

Factors Affecting Dental Fear in Korean Adolescents

Ah-Hyeon Kim^{1,2}, Eun-Suk Ahn³, So-Youn An⁴

¹Department of Preventive and Public Health Dentistry, College of Dentistry and Research Institute of Oral Science, Gangneung-Wonju National University, Gangneung,

²Private Clinic, Daejeon, ³Department of Dental Hygiene, Kyungbok University, Pocheon,

⁴Department of Pediatric Dentistry, College of Dentistry, Wonkwang University, Iksan, Korea

Purpose: The purpose of this study was to evaluate the dental fear experienced among Korean adolescents and to identify the relevant factors.

Materials and Methods: In order to compare the level of dental fear depending on the subjects' previous experience, descriptive statistical analysis was performed. Gender- and grade-dependent evaluation was performed according to the presence of their previous dental visit and dental fear. Subjective oral health status was also investigated. In order to determine the factors affecting dental fear, logistic regression analysis was performed.

Result: Among the total of 333 subjects who had experienced dental fear, females were found to experience 1.766 times greater dental fear than males ($P=0.007$). The worse subjective perception of their oral health was associated with increase in the experience of dental fear by 1.245-fold ($P=0.047$).

Conclusion: The dental fear was likely to be formed during the visit to the dentist's office or through previous experience of dental treatment. Therefore in order to reduce the fear associated with dental treatment in adolescents, establishment of a proper environment in the dental clinic and a patient management program are necessitated.

Key Words: Adolescent; Dental fear; Oral health

Introduction

In spite of the recent advances in dental equipment and treatment modalities, dental fear still exist and shows a steady increase among the patients¹⁻³. The

definition of dental fear varies, but it is generally defined as responses to stimuli that patients express subjectively as anxiety or fear while they receive dental treatment⁴). Among the previous investigation for the causes of dental fear, Moor et

Corresponding Author: **So-Youn An**

Department of Pediatric Dentistry, College of Dentistry, Wonkwang University, 895 Muwang-ro, Iksan 54538, Korea
TEL : +82-63-859-2955, FAX : +82-63-851-5324, E-mail : 9543sue@hanmail.net

Received for publication November 14, 2016; Returned after revision June 20, 2017; Accepted for publication June 29, 2017

Copyright © 2017 by Korean Academy of Dental Science

© This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

al.⁵⁾ reported that the followings cause dental fear; 1) a dental experience that causes mental trauma (traumatic), 2) a feeling of being helpless and out of control, 3) a social learning process, and 4) the secondary problems associated with other social and psychological problems. Specifying the cause in detail, they suggested spinning sound of the dental instruments which is inevitably accompanied during dental treatment, injection needles for anesthesia and trust in the dentist⁶⁻⁹⁾. Such dental fear does not only end as a problem generating a feeling of psychological anxiety, but also it leads to delay of dental treatment or an avoidance of necessary dental treatment^{10,11)}. Furthermore, apart from the causing oral health issues, it has been reported to cause socio-psychological problems and to lower the quality of life⁵⁾. In particular, dental fear was reported to occur frequently during childhood or adolescence when they are physically and psychologically immature^{12,13)}. Given that dental fear in adolescence may persist into adulthood and that extreme fear can lead to an avoidance of treatment, which can cause problems such as deterioration in oral health, a proper understanding of dental fear is required.

In the previous studies related to dental fear in adolescence, Raadal et al.¹⁴⁾ examined the degree of dental fear in children up to 11 years of age, and revealed that the level of dental fear showed a tendency of a decrease as the age increased, and the degree of fear was higher in females than in males. Murray et al.¹⁵⁾ demonstrated that dental fear had a tendency of an increase, which was associated with the quantity and quality of dental treatment experiences through a three-year longitudinal study for children from 9 to 12 years of age. According to the study of Ahn and Han¹⁶⁾, dental fear was regarded as one of the factors that caused the experience of unmet dental treatment in adolescents, which accounted for about 22% of the total. According to the results of analysis on the factors associated with the degree of dental

