anxiety and increase satisfaction. *J Am Dent Assoc.* 1988;116(1):73-6.
85. Bergvik S, Wynn R, Sørli T. Nurse training of a patient-centered information procedure for CABG patients. *Patient Educ Couns.* 2008;70(2): 227-33.
86. Wynn R. Empathy in general practice consultations: a qualitative analysis. *Epidemiol Psichiatr Soc.* 2005;14(3):163-169.
87. Wynn R. Medical students, doctors: is there a difference? *Text* 1996;16(3):423-448.

Tables

Table 1. Spearman's correlation representing interrelationships the dental anxiety measurements among variables

Variables			Item1	Item2	Item3	Item4
Spearman's rho	Item1	Correlation Coefficient	—	.501**	.474**	.348**
	Item2	Correlation Coefficient	.501**	—	.493**	.363**
	Item3	Correlation Coefficient	.474**	.493**	—	.528**
	Item4	Correlation Coefficient	.348**	.363**	.528**	—
<i>**Correlation is significant at the 0.01 level (2-tailed).</i>						

Table 2. Spearman's correlation representing interrelationships between dental anxiety and fear for studied sample

Variables			Anxiety	Fear
Spearman's rho	Anxiety	Correlation Coefficient	—	.291**
		Sig. (2-tailed)		.000
<i>**Correlation is significant at the 0.01 level (2-tailed).</i>				

Table 3. Influence of gender and field of study on the prevalence of dental anxiety

Anxiety rating	Gender		Field of study	
	Male	Female	Dentistry	Humanities and Social Science
Low	44.6%	23.1%	42.4%	25.3%
Moderate	40.7%	35.4%	36.7%	39.3%
High	11.0%	22.3%	11.9%	21.4%
Severe	3.7%	19.2%	9.0%	13.9%

For gender and field of study, Pearson Chi-Square and Fisher's exact tests ($p < 0.001$).

Table 4. Influence of gender and field of study on the prevalence of dental fear

Fear concern	Gender		Field of study	
	Male	Female	Dentistry	Humanities and Social Science
Low	3.7%	2.8%	3.4%	3.1%
Moderate	70.1%	58.5%	67.8%	60.7%
High	26.3%	38.7%	28.8%	36.2%

For gender, Pearson Chi-Square and Fisher's exact tests ($p < 0.05$).

For field of study, Pearson Chi-Square and Fisher's exact tests ($p > 0.05$).

Table 5. Influence of study level on the prevalence of dental fear and anxiety among dental students.

Rating	Anxiety rating		Fear concern	
	Preclinical students	Clinical students	Preclinical students	Clinical students
Low	37.1%	47.7%	2.8%	4.0%
Moderate	37.6%	35.8%	69.7%	65.9%
High	15.2%	8.5%	27.5%	30.1%
Severe	10.1%	8.0%		

For gender and study level, Pearson Chi-Square and Fisher's exact test ($p > 0.05$).

Table 6. Linear regression analyses results evaluating the effect of gender and field of study on the prevalence of dental fear and anxiety among studied sample

Variables	Predictors	B	OR	(95% CI)	P-Value
Fear	Male vs. Female	0.134	1.143	(0.058,0.210)	0.001
	Dental vs. Humanities and social science students	0.079	1.082	(0.003,0.155)	0.043
Anxiety	Male vs. Female	0.642	1.900	(0.509,0.776)	0.001
	Dental vs. Humanities and social science students	0.370	1.448	(0.236,0.504)	0.001

Table 7. Linear regression analyses results evaluating effect of gender and study level on the prevalence of dental fear and anxiety among dental students

Figures

Variables	Predictors	B	OR	(95% CI)	P-Value
Fear	Male vs. Female	0.093	1.097	(-0.013, 0.199)	0.087
	Level1 vs. Level2 vs. Level3 vs. Level4 vs. Level5	0.071	1.074	(-0.008, 0.149)	0.077
	Preclinical vs. Clinical students	-0.165	0.848	(-0.390, 0.060)	0.150
Anxiety	Male vs. Female	0.571	1.770	(0.387, 0.755)	0.001
	Level1 vs. Level2 vs. Level3 vs. Level4 vs. Level5	-0.062	0.9398	(-0.198, 0.074)	0.370
	Preclinical vs. Clinical students	-0.063	0.9389	(-0.453, 0.327)	0.752

