Assessment of The Prevalence of Dental Fear and its Causes Among Children and Adolescents Attending a Department of Paediatric Dentistry in Bucharest

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Abstract

Introduction: Dental fear is a common occurrence, an essential and inevitable emotion that appears as a response to the stress induced by various dental procedures. Its intensity varies from nervousness and anxiety to dental phobia and it is considered to be the main barrier to successful completion of treatment. ***Aims:*** The aims of this study were to evaluate dental fear/anxiety in children and adolescents, and the factors that lead to their appearance. ***Methods:*** The study was conducted using a sample of 134 patients aged between one and eighteen years (68 girls and 66 boys) who attended the Department of Paediatric Dentistry of UMF Carol Davila in Bucharest for consultation and treatment. Dental fear and anxiety (DFA) were measured from the dentists', the patients' and the parents' perspectives, using the Facial Image Scale (FIS). The results of the DFA evaluation were correlated with the children's dental behaviour, which was estimated using the Frankl Behaviour Rating Scale. ***Results:*** The results of the study point to the existence of a cumulative DFA for the children who were studied of 21.6% and negative behaviour towards dental procedures in a significantly higher percentage of children than in previous studies, especially in girls and in children under six years of age. The main causes of DFA reported by the children were fear of pain and generalised fear of doctors in general and dentists in particular. The concordance (agreement) level between the evaluation of the state of fear assessed by the doctors/parents and the patients' self-evaluation, measured using Cohen's Kappa, was poor. ***Conclusion:*** Assessment of dental fear is an extremely useful tool for the dental practitioner, who can use it to customise behavioural treatment and management for individual patients.

Key Words: Facial Image Scale, Children, Adolescents, Dental Anxiety and Fear

Introduction

Anxiety and fear have been defined in many ways in the literature. Spielberger (1983) made a distinction between the more temporary condition of 'state anxiety' and the more general and longstanding quality of 'trait anxiety' [1]. State anxiety reflects a 'transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity'. Spielberger continues, 'Trait anxiety denotes relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment' [1]. Both aspects are combined in dental fear and anxiety (DFA), a common occurrence characterised by an essential and inevitable emotion that appears as a response to various dental procedures [2]. It varies in intensity from one patient to another, ranging from a simple nervousness to dental anxiety, which is a sentiment of fear often unjustified and can disappear spontaneously or amplify, thus defining *dental phobia.* [2,3].

Dental phobia is a particular form of fear, completely disproportionate to reality, which cannot be explained or voluntarily controlled; if it persists, it can in time induce permanent avoidance of provocative situations [2]. Dental fear is constantly met among children younger than three years, but it also appears in older children, registering a maxi-

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mum frequency at around 11 years of age and declining towards adolescence [2].

Dental fear prevalence in children and adolescents has been assessed as between 3% and 21% in northern Europe, and as more frequent among girls [2]. As children grow older, they may develop methods to control it [4]. In one study in Singapore, 14% of children aged 10 to 14 presented with high levels of dental fear, and females were reported as 2.64 times more fearful than males [5]. However, in Indonesia and Argentina boys reported higher levels of fear than girls [3]. Children with high state anxiety are almost three times as likely to report dental fear as those with low state anxiety [5]. The prevalence of dental anxiety in the young adult population in Australia was reported to be 14.9%, whereas in Canada it was 12.5%, and in Russia 12.6%. About 4-7% of subjects in Japan, Indonesia, Brazil, and Argentina reported having extreme dental fear. Although a study on the onset and patterns of change in dental anxiety reported an increase in the prevalence of dental anxiety from 10.6% at age 15 years to 13.3% at 18 years, it has also been widely reported that anxiety tends to decrease with age [3].

