

Dental fear & anxiety and dental pain in children and adolescents; a systemic review

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Background: There are few previous studies investigating the relationship of dental fear and anxiety (DFA) with dental pain among children and adolescents. To address this issue, we examined the literature published between November 1873 and May 2015 to evaluate the prevalence of DFA and dental pain among children and adolescents, and their relationships with age and sex.

Methods: We performed a broad search of the PubMed database using 3 combinations of the search terms *dental fear*, *anxiety*, and *dental pain* and *prevalence*. A large proportion of the identified articles could not be used for the review due to inadequate end points or measures, or because of poor study design. Thirty-two papers of acceptable quality were identified and reviewed.

Results: We found that the prevalence of DFA was estimated to be 10%, with a decrease in prevalence with age. It was more frequently seen in girls, and was related to dental pain.

Conclusions: We concluded that dental fear, anxiety, and pain are common, and several psychological factors are associated with their development. In order to better understand these relationships, further clinical evaluations and studies are required.

Key Words: Adolescent; Child; Dental Anxiety; Dental Fear; Pain; Prevalence.

INTRODUCTION

Children's uncooperativeness in dentistry has been conceptualized in different ways. Dental fear (DF) and dental anxiety (DA) are used to denote early signs of dental phobia (DP): an excessive or unreasonable fear or anxiety with regard to the challenge/threat of dental examination and treatment, which influences daily living and results in prolonged avoidance of dental treatment [1]. Dental anxiety and fear (DFA) in children has been recognized in many countries as a public health dilemma [2], and has been studied at length. In the late 1960s, Norman Corah developed the Dental Anxiety Scale (DAS), providing an organizing principle to examine this

issue [3]. Dental fear is a normal emotional reaction to one or more specific threatening stimuli within the dental situation, while DA denotes a state of apprehension that something dreadful will happen in relation to dental treatment, coupled with a sense of losing control. Dental phobia represents a severe type of DA and is characterized by marked and persistent anxiety in relation either to clearly discernible situations/objects (e.g., drilling, injections) or to dental situations in general [4]. Henry Lauth investigated whether these patients' fear was related to the nature and the characteristics of dental care [5], while Elliot Gale concluded that clinicians needed to assess the situation of the patient, rather than actual pain under any circumstances, when assessing DF [6]. Moore et al compared the overall demographic trends and

their relation to the factors and degrees of DF [7].

Among other physical problems seen after birth and persisting into adolescence, toothache due to dental caries often begins in infant. Despite great progress in dental health through dentistry, most youths require dental treatment of various forms. However, teenagers, who are often immature psychologically and physically, can manifest a great fear of dental treatment. Holtzman et al found that, patients for fear of dental treatment missed appointments 3 times more than other patients. They did find that as age increased, fear and anxiety decreased, measured through physiological responses to critical reaction symptoms, such as patients' muscle tension when sitting in the dental chair; further, that younger women expressed more DF than older women, while men reporting DF was unrelated to age [8]. Similarly, many investigators have reported fear of dental treatment in children that may result in treatment management difficulties [9]. Behavior management problems are also related to dental factors, such as earlier negative treatment experiences [10,11], particularly injection, drilling, and extraction, which have been shown to carry the most negative emotional loads [12,13]. Furthermore, the dentist's attitude toward the pediatric patient is of vital importance for good treatment

outcomes [14]. A study of children aged 5 to 11 years by Milgrom et al. [15] suggested that conditioning is an important contributor to DF in childhood and adolescence. Prevalence estimates of childhood DF vary considerably, from 3% to 43% in different populations [4]. However, there are few previous studies examining the relationship of DFA to dental pain among children and adolescents. Thus, the purpose of this study was to examine the literature regarding the prevalence of DFA associated with dental pain.

Materials And Methods

A broad search of the PubMed database was performed using 3 combinations of the following search terms: dental fear, anxiety, and dental pain and prevalence. The search was limited to publications in English that included children and adolescents aged 0 to 18 years. The cut-off date was the end of May 2015. The keywords used and the search results are shown in Table 1. Relevant publications were identified after reviewing the abstracts. Table 2 shows the eligibility and ineligibility criteria for this study.