fear in adolescents in their teenage (13~18 years), it appeared that the higher dental fear they felt, the lower confidence they had in the dental staffs, and utilization of dental care. The subjective level of psychological burden of dental visits also negatively affected dental fear^{9,17)}. In particular, dental fear felt during adolescence is thought to influence not only the current oral health status, but also that in adulthood and up to an old age. It is therefore necessary to evaluate the dental fear experienced during adolescence and to identify the causes to take appropriate measures. Thus, the aim of this study is to provide baseline data for program development that can control dental fear in adolescents and promote oral health by identifying the degree of dental fear during adolescence and the related factors.

Materials and Methods

1. Study Subjects

Korean adolescents at a middle school (Sanbon, Korea) were selected as main subjects for questionnaire survey. The survey was conducted for one week from May 16, 2013. Following a pre-consultation between the researchers, the questionnaire was collected directly from the subjects on site. A total of 630 questionnaires out of 738 subjects were collected. Of those, 598 effective questionnaires were finally used for the present study.

2. Parameters for Survey

In order to measure and quantify the dental fear, dental fear survey scale (DFS, henceforth) developed by Kleinknecht and Bernstein¹⁸⁾ was used following some modification for Korean subjects. DFS consisted of 20 questions that are related to utilization patterns of dental care such as patterns of making and keeping the dental appointments, physical reactions including heart rate, breathing, sweating, etc., perception of fear during dental treatment at time points of waiting in the waiting

room, seeing and feeling needle, hearing and feeling the drill, etc. The dental fear severity of reaction was quantified as a 5-point scale, with 5 as the highest and 1 as the lowest fear. Gender and grade were categorized as general characteristics of the subjects. Moreover, other parameters such as experience of dental visit, experience of dental fear, and the subjective oral health status, were investigated.

3. Analytical Methods

In order to compare the level of dental fear according to the presence of previous experience of dental fear, descriptive statistical analysis was performed. Those who gave affirmative or negative answers to the main question 'Have you ever felt dental fear during a dental visit?' were subject to

independent analysis whether they had experienced dental fear or not. In order to verify the sub-criteria contributing to the dental fear, construct validity of each variable was validated. For the measurement of the reliability of the each factor constituting the sub-criteria (Cronbach's α), reliability analysis was performed. For the validation of construct, factors were extracted using the principal-component factors with the Eigenvalue of 1.0 or more as a standard. Additionally for the identification of the structure of the factors, a factor analysis was performed using varimax method in the orthogonal axis rotation system.

Finally, in order to determine the factors affecting dental fear, logistic regression analysis was performed using the experience of dental fear as a

Table 1. Mean dental fear survey scale (DFS) item scores for the fear group and the non-fear group

Item ^a	Fear group (n=333)		Non-fear group (n=265)	
	Mean±SD	Rank	Mean±SD	Rank
1. Appointments put off due to dental fear	2.09±1.09	18	1.29±0.62	16
2. Appointments canceled due to dental fear	1.73±0.99	19	1.17±0.47	19
When having dental work done:				
3. Muscles tense	2.56±1.20	11	1.46±1.09	8
4. Breathing rate increases	2.27±1.20	15	1.34±0.67	13
5. Perspiration	2.09±1.22	17	1.25±0.54	18
6. Nausea	1.50±0.85	20	1.16±0.49	20
7. Heart beat increase	2.56±1.23	10	1.44±0.75	9
Rating of fear when:				
8. Making appointment	2.36±1.24	14	1.27±0.61	17
9. Approaching dentist's office	2.58±1.25	9	1.33±0.69	14
10. Sitting in waiting room	2.70±1.24	8	1.35±0.71	11
11. Seated in dental chair	2.73±1.29	7	1.40±0.81	10
12. Smelling dentist's office	2.41±1.34	13	1.34±0.68	12
13. Seeing dentist	2.13±1.18	16	1.30±0.66	15
14. Seeing anaesthetic needle	3.14±1.45	4	1.99±1.17	2
15. Feeling needle injected	3.22±1.39	1	2.02±1.23	1
16. Seeing drill	3.21±1.37	2	1.89±1.12	3
17. Hearing drill	3.17±1.37	3	1.79±1.06	4
18. Feeling vibrations of drill	2.80±1.35	5	1.64±0.94	5
19. Having teeth cleaned	2.48±1.27	12	1.48±0.82	7
20. Overall rating, fear of dental treatment	2.78±1.24	6	1.52±0.80	6

SD: standard deviation.