The most frequent causes of dental fear include: fear of pain by anticipation, of being deceived/betrayed, of losing control, fear of the unknown (through lack of information or communication), of invasive procedures, of a psychological aggression (scolding/criticising), fear of repetition of negative past experiences, of the various dental instruments' noises, of bleeding, of the unpleasant smells associated with the dental practice, fear of meeting unfriendly medical staff and of being confined in small places [2, 6, 7, 8, 9].

It is essential to identify anxious children at the earliest age possible in order to be able to institute a precocious behavioural treatment [10]. Dental fear can be assessed by the dentist/parent but also by the child him/herself using appropriate scales for the evaluation of dental fear and physiological measures (e.g., pulse rate, basal skin response and muscle tension) [7, 10, 11, 12, 13, 14].

Three types of measurements have been used for assessing dental fear in children: rating of behaviour during dental visits (e.g., the Frankl Behaviour Rating Scale; FBRS), projective techniques (e.g., Facial Image Scale [FIS] or Children's Dental Fear Picture test [CDFP]), and psychometric scales [10].

The instrument most frequently used by dentists to categorise patients' behaviour is the FBRS, which groups patients into four categories: totally cooperative (++), partially cooperative (+), partially uncooperative (-), and totally uncooperative (–) [15].

For auto-evaluation, children may use: the FIS, the Venham Picture Scale, the Fear Thermometer Scale (for younger children), the Children's Fear Survey Dental Subscale for teenagers, and the Corah Dental Anxiety Scale (for teenagers and adults) [7, 11, 12, 13, 14].

Aims

Against this background, the aims of this study were:

1. To evaluate dental fear in children and adolescents using the FIS from the point of view of dentists, parents, and patients.

2. To validate and identify the main limitations of this dental-fear measuring tool.

3. To identify the determinants of dental fear, including the impact of age and gender.

Methods

A cross-sectional study was carried out in the paediatric dentistry department of the Dental Medicine Faculty, UMF Carol Davila, Bucharest using a convenience sample of 150, who were between 3-18 years old.

The inclusion criteria were all healthy communicative children (older than three years) who presented in the clinic during March 2008 (the month with the historically highest number of attendances at the clinic) for the first time, with various orodental emergencies.

The exclusion criteria from the study sample were patients younger than the age of three years, patients with mental disabilities, and patients/parents who were unable to provide complete answers to the questionnaire.

Parents and children were approached in the paediatric dentistry department's waiting room, in order to obtain their informed written consent to the participation in the present study.

Both dependent and independent variables were assessed using the same questionnaire *(Figure 1),* which was completed by the parent, dentist and patient. Each questionnaire had two pages, both containing the FIS. The first page contained the patient's identification data (initials, age, sex), fear motives (possibility to choose between: pain;

1

5   4   3   2   1
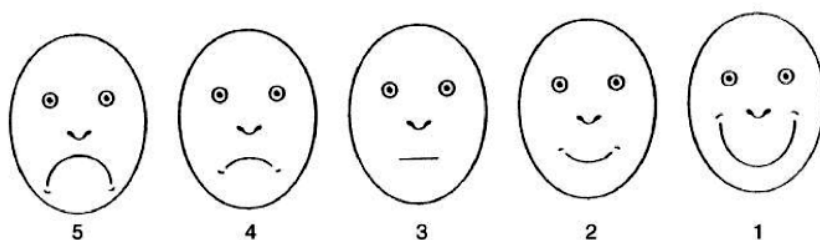
PACIENT (PATIENT)

Iniţiale (initials): _____

Vârstă (age): _____

Sex: M ☐ F ☐

Motivul fricii (fear reason):