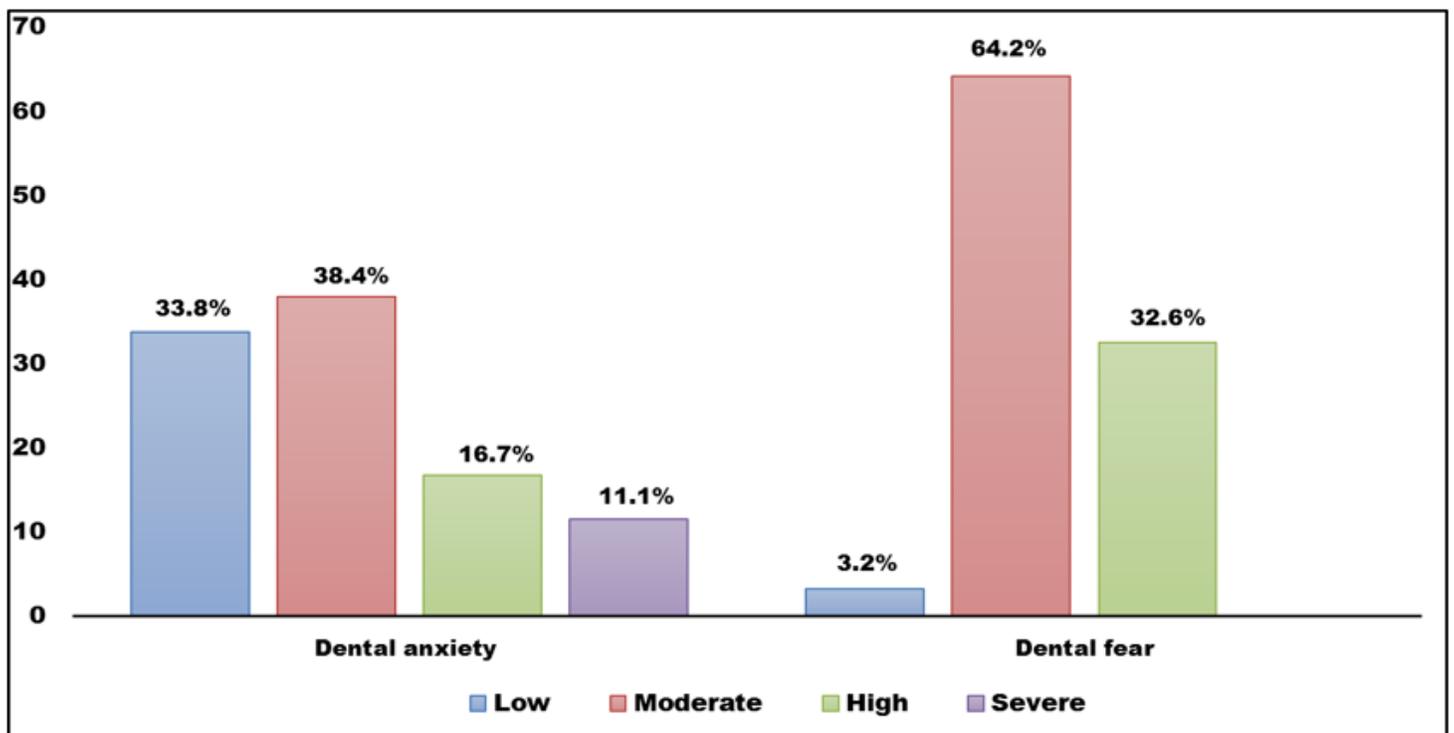


Figure 1

Percentages of dental anxiety and fear among variables.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [STROBEchecklistcrosssectional.doc](#)