^aAbbreviated item texts. For complete texts, see Kleinknecht and Bernstein (Behav Ther. 1978; 9: 626-34)¹⁸⁾.

dependent variable. In consideration of the impact of the individual characteristics of the subjects, gender, grade, experience of dental visit and the subjective status of oral health were included in the regression equation. STATA 14.0 (StataCorp, College Station, TX, USA) was used for all the analysis performed.

Result

1. Description of DFS Score to Subjects

The subjective degree of perception of dental fear at each item depending on the presence of previous dental fear is shown in Table 1¹⁸⁾. In contrast to a total of 333 people who had experienced dental fear, 265 people had not experienced it. The level of perception of dental fear at each item in the group with the experience of dental fear was ranked and the sentences 'I feel fear when the needle for anesthesia pierces the flesh' and 'I feel fear when

I see the instruments for dental elimination (drill)' had the highest scores of 3.22 ± 1.39 and 3.21 ± 1.37 , respectively. In addition, it was revealed that they also felt fear when they arrive at the dentist's office, while they were waiting in the waiting room, and while they were sitting in a dental chair waiting for dental treatment. In the group that had not experienced dental fear, the rankings of each item also showed a similar pattern, but the average value was different from that in the group with the experience of dental fear.

2. Validity and Reliability of DFSs' Factor

Targeting the 333 people with the experience of dental fear, the underlying factors constituting dental fear were examined and the results are shown in Table 2. The underlying factors of dental fear consisted of three factors, each of which was named as fear of avoiding dental treatment, fear associated with dental treatment and fear of dental

Table 2. Exploratory factor analysis results and reliability

	1	2	3
1. Appointments put off due to dental fear	0.598		
2. Appointments canceled due to dental fear	0.627		
3. Muscles tense		0.777	
4. Breathing rate increases		0.776	
5. Perspiration		0.745	
6. Nausea		0.518	
7. Heart beat increase		0.787	
8. Making appointment		0.806	
9. Approaching dentist's office		0.853	
10. Sitting in waiting room		0.843	
11. Seated in dental chair		0.817	
12. Smelling dentist's office		0.779	
13. Seeing dentist		0.742	
19. Having teeth cleaned		0.664	
20. Overall rating, fear of dental treatment		0.786	
14. Seeing anaesthetic needle		0.659	0.483
15. Feeling needle injected		0.631	0.546
16. Seeing drill		0.753	0.460
17. Hearing drill		0.750	0.458
18. Feeling vibrations of drill		0.746	0.402
Chronbach's α	0.858	0.959	0.931

stimuli, respectively. The fear factor avoiding dental treatment consisted of two questions to verify whether they had cancelled or postponed dental treatment ever. The fear associated with dental treatment included 13 sub questions. The fear of dental stimuli was specified as five sub questions. All Chronbach's α values of each factor were recorded with 0.80 or higher, which represented a high reliability.

3. Impact on Factor of Dental Fear

Table 3 shows the results of the verification of the factors affecting dental fear. Females were found to experience 1.766 times more dental fear than males ($P=0.007$). The worse subjective perception of their oral health was associated with increase in the experience of dental fear by 1.245-fold ($P=0.047$). In terms of the effect of the underlying factors on dental fear, the fear associated with dental treatment lead to 3.58-fold increase in dental fear ($P=0.000$), and the fear of dental stimuli appeared to cause 1.47-fold increase in the experience of dental fear ($P=0.001$).