    - durere (pain) ☐

    - extracţii (extractions) ☐

    - injecţii (injections) ☐

    - doctori (medics) ☐

    - frica de necunoscut (fear of unknown) ☐

    - disconfort senzorial (sensorial discomfort) ☐
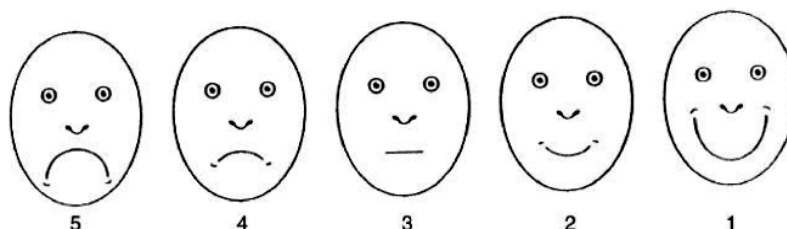
Scor FIS copil (FIS score child):

    - în sala de aşteptare (in the waiting room): ___
    - pe scaunul stomatologic (on the dental chair): ___

MEDIC (DENTIST)

Scor FIS medic (FIS score dentist): ___

Scor Frankl (Frankl score): ___

2

5   4   3   2   1

PĂRINTE (PARENT)

Iniţiale părinte (parent's initials): _____

Vârstă (age): _____

Sex: _____

Nivel de educaţie (education level):

    - fără educaţie (no education) ☐
    - şcoală primară (primary school) ☐
    - gimnaziu (some secondary school) ☐
    - liceu (highschool) ☐
    - şcoală postliceală (some additional training) ☐
    - studii superioare (university graduate) ☐

Mediu de viaţă (living environment):

    - urban ☐
    - rural ☐

Figure 1. *Facial Image Scale (FIS) and the questionnaire used to assess dental fear and anxiety.*

Contacte anterioare ale copilului cu medicul stomatolog (previous dental contacts of the child):

    - Da (yes) ☐
    - Nu (no) ☐

Scor FIS (FIS score): _____

extractions; injections; medics; fear of unknown; sensorial discomfort - unpleasant noises, smells, tastes, touches, light; unknown reason; no fear), the chosen FIS score for the child (in the waiting room and in the dental chair) and dentist, and the dental behavioural pattern, established by the dentist according to the FBRS. The second page contained the parent's identification data (initials, age, sex), education, living environment, previous dental contacts of the child (yes/no), and the chosen FIS score. The child was not able to see the parent's rating and vice versa.

Dental fear and anxiety, the dependent variable, was assessed using the FIS (auto-evaluation of the child and evaluation by the parent and the dentist), which is a validated instrument of DFA assessment [11] whereas the child's behavioural pattern was assessed using the FBRS (assessed by the dentist). The Frankl score, a discrete qualitative variable, was measured on an ordinal scale by observation performed by the dentist (same one for all children) using the FBRS.

The FIS comprises a row of five faces ranging from very happy (1) to very unhappy (5). Children were asked to indicate on the scale the appropriate point that best represented their fear sensation, both in the waiting room and while sitting on the dental chair.

The authors considered that the choice of faces 4 and 5 (by the child, parent or the dentist) indicates the presence of DFA in the patient, face 5 representing extreme dental fear.

The FIS was selected as a measuring instrument of dental fear and anxiety because it is based on simple and suggestive images and is easy to understand, even for younger children, which is of considerable help in reducing the questionnaire's completion time.

Independent variables used in the analyses were sex, age, and reason for dental fear.

The 'reason for dental fear', a qualitative discrete variable, was measured on a nominal scale by applying a closed question.

The other variables (education, living environment, previous dental contacts of the child) for which data were collected through the questionnaires will be analysed and presented in future publications.

Data obtained through the questionnaires were analysed using statistical software (SPSS version 15.0, SPSS Inc, Chicago, USA).

The cumulative frequency of DFA (FIS=4, 5)

and extreme dental fear (FIS=5) was calculated using SPSS's descriptive statistics. This method was also used to calculate the global frequency of behavioural patterns according to the FBRS and the global distribution of reasons for dental fear.

The difference between the children's mean FIS score in the waiting room and the mean FIS score obtained in the dental chair was statistically tested using the paired sample t-test.

