


# Children's Dental Fear: Occurrence Mechanism and Prevention Guidance

Jiaxun Ying<sup>1</sup> , Hanbo Tao<sup>1</sup>, Qingyuan He<sup>1</sup>, Zhiruo Zhang<sup>1</sup>, Wenfei Hu<sup>1</sup>, Shuting Chen<sup>2</sup>, Ye Guan<sup>1</sup>

<sup>1</sup>Savaid Stomatology School, Hangzhou Medical College, Hangzhou, Zhejiang, People's Republic of China; <sup>2</sup>School of Basic Medicine and Forensic Medicine, Hangzhou Medical College, Hangzhou, Zhejiang, People's Republic of China

Correspondence: Ye Guan, Savaid Stomatology School, Lin'an Campus, Hangzhou Medical College, No. 8, Yikang Street, Lin'an District, Hangzhou, 310000, People's Republic of China, Tel +86 18868105499, Email 21818734@zju.edu.cn; Shuting Chen, School of Basic Medicine and Forensic Medicine, Lin'an Campus, Hangzhou Medical College, No. 8, Yikang Street, Lin'an District, Hangzhou, 310000, People's Republic of China, Tel +86 88892867, Email shutinren@163.com

**Abstract:** Children's dental fear (CDF) has become one of the main reasons affecting the quality of dental treatment. In order to reduce the incidence of CDF in China before and after children's dental visits, this review applies literature analysis and empirical summary methods to analyze and summarize academic discussions on this topic, including occurrence mechanism, prevention guidance, and the conclusion that the occurrence and prevention of CDF is closely related with children's internal characteristics and external influences. In the end, we propose a breakthrough of combining the CFSS-DS scale and three-grade prevention theory together in the future to provide new ideas and hypotheses for the prevention of CDF.

**Keywords:** dental anxiety, character, environment, family, hospital, three-grade prevention

## Background

Dental fear is also called dental anxiety, defined as a patient's psychological state of worry, anxiety, or even dread that is specific to a dental or prospective clinic.<sup>1</sup> Children's dental fear (CDF) or anxiety (CDA) disorder refers to the clinical manifestations of dental phobia or anxiety in children, including reduced cooperation, lessened compliance, and even resistance to treatment.<sup>2</sup> According to cross-sectional and cohort studies published from 2000 to 2014, analyzed by S Cianetti who had searched in 3 electronic databases (Medline, Embase, Web Of Science) to analyze the clinically used dental fear scales such as CFSS-DS, DAS, MDAS, DFS, and DFSS-SF, the prevalence of dental fear/anxiety was found to be between 10% and 20% in different countries. Dental fear/anxiety has already been a common problem among children/adolescents worldwide.<sup>3</sup>

According to the fourth national oral health epidemiological survey released in 2017, the caries rate of permanent teeth of 12-year-old children in China was 34.5%, which was 7.8% higher than that of ten years ago. 70.9% of 5-year-old children had caries in their baby teeth, which was 5.8 percentage points higher than that of ten years ago. Moreover, the caries rate of children has been on the rise. The results in some areas of China also showed that the incidence of CDF was between 20% and 50%, indicating that it was a common phenomenon in the clinical treatment of dental diseases in children. This psychological state of anxiety is one of the main points that affects the dental consultation rate and treatment quality of children.<sup>4</sup> The interference caused by CDF on early detection, early diagnosis and early treatment of childhood oral diseases cannot be ignored. Domestic research in China related to CDF started late and few people have comprehensively and carefully analyzed the possible influencing factors and prevention methods of CDF in preschool children.

As a large and important population for the prevention and early treatment of dental problems, children are supposed to be paid extra attention to for their oral health status. However, nowadays, the prevalence of dental diseases among children remains high and is on the rise. CDF, an increasingly widespread multi-factor psychological state, has a huge impact on the treatment of children's dental diseases, resulting in adverse consequences in all aspects. Therefore, it is important to study the factors associated with CDF as a research target for the prevention of it, as well as to provide clinical prevention guidance.