Discussion

It has been reported that the dental fear experi-

enced in adolescence continued to be present until adulthood, which may lead to avoidance of dental treatment and an adverse impact on oral health as a result. The purpose of this study was to assess the dental fear experienced in adolescence and to identify relevant factors. According to the results, the subjects with previous experience of dental fear showed higher relations between dental fear and either watching or hearing the instrument sound during tooth preparation.

In spite of the technological advances in dental equipment and treatment modalities, the fear caused by the use of the instruments for tooth preparation and the noise they make still appears to be main causes of delaying dental treatment. According to the study of Yousuf et al.²⁾, there was a significant effect of music sound in the dental office on the reduction of dental fear, implicating that the patient management included the manipulation of sounds in the dental office in the aspect of the pain control for patients as well as efforts for the advance in the dental devices and equipment¹⁹⁾. When the construct validity of the variables measuring dental fear was examined, three underlying factors, the fear of avoiding dental treatment, the fear associated with dental treatment and the fear of dental stimuli, were turned out to be significant.

Table 3. Factors affecting dental fear

	OR	SE	95% CI
Sex (1=male)			
Female	1.766	0.371	1.170~2.660
Age (1=1st grade)			
2nd grade	0.763	0.207	0.449~1.298
3rd grade	0.698	0.171	0.431~1.129
Dental visits (1=No)			
Yes	1.633	1.563	0.250~10.658
Self-assessed oral health status	0.755	0.107	0.572~0.996
Avoidance behavior	1.273	0.251	0.865~1.873
Associated fear of dental treatment	3.576	0.774	2.339~5.465
Fear of dental stimuli	1.472	0.172	1.170~1.851
Constant	0.029	0.031	0.004~0.238

OR: odds ratio, SE: standard error, CI: confidence interval.

Generally, the sub-criteria of DFS were shown to be listed as avoidance, physical tense, fears of specific stimuli, etc. However, the variables constituting the underlying factors appear to vary at each study⁽⁶⁻⁸⁾. Presumably there may be some demographic and cultural characteristics of the study subjects. The results obtained from the examination of the factors affecting dental fear is shown in Table 3. In terms of gender effect, females were shown to experience more dental fear than males, which was consistent with previous studies^(9,12,14,15,20,21). The subjective perception of the oral health status was shown to have a negative effect on dental fear, which was contrasted by the findings of previous studies^(20,22). This might be due to the tendency of delaying dental care among the patients with severe fear towards dental treatment despite obvious treatment needs. Among the underlying factors constituting dental fear, the fears associated with dental treatment and the fears of dental stimuli were shown to affect the experience of dental fear. In particular, it was found that the more fear associated with dental treatment they felt, was related to experience of 3.58 times more fear.

In this study, it was found that the fear factors associated with dental fear included waiting in the waiting room, distinctive odor at the dental office, and notice of physical tension experienced during dental treatment. The fear associated with dental treatment was likely to be formed during the visit to the dentist's office or through previous experience of dental treatment, thus in order to reduce the fear associated with dental treatment in adolescents, establishment of proper environment in the dental clinic and patient management program are necessitated. As mentioned in previous studies, in order to reduce the fear caused by the noise generated in the dental clinic, patients are to be advised to listen to the music of their choice from the time at the waiting room until the end of the treatment. In order to minimize the fear felt during the waiting time, an effort to minimize the waiting

time on the dental chairs and other waiting time is thought to be effective^(2,18). In addition, in order to reduce dental fear in adolescents, acknowledgement of the importance of dental health professionals' knowledge and understanding of psychological aspects of dental care for children may be crucial. In case of lack of cooperation, the dentists would have to empirically seek for appropriate causative factors. Strict verbal instructions may not be as helpful for the relationship between the doctor and the patient especially when the causative factors are evident. A limitation of the study is the cross-sectional design. However, the population-based randomized sample of considerable size with small number of drop-outs may add some strength and credibility of the present study.