In order to investigate the associations of age and gender on FIS scores (in the dental chair), age was transformed into a grouping variable (3–6 years, 6–9 years, 9–12 years, 12–15 years, and 15-18 years). These associations were tested using the chi-square test [15]. In a first phase, we included the associations between fear perception (in the dental chair) measured by FIS and patient gender. In a second phase, we tested patient age as an influencing factor for FIS.

The degree of correlation between the FIS evaluations carried out by the child/parent/dentist was determined by calculating the Cohen's Kappa scores [16, 17, 18].

Statistical significance was set at $P<0.05$.

Results

Final sample and ages of patients
Of the initial sample of 150 patients, 16 were excluded: eight because they were younger than three years of age, three because they had mental disabilities, and six patients/parents (n=6) because they were unable to provide complete answers to the questionnaire. The exclusion of 16 children from the initial study sample left a final sample of 134 patients, 68 (50.7%) girls and 66 (49.3%) boys.

There was a reasonable spread by age but over 50% of patients were under nine years old. The figures and percentages are as follows:

Aged 3-6 years: 29 patients (21.6% of the final sample).

Aged 6-9 years: 44 patients (33.6% of the final sample).

Aged 9-12 years: 26 patients (18.7% of the final sample).

Aged 12-15 years: 18 patients (13.4% of the final sample).

Aged 15-18 years: 17 patients (12.7% of the final sample).

The patients' mean age was 9.36 years (SD= 3.91 years). Because all participants in the study provided complete answers to the questionnaire,

Table 1: *Dental Fear and Anxiety (DFA) Frequency by Sex and Age Groups*

Age / Sex	3-6 years % (n)	6-9 years % (n)	9-12 years % (n)	12-15 years % (n)	15-18 years % (n)	Cumulative frequency % (n)
Girls	6.0 (8)	4.5 (6)	0 (0)	1.5 (2)	1.5 (2)	13.4 (18)
Boys	3.0 (4)	2.2 (3)	1.5 (2)	1.5 (2)	0 (0)	8.2 (11)
Cumulative frequency	8.9 (12)	6.7 (9)	1.5 (2)	3.0 (4)	1.5 (2)	21.6 (29)
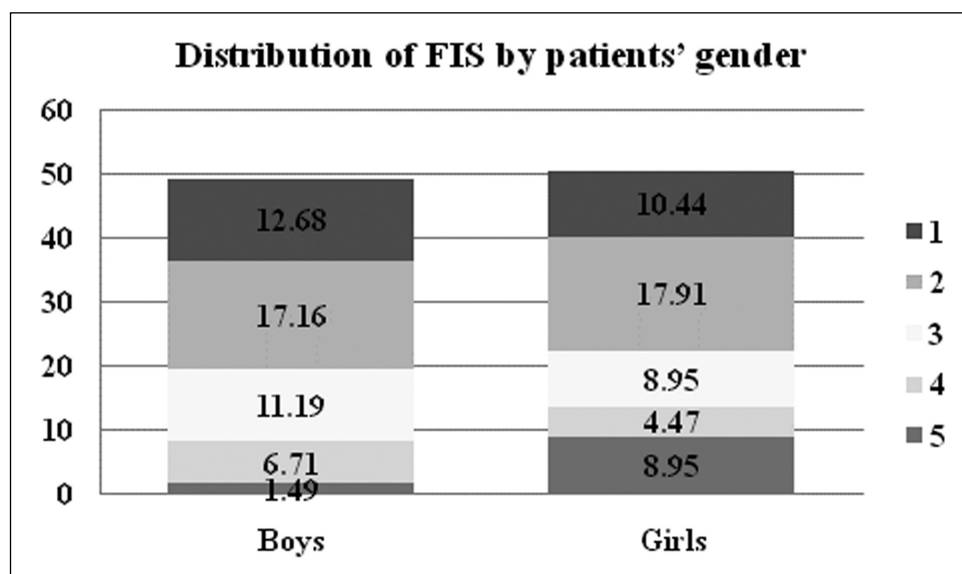
Figure 2. *Distribution of Facial Image Scale (FIS) by patients' gender.*

the response rate was 100% for all 134 patients included in the analysis.