Table 1. Keywords searched on Medline (late May 2015) and number of publications found

Keyword	Number of publications	Earliest paper	Latest paper
Dental fear	5,356	July 1946	May 2015
Dental fear prevalence	646	May-Jun 1966	May 2015
Dental fear child	1,572	Jul 1964	Mar-Apr 2015
Dental fear child prevalence	174	Mar 1971	Dec 2014
Dental fear children	1,694	Jun 1963	Mar-Apr 2015
Dental fear children prevalence	202	Mar 1971	Apr 2015
Dental fear adolescent	1,115	May-Jun 1966	Mar 2015
Dental fear adolescent prevalence	250	May-Jun 1966	Feb 2015
Dental fear adolescents	646	May-Jun 1966	Mar 2015
Dental fear adolescents prevalence	255	May-Jun 1966	Apr 2015
Dental anxiety	4,498	July 1946	May 2015
Dental anxiety prevalence	558	May-Jun 1966	May 2015
Dental anxiety child	1,367	Jul 1964	Mar-Apr 2015
Dental anxiety child prevalence	156	Mar 1971	Dec 2014
Dental anxiety children	1,454	Jun 1963	Mar-Apr 2015
Dental anxiety children prevalence	178	Mar 1971	Dec 2014
Dental anxiety adolescent	1,001	May-Jun 1966	Mar 2015
Dental anxiety adolescent prevalence	225	May-Jun 1966	Feb 2015

(Continued to the next page)

Table 1. Continued

Keyword	Number of publications	Earliest paper	Latest paper
Dental anxiety adolescents	1,020	May-Jun 1966	Mar 2015
Dental anxiety adolescents prevalence	230	Apr 2015	May-Jun 1966
Dental phobia	4,560	July 1946	May 2015
Dental phobia prevalence	563	May-Jun 1966	May 2015
Dental phobia child	1,376	Jul 1964	Apr 2015
Dental phobia child prevalence	431	Jul 1970	Mar 2015
Dental phobia children	1,463	Jun 1963	Apr 2015
Dental phobia children prevalence	496	Jul 1970	May 2015
Dental phobia adolescent	1,008	May-Jun 1966	Mar 2015
Dental phobia adolescent prevalence	580	Jul 1970	Mar 2015
Dental phobia adolescents	1,027	May-Jun 1966	Mar 2015
dental phobia adolescents prevalence	596	Jul 1970	Apr 2015
Dental fear and anxiety	4,498	July 1946	May 2015
Dental pain	15,361	Nov 1873	May 2015
Dental pain prevalence	1,657	May 1968	May 2015
Dental pain child	1,886	Jun 1964	Mar 2015
Dental pain child prevalence	431	Jul 1970	Mar 2015
Dental pain children	2,068	Jun 1964	May 2015
Dental pain children prevalence	469	Jul 1970	May 2015
Dental pain adolescent	2,687	Dec 1963	Apr 2015
Dental pain adolescent prevalence	580	Jul 1970	May 2015
Dental pain adolescents	2,720	Dec 1963	Apr 2015
Dental pain adolescents prevalence	596	Jul 1970	Mar 2015

Table 2. Eligibility and ineligibility criteria for the study

Eligibility criteria	Ineligibility criteria
The prevalence of the relevance of dental fear/anxiety and dental pain	If written in a language other than English
The number one target in the representation Example: National Survey	Subject matter not at all relevant to the topic
Child and adolescent age group	Adult age group only
High-quality review articles	Failure to secure the full text of the paper

RESULTS

The literature selection process was performed as seen in Fig. 1. Combining the search terms dental fear, anxiety, and dental pain and prevalence, the number of screened articles was 2,281. Much work has been published on the prevalence of dental pain, but relatively little on the prevalence of DFA. Two separate researchers selected articles. However, a large proportion of the identified articles could not be used for the review due to inadequate end points and measures or poor study design. Finally, 32 relevant articles with acceptable end points were identified and retrieved (Table 3). After that, critical assessment was performed on each article, examining the

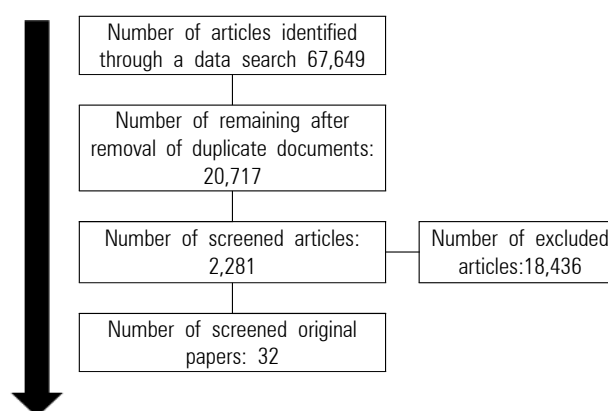


Fig. 1. The flow of the literature selection process

prevalence of DFA and dental pain, with differences based on age and sex.