Conclusion

The fear associated with dental treatment was likely to be formed during the visit to the dentist's office or through previous experience of dental treatment. Therefore, in order to reduce the fear associated with dental treatment in adolescents, establishment of proper environment in the dental clinic and patient management program are considered effective.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

References

1. 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.
2. Yousuf A, Ganta S, Nagaraj A, Pareek S, Atri M, Singh K, Sidiq M. Acoustic noise levels of dental equipments and its association with fear

- and annoyance levels among patients attending different dental clinic setups in Jaipur, India. *J Clin Diagn Res.* 2014; 8: ZC29-34.
3. Gao X, Hamzah SH, Yiu CK, McGrath C, King NM. Dental fear and anxiety in children and adolescents: qualitative study using YouTube. *J Med Internet Res.* 2013; 15: e29.
 4. Klages U, Kianifard S, Ulusoy O, Wehrbein H. Anxiety sensitivity as predictor of pain in patients undergoing restorative dental procedures. *Community Dent Oral Epidemiol.* 2006; 34: 139-45.
 5. Moore R, Brødsgaard I, Rosenberg N. The contribution of embarrassment to phobic dental anxiety: a qualitative research study. *BMC Psychiatry.* 2004; 4: 10.
 6. Kleinknecht RA, Thorndike RM, McGlynn FD, Harkavy J. Factor analysis of the dental fear survey with cross-validation. *J Am Dent Assoc.* 1984; 108: 59-61.
 7. Oliveira MA, Vale MP, Bendo CB, Paiva SM, Serra-Negra JM. Dental Fear Survey: a cross-sectional study evaluating the psychometric properties of the Brazilian Portuguese version. *ScientificWorldJournal.* 2014. doi: 10.1155/2014/725323.
 8. Yoshida T, Milgrom P, Mori Y, Nakai Y, Kaji M, Shimono T, Donaldson AN. Reliability and cross-cultural validity of a Japanese version of the Dental Fear Survey. *BMC Oral Health.* 2009; 9: 17.
 9. Choi JS, Kim JS. Analysis of dental fear and its related factors using dental fear survey among 13 to 18 year olds. *J Korean Acad Pediatr Dent.* 2008; 35: 118-26.
 10. 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.
 11. Kvale G, Berg E, Nilsen CM, Raadal M, Nielsen GH, Johnsen TB, Wormnes B. Validation of the dental fear scale and the dental belief survey in a Norwegian sample. *Community Dent Oral Epidemiol.* 1997; 25: 160-4.
 12. Milgrom P, Vignehsa H, Weinstein P. Adolescent dental fear and control: prevalence and theoretical implications. *Behav Res Ther.* 1992; 30: 367-73.
 13. Raciene R. Dental fear among teenagers. Individual anxiety factors. *Baltic Dental and Maxillofacial Journal.* 2004; 6: 118-21.
 14. Raadal M, Milgrom P, Weinstein P, Mancl L, Cauce AM. The prevalence of dental anxiety in children from low-income families and its relationship to personality traits. *J Dent Res.* 1995; 74: 1439-43.
 15. Murray P, Liddell A, Donohue J. 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: 309-20.
 16. Ahn ES, Han JH. Measure of unmet dental care needs among Korean adolescent. *J Dent Hyg Sci.* 2015; 15: 91-7.
 17. Moon SJ, Moon WS, Ku IY. The related factors of fear of dental treatment and distrust for dentists in high school students. *Korean Soc Heal Serv Manag.* 2014; 8: 125-35.
 18. Kleinknecht RA, Bernstein DA. The assessment of dental fear. *Behav Ther.* 1978; 9: 626-34.
 19. Milgrom P, Fiset L, Melnick S, Weinstein P. The prevalence and practice management consequences of dental fear in a major US city. *J Am Dent Assoc.* 1988; 116: 641-7.
 20. Shim YS, Ahn SY, Park SY. The survey of fear associated with dental treatment in some middle school students in Cheongju. *Korean J Heal Serv Manag.* 2014; 8: 165-73.
 21. 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.
 22. Pohjola V, Lahti S, Vehkalahti MM, Tolvanen M, Hausen H. Association between dental fear and dental attendance among adults in Finland. *Acta Odontol Scand.* 2007; 65: 224-30.