Fear and anxiety scores

Twenty-nine (21.6%) children reported FIS scores of 4 or 5 in their auto-evaluation in the dental chair. Fourteen (10.4%) reported extreme dental fear (FIS score 5).

The number of children presenting DFA according to their self-evaluation (n=29, 21.6%) was noticeably lower than the number of children displaying uncooperative dental behaviour, according to Frankl's scale (n=64, 47.7%).

The children's mean FIS score in the waiting room was 2.21 (SD = 1.26), which is significantly (P<0.0001) lower than the mean FIS score obtained in the dental chair—2. 51 (SD=1.09).

The frequency of dental fear in girls (DFA=13.4%; extreme dental fear=9.0%) was greater compared to that in boys (DFA=8.2%; extreme dental fear=1.5%) *(Table 1, Figure 2)*. Although the differences are interesting from a descriptive point of view, they are not statistically significant (after applying the chi-square test the resulted significance level was P=0.079)

The frequency of DFA in age groups was as follows:

Aged 3-6 years: 12 patients (9.0%), of whom 10 (7.5%) showed extreme DFA.

Aged 6-9 years: 9 patients (6.7%), of whom 4 (3.0%) showed extreme DFA.

Aged 9-12 years: 2 patients (49.0%), none of whom showed extreme DFA.

Aged 12-15 years: 4 patients (3.0%), none of whom showed extreme DFA.

Aged 15-18 years: 2 patients (1.5%), none of whom showed extreme DFA.

See *Figure 3*.

Statistical analyses

The effect of age on dental fear was significant (P<0.05). The association between the child's fear perception and his/her age indicates that fear tends to decrease with the advancement of age which was statistically significant (P<0.0001).

The Cohen's Kappa scores calculated in order to ascertain the degree of correlation between the FIS evaluations carried out by the child/parent/dentist indicate a poor concordance between dentist–parent (K=0.14; significance 0.002), child (in den-
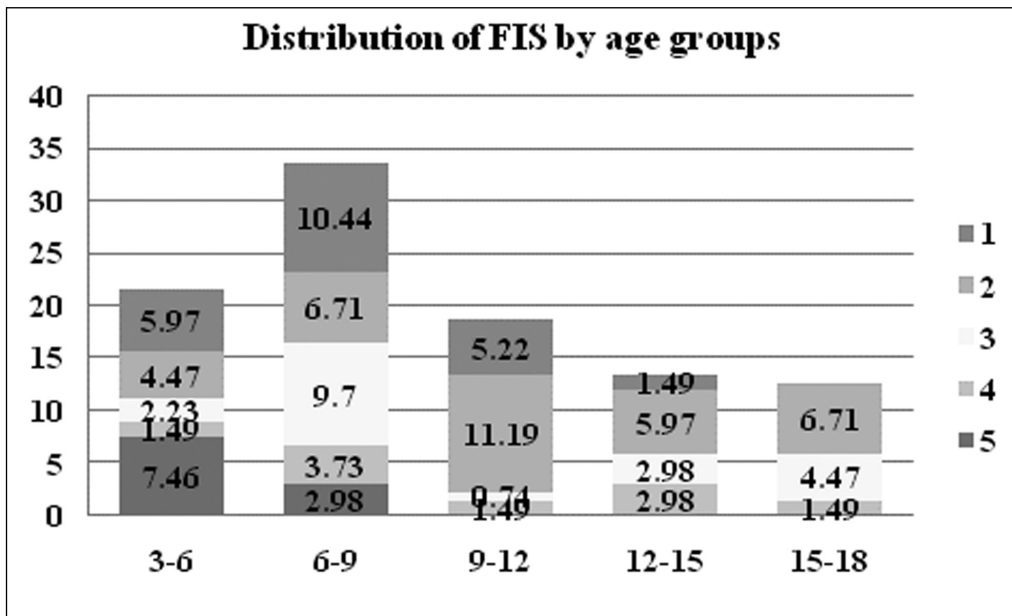
Figure 3.
Distribution of Facial Image Scale (FIS) by age group.