The included articles were published between 1982 and

Table 3. List of selected articles that used fear anxiety and pain measurement tools

1	Dental fear in children: the role of previous negative dental experiences. <i>Clin Oral Investig.</i> 2015 Apr;19(3):745-51. (Wong-Baker FACES® Pain Rating Scale and Corah's Dental Anxiety Scale [DAS])[40] No statistical differences were observed in anxiety levels with respect to patient gender.
2	Dental anxiety and fear: relationship with oral health behavior in a Turkish population. <i>Int J Prosthodont.</i> 2014 Jan-Feb;27(1):50-3. (Modified DAS and Dental Fear Scale)[41] Sex significantly affected dental anxiety
3	Dental fear and anxiety in older children: an association with parental dental anxiety and effective pain coping strategies. <i>Journal of Pain Research</i> 2014;7 515-521 (Dental Anxiety Questionnaire [CDAS] and Dental Subscale of the Children's Fear Survey Schedule [CFSS-DS], Dental Cope Questionnaire (DCQ), and sociodemographic questionnaire)[42] 11% (CDAS) No significant differences in CDAS scores were found between boys and girls ,11%(CFSS-DS)No significant differences in CFSS-DS scores were found between boys and girls
4	Prevalence of dental anxiety and its relation to age and gender in coastal Andhra (Visakhapatnam) population, India. <i>J Nat Sci Biol Med.</i> 2014 Jul;5(2):409-14. (Corah DAS [CDAS] and Clarke and Rustvold's DentalConcerns Assessment Scale [DCAS])[43] 22.6%.A significant relation between age and DA, significantly higher in females (10.88) than in males (9.96) (P < 0.0001).
5	Prevalence and predictive factors of dental anxiety in Brazilian adolescents. <i>J Dent Child (Chic).</i> 2013 Jan-Apr;80(1):41-6. (DAS)[44] 18%. Dental anxiety was correlated with the following factors: gender (P<.05), age group (P<.001), degree of schooling (P<.001), access to newspapers and/or the Internet (P<.02), oral hygiene frequency (P=.005), visits to the dentist (P<.02), reason for last visit to the dentist (P<.001), and experience with dental pain (P=.002).
6	Assessment of psychological effects of dental treatment on children. <i>Contemp Clin Dent.</i> 2012 Apr; 3(Suppl1): S2-7 [45] 8%, the younger age group had more negative perceptions
7	The relationship between dental anxiety and dental pain in children aged 18 to 59 months: a study in Recife, Pernambuco State, Brazil. <i>Cad Saude Publica.</i> 2009 Apr;25(4):743-50.(Dental Anxiety Question [DAQ])[46]9.1% .There was a strong association between dental anxiety and dental pain experience
8	Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. <i>International Journal of Paediatric Dentistry</i> 2007;17(6):391-406.(dental fear and anxiety (DFA) and dental behaviour management problems (DBMP)) [4] Review. Estimated to 9%, with a decrease in prevalence with age, more frequent in girls.
9	Experience with dental pain and fear of dental pain. <i>J Dent Res.</i> 2005 Oct;84(10):947-50. (a short version of the Dental Anxiety Inventory (S-DAI) and Fear of Dental Pain (FDP)questionnaire)[47]
10	Dental fear in children may be related to previous pain experience during dental treatment. ((Dental Cope Questionnaire and a Dental Subscale of the Children's Survey Schedule (CFSS-DS)) <i>J Evid Based Dent Pract.</i> 2005 Sep;5(3):143-4.[48]
11	Dental trait anxiety and pain sensitivity as predictors of expected and experienced pain in stressful dental procedures. <i>Eur J Oral Sci.</i> 2004 Dec;112(6):477-83. (DAS and the Pain Sensitivity Index)[49]
12	An assessment of the validity and reliability of dental self-report items used in a National Child Nutrition Survey. <i>Community Dent Oral Epidemiol.</i> 2004 Feb;32(1):49-54.[50] a National Child Nutrition Survey
13	Dental pain and dental treatment of young children attending the general dental service. <i>Br Dent J.</i> 2002 Mar 9;192(5):280-4.[51] half of the children in the study (48%) were recorded as having at least one episode of pain See comment in PubMed Commons below
14	Childhood dental fear in the Netherlands: prevalence and normative data. <i>Community Dent Oral Epidemiol</i> 2002;30:101-7 (Dental Subscale of the Children's Fear Survey Schedule [CFSS-DS])[52] 6%
15	Gender and age differences in attitudes to dental pain and dental control. <i>Community Dent Oral Epidemiol.</i> 1997 Aug;25(4):314-8. (Pain Anxiety Symptoms Scale and the Iowa Dental Control Index)[53]
16	Appraisal of dental anxiety and fear questionnaires: a review. <i>Eur J Oral Bi</i> 1997: 105: 117-122. (Kleinknecht's Dental Fear Survey, Corah's DAS, Stouthard's Dental Anxiety Inventory, Weiner's Fear Questionnaire, and Morin's Adolescents' Fear of Dental Treatment Cognitive Inventory)[54] Review
17	Dental anxiety among adolescents in St. Petersburg, Russia. <i>Eur J Oral Sci</i> 1997: 105: 117-122. (DAS)[55] a prevalence of high dental fear of 12.6%.
18	Changes in Self-reported Dental Anxiety in New Zealand Adolescents from Ages 15 to 18 Years <i>J Dent Res</i> 1997 June; 76(6): 1287-1291. (Corah's DAS)[56]
19	Dental fear and behavior management problems in children: a study of measurement, prevalence, concomitant factors, and clinical effects. <i>Swed Dent J Suppl.</i> 1995;103:1-78. (CFSS-DS)[57]
20	Dental fear in an urban Swedish population: prevalence and concomitant factors. <i>Community Dent Health</i> 1994;11:208-14. (CFSS-DS, a short form of the CFSS measuring general fears, Corah's DAS).[29] Review
21	Cross cultural validity of a parent's version of the Dental Fear Survey Schedule for children in Chinese. <i>Behav Res Ther.</i> 1994 Jan;32(1):131-5. (Dental Fear Survey Schedule (DFSS) for children)[21] girls reported more fearful than boys
22	Summary of the scientific literature for pain and anxiety control in dentistry. <i>Anesth Prog.</i> 1994;41(2):48-57.[58] Review.
23	Brief treatment of children's dental pain and anxiety. <i>Percept Mot Skills.</i> 1993 Feb;76(1):192-4.[59] Review.