## Occurrence Mechanism

### Internal Cause

#### Personal Traits

Personal traits can affect the development and extent of CDF, including gender, temperament, intellect, education level, and so on. A genome-wide association study conducted by Y Zhou, D W McNeil with Genome-wide scans, gene enrichment analysis and heritability analysis dedicated that dental care-related fear and anxiety could be partly explained by genetic factors<sup>5</sup>. In terms of gender, compared with adolescent boys, the results showed significantly higher rate of dental anxiety and medical fear in adolescent girls.<sup>6</sup> The study by Buldur et al reached the same conclusion and it was speculated to be related to the conventional habit of boys' reluctance to express their fears.<sup>7</sup> Multinomial logistic regression analysis revealed that emotionality and shyness temperaments might be weakly associated with dental anxiety, and shyness might be weakly associated with the dental behavior of the preschool child.<sup>8</sup> As for intellectual factors, Tuba Talo Yildirim, Serkan Dundar proved that those who had a low level of education had higher levels of psychological disorder, contributing to a higher rate of dental anxiety.<sup>9</sup> Adolescents with mild or borderline intellectual disabilities had poorer oral health and showed worse oral health-promoting behaviors than their peers in the general population.<sup>10</sup> Targeted interventions to reach this vulnerable group are necessary.<sup>10</sup>

#### Pre-Existing Illnesses

The relation between oral and mental health is a two-way association. On the one hand, the prospect of dental treatment can lead to anxiety and phobia. On the other hand, many psychiatric disorders, such as severe mental illness, affective disorders, and eating disorders, are associated with dental disease.<sup>11</sup> However, pre-existing dental illnesses do not seem to have much to do with dental anxiety. Vanhée T, Poncelet J showed that there was no significant association between MIH (Molar Incisor Hypomineralization) and dental anxiety,<sup>12</sup> though it indicated an impaired oral health-related quality of life.<sup>13</sup> Laureano ICC, Farias L also found that dental caries and MIH were not associated with dental fear.<sup>14</sup>

To summarize, the personal traits we mentioned above are intrinsic factors we can hardly change. However, a personalized diagnosis and treatment scheme on the basis of these elements can be established to provide visitors a more humanized and precise medical service.

### External Cause

#### Physical Pain and Trauma Experience

Yap AU, Lee DZR found that CDF might result from experiential conditioning in the presence of pain and vulnerability.<sup>15</sup> That means their previous terrible dental experience cast a shadow on his or her mind, inducing their anxiety.<sup>15</sup> Murad MH, Ingle NA also drew similar conclusion.<sup>16</sup> Some people have a low pain threshold, which indicates more terrible feelings throughout the treatment. At these moments of oscillatory physiological feedback, there is big room for behavioral management and dental attitude to make a difference.<sup>17</sup> In addition, the physical pain itself also counts for dental anxiety. Ultimately, the less children go to the dentist, the worse their dental condition will become, bringing more physical pain and reducing their frequency of dental visits.<sup>18</sup> A vicious circle is on the way.

#### Family Values and Cultural Diversity

Parental dental fear is an important factor.<sup>19</sup> Besides, parents' dental behaviors such as the frequency of dental visit sets an example for children, subliminally influencing their habits.<sup>18</sup> Buldur's study showed that all parental variables except prior exposure to training about dental health were significantly correlated with dental caries.<sup>20</sup> However, the study conducted by Wu L, Gao X found that parental dental fear and parenting example did not affect children's dental fear significantly. They found family structure (nuclear or single-parent family) and presence of siblings were more significant determinants.<sup>21</sup> Cultural beliefs about oral health also seem to be important by affecting children's mental state when facing aversive learning.<sup>18</sup>

#### Economic Condition

Tongfei Z's team discovered significant increase in average cost per hospitalization for patients with oral diseases in China.<sup>22</sup> Another research showed that oral disease consultation rate in Beijing of both urban and rural residents was at

a low level, but the average cost per visit was a huge amount.<sup>23</sup> Yap AU, Lee DZR proved that the cost of dental treatment is a contributing factor for dental anxiety.<sup>15</sup> The study conducted by Xiang B, Wong HM showed monthly family income also plays a role,<sup>24</sup> mediating influencing children dental fear by affecting family dental patterns we mentioned above.