***Table 2:** Cohen's Kappa Coefficients*

		Child		Parent	Dentist
		Waiting room	In dental chair		
Child	Waiting room	1			
	In dental chair	0.62**	1		
Parent		0.10*	0.19**	1	
Dentist		0.08*	0.17**	0.14**	1

Note: All cells were computed based on 134 cases, * with a probability higher than 95%, ** with a probability higher than 99%

tal chair)–parent (K=0.19; significance 0.000); and child (in dental chair)–dentist (K=0.17; significance 0.000) *(Table 2).* Although these values indicate a rather low level of concordance, all three coefficients are statistically significant, with a very high probability level (P<0.0001).

All calculated Kappa coefficients were statistically significant with a probability greater than 95%. However, there are differences in view of the perceptions' concordance degree. The only higher value (K=0.62) was registered between the young patients' perception in the waiting room and in the dental chair. An intermediate concordance level was found between the following pairs: child (in dental chair)–parent, child (in dental chair)–dentist, and parent–dentist (K values between 0.14 and 0.19). The lowest concordance levels were found between children (in waiting room)–parents and children (in waiting room)–dentist (K values between 0.10 and 0.08).

The analysis of the reasons for dental fear indicated that the main reasons were:

From the child's point of view: pain (32.8%), followed by sensorial discomfort (15.7%) and unknown causes (14.9%)

From the parents' perspective: dentists (physicians in general) (29.9%), followed by pain (20.1%) and unknown causes (13.4%).

Discussion

Anxiety in patients still poses a significant problem for the practice of dentistry, so detecting and assessing dental anxiety among child patients with some valid method of measurement is necessary. This study provides further evidence of validity for DFA evaluation with FIS and we would recommend this measure for use with young children in particular.

The cumulative frequency of DFA (21.6%) as well as extreme dental fear's frequency (10.4%), as reported in this study, was higher than that reported in previous studies. This may be explained by several reasons: all the investigated patients were

experiencing various dental emergencies, most of which were associated with pain or suffering; the parents' level of dental awareness was in some cases poor leading to a delayed presentation for treatment; and in many cases, parent anxiety was transmitted to the child. The value of the cumulative DFA was, however, close to the highest value reported by Chapman and Kirby (2002) for children in northern Europe [6].

The children's mean FIS score in the waiting room was significantly lower than the mean FIS score when they were in the dental chair.

Although the frequency of dental fear in girls was 1.63 times greater than in boys, the association between DFA and gender was not statistically significant. This value is much lower than that of Chellappah et al. (2006), which could be explained by cultural differences [5].

In the current study, the association between the child's fear perception and his/her age may indicate that fear tends to decrease as children get older. In this context, it was interesting to note that in this study extreme dental anxiety was not reported by children over the age of nine years. This finding does not support the work of Chapman & Kirby (1999), who have suggested that fear reaches its maximum at about 11 years of age and then declines towards adolescence [2]. This may be because of cultural differences between the children studied in the current study and those studied by Chapman and Kirby (1999).

The degree of correlation between FIS evaluations of dentist–parent, child (in dental chair)–parent, and child (in dental chair)–dentist indicated a poor agreement, although statistically significant. The degree of correlation between child (in dental chair)–child (in the waiting room) indicated a good agreement, which was also statistically significant.

The poor concordance (agreement) between the fear assessed by the FIS score selected by children and their uncooperative behaviour during treatment may have several explanations. Facial image 3 of the FIS (see *Figure 1* for this study) proved hard to interpret for the children. Some of them were defiant, stating that they were not afraid although they manifested negative behaviour during treatment, whereas others were insolent, probably because they were extremely indulged.