- 24 Prediction of behavior-management problems in 3-year-old children. *Scand J Dent Res.* 1993 Apr;101(2):110-4. (The method of Holst and Crossner)[60] 11% reacted negatively
- 25 Dental fear and pain: effect on patient's perception of the dentist. *Community Dent Oral Epidemiol.* 1990 Oct;18(5):264-6. (Dental Anxiety Scale Dental Anxiety Scale (DAS) and the Dental Beliefs Survey Dental Beliefs Survey (DBS))[61]
- 26 Prevalence of dental anxiety and fear in children in Singapore. *Community Dent Oral Epidemiol.* 1990 Oct;18(5):269-71.[62] 17.7% . Females were 2.64 times more
- 27 A Longitudinal Study of the Contribution of Dental Experience to Dental Anxiety in Children Between 9 and 12 Years of Age. *J Behav Med* 1989;12(3):309-20.[63]
- 28 Prediction of behavior management problems in children. *Scand J Dent Res.* 1988 Oct;96(5):457-65.[64]
- 29 The prevalence and practice management consequences of dental fear in a major US city. *J Am Dent Assoc.* 1988 May;116(6):641-7.[16] High dental fear 20.4% , Females were 1.8 times more
- 30 Behavioral methods and research issues in management of child patients. *Anesth Prog.* 1986 Jan-Feb;33(1):17-23. [65] Review
- 31 Survey of teaching pain and anxiety control on the predoctoral level. *Anesth Prog.* 1983 Jan-Feb;30(1):10-3. [66] Review
- 32 Bibliography for the control of anxiety, fear & pain in dentistry. *Anesth Prog.* 1982 Nov-Dec;29(6):167.i-9. [67] Review

2015; the number of individuals surveyed for DFA varied from 52 to 4505. The prevalence of DFA was estimated at 10%, with a decrease in prevalence with age. Dental fear and DA was more frequently seen in girls, and was related to dental pain.

DISCUSSION

Fear or anxiety about dental treatment is very common. One study suggests that, in the US, more than 80% of the population fears dental treatment, and 20% avoids the dentist due to severe DF [16]. Avoiding dental treatment due to anxiety and fear exacerbates problems related to patients' oral health. Further, treating anxious patients tends to be both more difficult and more time-consuming. Because dental patients feel anxiety and fear associated with dental treatment, it has been vital for dentists to construct an environment that alleviates patient worries. Effective regulation of anxiety and pain is an essential element of dental care, allowing many patients, who previously could not be treated, to receive dental treatment, due to the extensive and various ways available to control anxiety and pain. In attempts to solve these problems, studies examining causes of DFA, as well as its prevalence, patient categories, and its impact on intra-oral and extra-oral environments and treatment plans have been conducted. However, the use of such methods in clinical situations is low due to lack of understanding,

time constraints, and translation difficulties.