### Medical Environment and Practitioner Preference

Yap AU, Kwan YY's research showed that Southeast Asian youths generally liked dental clinics with adorned walls, cooler temperatures, magazines/books, background music and audio-visual devices. In addition, they favoured female practitioners who are young, friendly, talkative and maintain a professional relationship.<sup>25</sup> Shindova MP, Belcheva AB's study also emphasized clinical environmental factors.<sup>26</sup>

## Hazards of CDF

### Dental Anxiety Will Lead to Poor Oral Health

CDF may prevent children from going to the dentist. If not treated in time, oral and maxillofacial diseases will lead to poor oral health such as caries, missing teeth or periodontal problems, casting a far-reaching negative impact on the growth and development of children.<sup>27</sup>

### Dental Anxiety Will Change the Distribution of Functional Occlusal Contacts

It has been suggested that when children encounter oral diseases during growth without medical treatment, extensive untreated dental caries and its complications such as oral pain, will directly lead to reduced chewing or asymmetric chewing. Long-term unilateral chewing may lead to impaired facial growth and development, resulting in malocclusion and dental facial malformation.<sup>28</sup>

### Decay of the Adjacent Surfaces of the Cuspids and Molars May Result in a Reduction in Crown Width

Adjacent teeth tend to migrate toward the affected area, which may shorten the arch length. The loss of arch length may result in tooth displacement, occlusal instability, tooth crowding and chewing disability.<sup>29</sup> Disintegration of the crowns of baby teeth due to severe dental caries may lead to malnutrition.<sup>30</sup>

### Caries Cavities in Baby Teeth May Accommodate Food and Change the Oral Microenvironment

The researchers noted that severe caries in early childhood can lead to more severe caries in adulthood, while permanent caries is more likely to develop in the decay-free baby teeth.<sup>31,32</sup> This phenomenon has to do with the fact that caries cavities in baby teeth accommodate food and change the oral microenvironment.

### Dental Anxiety Will Lead to Poor Mental Health

Children are still immature in their psychological development, which makes them more susceptible than other age groups to negative psychological consequences.<sup>33</sup>

### Dental Fear May Cause Lasting Psychological Shadows

It is well documented that the majority of dental fear originates from poor dental experiences at childhood.<sup>34</sup> This makes work of doctor important, and even if the child can be treated successfully, the fear left will extend into adulthood.

### Dental Fear May Induce Multidimensional Problems

It has been suggested that the mental anxiety associated with chronic dental fear includes psychosocial problems (eg, nervousness about the appearance of bad breath and dental caries), as well as embarrassment, decreased self-esteem and lower quality of life.<sup>33</sup> As a newly developed conceptual model has shown, there is a valid demonstrable path of association between CDF and children's oral health-related quality of life (OHRQoL).<sup>35</sup> ANNIE G. MORGAN interviewed some children on multiple dimensions (situational factors and changed thoughts, feelings, physical symptoms, and behaviors) on the experience of internal anxiety. In his study, there were parents reporting that they sometimes felt overwhelmed because they could not convince their children to go to school.<sup>36</sup>

Although CDF appears to be associated with oral and mental health and new research is beginning to suggest a link between children's oral health and many other major diseases, whether dental anxiety is a risk factor for later health complications such as cardiovascular disease and obesity has not been directly studied. Considering the enormous cost and damage of these diseases to individuals and public, there is an urgent need to study early predictors that can be modified. More research is needed to explore the consequences of dental anxiety.

## Prevention Guidance

### Family Prevention Guidance

#### Thoughts' Guidance

Enhancing the consciousness of family oral health care is of practical significance for the prevention of CDF. Oral health greatly affects people's quality of life,<sup>37</sup> and for children, their oral health condition can be closely related to parents' oral health awareness in the upbringing. It was suggested that children in families with low parental awareness of oral health were more likely to experience toothache.<sup>37</sup> Caused by dental caries, toothache brings negative impact of oral discomfort, which may aggravate the children's fear of clinical treatment, playing a role in the formation of CDF.<sup>38,39</sup> Therefore, it is of great necessity to raise the awareness of oral health care among family members but not limited to parents. Besides, by educating children for early prevention, such as correcting teeth brushing method, using fluoride toothpaste, controlling sugar intake, etc.<sup>40</sup> family members can help children maintain a good oral health condition, thereby decreasing CDF.

#### Family Support

It can make a huge difference to prevent and rectify CDF with family support. For example, based on the CFSS-DS scale of dental anxiety, Majstorovic et al<sup>41</sup> used bivariate analysis to analyze the questionnaire results of 93 children and concluded that girls were more likely to develop dental anxiety than boys, which partly gives guidance on family care to focus on girls.

In addition, family structure is also an interfering factor. Compared with nuclear families, children in single-parent families are less likely to suffer from dental fear.<sup>21</sup> This suggests that the nuclear family should pay more attention to CDF. Studies have shown that generally the company and encouragement of parents can increase the children's sense of security and greatly eliminate CDF. However, for those stubborn and spoiled children, parents may indulge their negative mentality, instead providing them excuse to delay or escape from the diagnosis and treatment.<sup>42</sup> Besides, it is also necessary to avoid deception, verbal intimidation and brutal behavior when treating children who do not cooperate due to fear.<sup>43</sup> Appropriate encouragements can increase their self-confidence and help them perform better in treatment.