As far as the FIS is concerned, we concluded that it was generally an easy, fast and efficient method of measuring children's fear; however, it had some limitations. Some of the children younger than five years of age experienced difficulty in choosing a facial image that would match their present state of mind. Facial image 3, associated by the authors with indifference, was difficult to interpret and was therefore avoided both by the children as well as their parents. For this reason, we propose the modification of the FIS scale by removing image 3.

The results of this study suggest that there is a need for further research to find better methods for understanding and improving the fears and behaviour of children and adolescents when they visit dentists, taking into account their age and the attitudes and opinions of their parents.

Conclusion

Assessment of dental fear is an extremely useful tool for the dental practitioner, who can use it to customise behavioural treatment and management for individual patients. However, further work is necessary to improve the understanding of the fears and behaviours of children when they visit the dentist.

References

1. Spielberger CD. *Manual for the State-Trait Anxiety Inventory (STAI)*. Palo Alto, CA: Consulting Psychologists Press; 1983.

2. Chapman HR, Kirby NC. Dental fear in children: a proposed model. *British Dental Journal* 1999; **187**(8): 408-412.

3. Udoye CH, Oginni AO, Oginni FO. Dental anxiety among patients undergoing various dental treatments in a Nigerian teaching hospital. *Journal of Contemporary Dental Practice* 2005; **6**(2): 91-98.

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. *International Journal of Paediatric Dentistry* 2007; **17**(6): 391-406.

5. Chellappah NK, Vignehsa H, Milgrom P. Prevalence of dental anxiety and fear in children in Singapore. *Community Dentistry and Oral Epidemiology* 2006; **8**(5): 269-271.

6. Chapman HR, Kirby-Turner N. Visual/verbal analogue scales: Examples of brief assessment methods to aid management of child and adult patients in clinical practice. *British Dental Journal* 2002; **193**(80): 447-450.

7. Crossley ML, Joshi G. An investigation of paediatric dentists' attitudes towards parental accompaniment and behavioural management techniques in the UK. *British Dental Journal* 2002; **192**(9): 517-21.

8. Klaassen MA, Veerkamp JSJ, Hoogstraten J. Dental fear, communication, and behavioural management problems in children referred for dental problems. *International Journal of Paediatric Dentistry* 2007; **17**: 469-477.

9. Freeman R. Barriers to accessing dental care: patient factors. *British Dental Journal* 1999; **187**(3): 141-144.

10. Yamada MKM, Tanabe Y, Sano T, Noda T. Cooperation during dental treatment: the Children's Fear Survey Schedule in Japanese children. *International Journal of Paediatric Dentistry* 2002; **12:** 404-409.

11. Buchanan H, Niven N. Validation of a Facial Image Scale to assess child dental anxiety. *International Journal of Paediatric Dentistry* 2002; **12**: 47-52.

12. Buchanan H, Niven N. Evidence for the validity of the facial image scale. *International Journal of Paediatric Dentistry* 2003; **13**: 368-369.

13. Freeman RA. Fearful child attends: a psychoanalytic explanation of children's responses to dental treatment. *International Journal of Paediatric Dentistry* 2007; **17**(6): 407-418.

14. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *International Journal of Paediatric Dentistry* 2007; **17**(6): 391-406.

15. Dash JK, Sahoo PK, Baliarsing RR, Dash SN. A study of behaviour patterns of normal children in a dental situation and its relationship with socioeconomic status, family type and sibling position. *Journal of Indian Society of Pedodontics and Preventive Dentistry* 2002; **20**(1): 23-29.

16. Plackett RL. Karl Pearson and the chi-squared test. *International Statistical Review* 1983; **51**(1): 59-72.

17. Cohen J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 1960; **20**(1): 37-46.

18. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977; **33**: 159-174.