Dental anxiety and DF among both adults and children has been recognized as a problem area in clinical dentistry for many years, but only a small number of investigations have tried to depict the epidemiologic public health factors related to DF in countries and cultures other than Western Europe and North America. Approximately 10% to 20% of the adult population in the western industrialized world report high DA; most also report this reaction as having developed in childhood [17-25]. Although negative dental experiences are often cited as the major factor in the development of DA, very few studies have provided prevalence data. Prevalence estimates of childhood DF vary considerably, from 3% to 43% in different populations [2,15,26-30]. These differences in prevalence estimates may be due to several parameters, such as methodological or cultural variables, in the populations surveyed. For example, instruments used in these studies vary from behavioral rating scales to several forms of fear questionnaires, such as the DAS [3] and the Dental Subscale of the Children's Fear Survey Schedule [31]. Corah's DAS, published in 1969, consists of 4 questions with 5 answer alternatives for each [6] the scores may range from 4 (no anxiety) to 20 (high anxiety) [3]. The Dental Fear Survey (DFS), originally a 27-item self-assessment survey published by Kleinknecht et al. in 1973, was later revised to a 20-item version [32]. Two items focus on avoidance, 5 on self-perceived signs of physiological arousal, 12 on fear of specific dental

situations and procedures, and 1 (item 20) on DF in general. Each question has 5 unimodal answer alternatives using an ordinal level of measurement. The summed scores may range from 20 (no fear) to 100 (terrified), but the DFS is primarily designed to detect the fear induced by the separate items.

In 1990, Weiner and Smehhan published the Fear Questionnaire (FQ), consisting of 2 parts [33]. Part A contains 16 five-point questions. Approximately one half of the list was similar to the Anticipated Anxiety Level Chart [34-36], with which commonly occurring general and dental fears were studied. Part B examines autonomic stress reactions in particular, with 18 five-point questions, of which 3 questions deal with severe anxiety attacks. The answer alternatives are unimodal and are of the ordinal level of measurement. The 2 parts of the FQ contain 4 orthogonal, reliable factors. Four factor indices are computed, for “generalized (endogenous) fear,” “dental specific fear,” “endogenous anxiety symptoms,” and “exogenous anxiety symptoms.” The 4 scales show inter-correlation ranging from 0.21 to 0.52, and were therefore considered to be only modestly related [33]. In 1991, Gauthier et al. published the Adolescents’ Fear of Dental Treatment Cognitive Inventory (AFDTCI), developed by Morin in 1987. The AFDTCI evaluates thoughts and ideas that an adolescent may experience during dental treatment. The questionnaire originally consisted of 42 questions with ordinal 1- to 5-point scales, but after assessment by 8 experts, it was reduced to 29 items. A test using adolescent subjects ($n = 343$) led to the removal of 6 more items, leaving 23 items in all. The scores on the AFDTCI may range from 23 (no fear) to 115 (high fear) [37].

Fear of pain was found to be the most important predictor of DA; issues of control were also related to DA. Therefore, it was predicted that gender and age differences would be reflected in attitudes toward pain and control. Childhood fears are often related to developmental changes in children, and the nature of fears prominent in a child’s life also seems to depend on the child’s age [38,39]. For a preschool-aged child, attach-

ment and separation anxiety often play an important role, whereas at a later age (≥ 8 years), fear of bodily injury and social ostracization become more prominent. Most of these developmental age-appropriate fears decrease or disappear as children grow older, due to increased ego strength and cognitive ability development, thus providing children with adequate coping styles. Accordingly, from a developmental perspective, young children are expected to suffer some degree of fear when visiting the dentist for the first time, possibly due to being separated from a parent, not understanding the dental procedures, or associating these with other, age-appropriate fears. In most children, this fear will probably decrease after visiting the dentist more often and thereby becoming habituated to the dental situation. However, in a small subgroup of children, fear seems to persist into adulthood and become chronic. It has been suggested that patients need to have the attitude and desire to actively use these evaluation methods, rather than paying constant attention to the anxiety regarding dental care.

CONCLUSION

Dental fear, DA, and dental pain are common, and several psychological factors are associated with the development of these problems. The prevalence of DFA is estimated to affect 10% of the population, with a decrease in prevalence with age. We also found that DFA was more frequently seen in girls, and that it was related to dental pain. In order to better understand these relationships, further clinical evaluations and studies are required. Further research, using more appropriate methods, is needed to clarify the role of dental pain in the genesis of DFA.

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