It is worth mentioning that motherhood in the family can be associated with the formation of CDF,<sup>44</sup> which means that the generation of CDF is likely to be accompanied with mothers' dental fears.<sup>45</sup> Therefore, we speculate that setting a good example of motherhood, such as reducing the expression of bad medical experiences<sup>42</sup> and avoiding negative evaluations of the treatment process or methods in front of children, may make sense in preventing CDF.

### Guardian-Doctor's Cooperation

Good cooperation between guardians (usually parents) and doctors can effectively cope with CDF. It is manifested in the guardian's awareness and approval of therapeutic schedule. In most cases, due to inadequate knowledge of oral diseases, guardians may be skeptical about doctor's therapeutic schedule and easily show bad temper like anxiety, dissatisfaction, even anger.<sup>46</sup> The guardian's behavior will enhance children's awareness of the danger under their cognition, which may greatly decline their sense of security, thereby aggravating CDF.<sup>47</sup> To avoid such situations, guardians and doctors should reach consensus in children's therapeutic schedule and strive for a closer cooperation in the treatment process.

## Hospital Prevention Guidance

### Environmental Optimization Measures

#### Visual Optimization Measures

The decoration of children's dental clinic including the color of scenery and the intensity of indoor lighting and waiting area should be given full consideration to. For example, the clinic with blue and pink background mainly can effectively strengthen children's positive attitude, and the soft lighting can also reduce children's anxiety.<sup>48</sup> In the arrangement of the waiting area, picture books, toys, cartoons and so on can be provided to create a pleasant and relaxed atmosphere for children. Besides, showing positive dental pictures can also reduce CDF.

#### Olfactory Optimization Measures

Experiments have shown that lavender essential oil therapy has a certain effect on overcoming dental anxiety and the inhalation of lavender oil in the treatment process can effectively reduce the pain level of children.<sup>49</sup> Furthermore, covering up the smell of medicine with the aroma of essential oils may also relieve children's fear of those medicine with special odor.

#### Auditory Optimization Measures

As an efficient, effective and easily accepted method, music therapy is an internationally recognized behavior management aid. By causing physical resonance in human body (intrinsic heart rate, blood pressure, etc.), music produces positive physiological effects in relieving children's fear and improving their cooperation level.<sup>50</sup>

### Clinical Measures

#### Spiritual Intervention

In the process of oral treatment, children's uncooperative behaviors mostly come from the fear of the unknown. TDSM ("Tell-Show-Do" Method) is used to explain and demonstrate the oral instruments and operating procedures for children with accessible language, which can significantly improve the compliance of children in treatment and relieve their anxiety.<sup>51</sup> In addition, systematic desensitization therapy is also a favorable mental intervention by removing the causes of CDF to make a successful management of individual with dental fear.<sup>52</sup> Compared with adults, children have higher enthusiasm for imitating and learning. As a result, applying model method in clinical treatment and strengthening praise and encouragement can positively enhance children's compliance.<sup>48</sup>

#### Psychological Dispersion Technique

The skillful use of audio-visual dispersion method clinically can markedly decrease children's tension and please them.<sup>53</sup> In a number of experimental conclusions in developed countries, VR,<sup>54</sup> robotic approach,<sup>55</sup> animal assistance<sup>56</sup> and video modelling<sup>57</sup> can remarkably disperse children's anxiety from concentrating on the treatment process. Based on the economic conditions of medical institutions themselves, the techniques aforesaid are strongly recommended to be carried out.

### Treatment Requirements

In the treatment of children's caries and other diseases, minimal intervention can decline the incidence of CDF.<sup>58</sup> In the past, inhalation anesthesia and binding method were frequently used to prevent CDF from interfering with the treatment. However, the application of anesthesia may put risks on children (such as adverse reactions and contraindications, etc.),<sup>59</sup> and the wearing process of anesthetic inhalers may also bring psychological trauma to children, let alone the binding method. Therefore, with the development and application of many new prevention programs for CDF, such sedation methods above are supposed to be reduced appropriately to avoid the development of negative mentality.

### Service Measures

#### Graded Reward –Course of Action Based on the "Behavior Modeling"

Referring to the CFSS-DS scale,<sup>60</sup> reward measures can be graded according to children's behavior in the treatment, and the classifications are as follows:

Level I (15–26 points): Cooperate positively without crying. – Star of Brave.

Level II (26–38 points): Try hard to overcome fear and tension to cooperate with the treatment. – Star of Tough.

Level III (38–60 points): Overwhelmed with fear, anxiety and crying most of the time in need of external forces – Star of Hope.

Level IV (60–75 points): Refuse to cooperate with any treatment and have intense stress response – Star of Future.

Four levels of rewards can be posted in the waiting area and nurses can encourage children to be brave during treatment, so as to strive for a higher level of reward.

### Design of Service Props

Children's favorite illustrations and cartoon images can be printed onto the working props such as doctors' caps, masks, disposable paper cups and medical work permits, which can help create an amiable clinical environment, thus diverting children's attention and strengthening parents' goodwill towards the hospital.

### External Service Contact

To help infiltrate children the importance of oral health in daily life and improve their acceptance of treatment, children's favorite image ambassadors can be recruited for public service advertisements.<sup>61</sup> Moreover, activities of propaganda and free diagnosis should be actively carried out, which are also valuable to prevent CDF.

## Future Outlook

In recent years, a wave of research on CFSS-DS (Children's Fear Questionnaire – Dental Subscale) has lifted in China. Relevant studies have proved that CFSS-DS (Chinese version) has a certain reliability and effectiveness with its application domestically.<sup>62</sup> Based on the conclusions forehead, the levels of CDF are proposed to be divided into three grades based on CFSS-DS: “no fear”, “mild to moderate fear” and “severe fear”. By making the classification a combination with the theory of three-grade prevention of diseases, it can be applied into the prevention of CDF.

CFSS-DS (Chinese edition)<sup>62</sup> includes 15 items on fear and anxiety, each of which is scored on a scale of 1–5 according to the range of response (from “not afraid at all” to “very afraid”), and the total scores range from 15 to 75. Using 38 points as a cut-off point, the subjects scored over 38 points are defined as CDF, on the contrary, those scored below 38 points are not. This paper proposes a second demarcation point between 38 points to 75 points (suppose it is 56 points) in order to divide “mild to moderate fear” from “severe fear”. Thus, CDF is classified into three levels: “no fear”, “mild to moderate fear” and “severe fear”.

The theory of three-grade prevention is put forward by the World Health Organization (WHO). The primary prevention is etiological prevention, which can also be perfectly explained by the idea of traditional Chinese medicine. It finds its essence with the idea to “cure a disease before its onset”<sup>63</sup> The secondary prevention, preclinical prevention, advocates ‘early detection, early diagnosis and early treatment’. The tertiary prevention is clinical prevention, which refers to the purpose of preventing the deterioration of disease through a series of treatments.

According to this theory, the assumptions are as follows:

- (i) For children with a CFSS-DS scale score less than 38 points (“no fear”), the primary prevention is recommended to eliminate the cause of dental fear. Most of this type of prevention is based on family support. By enhancing oral health education, guardians may succeed to eliminate the possibilities of CDF due to oral discomforts.
- (ii) For children with a score ranges from 38 points to 56 points (“mild to moderate fear”), the secondary prevention fits him/her. This type of prevention focuses on clinical auxiliary measures, such as optimizing the hospital environment including layout, odor, and sound<sup>48–50</sup> so as to improve children's experience and relieve their anxiety.
- (iii) For children with a score from 57 points to 75 points (“severe fear”), a further clinical intervention (tertiary prevention) should be spotlighted. For example, “systematic desensitization therapy” for such children can be a preferable mental intervention.<sup>52</sup> During this treatment process, psychotherapists expose and stack the elements which cause CDF in order to reinforce children's tolerance against dental fear, ultimately achieving the purpose of preventing the further development of CDF, even helping them get rid of it.



A further exploration on CDF is of great significance for improving the general health standard. For this purpose, our review summarizes the current researches and provides feasible prevention guidance for CDF from the two aspects of family and hospital. In addition, we try to make a breakthrough, combining CFSS-DS (Chinese version) with the theory of three-grade prevention and providing new ideas and hypothetical methods for the prevention of CDF.

Looking forward to the future, we sincerely hope that more scholars will carry out further researches and give confirmation of our study. Last but not least, according to the existing literatures, international scholars do have conducted many studies on the clinical prevention of CDF, however, there are certain deficiencies in the study of family prevention. Further exploration and breakthroughs in the future are expected.

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