

Original Research Paper

Components Affecting Dental Fear in Adults: A Cross Sectional Study

¹Eugenia M. Diaz Almenara, ¹Antonio Castaño Seiquer,
¹Laura Sanmartin Galindo, ¹Camilo Abalos Labruzzi and ²Miguel Ruiz-Veguilla

¹Departamento de Estomatología, Universidad de Sevilla, Spain

²Hospital Virgen del Rocío, Sevilla, Spain

Article history

Received: 27-01-2015

Revised: 22-02-2015

Accepted: 07-04-2015

Corresponding Author:

Eugenia M. Diaz Almenara
Departamento de Estomatología,
Universidad de Sevilla, Spain
Email: eugedial@gmail.com

Abstract: The estimated prevalence of extreme dental fear and anxiety is 40% among the adult population. Patient expressed fear of the dentist is rarely used in clinical practice to assess patient concerns. The present study was carried out to identify the risk factors associated to fear of the dentist and the frequency of visits to the dental clinic. The study comprised 98 subjects visiting a private dental clinical in Seville (Spain). Dental fear was measured: (How afraid are you of visiting the dentist? a. not at all, b. little c. a lot). Demographic data were collected assessed based on the Hospital Anxiety and Depression Scale (HAD), while dental fear was evaluated using the Dental Fear Questionnaire (CMD). These evaluations were made before dental treatment was carried out. Results revealed that four dimensions of the CMD were considered: A. accidental care, b. attitude of the dentist, c. neglect and d. organization. Only the dimensions of attitude of the dentist (OR = 2.4 (95% CI: 1.1-5.4); p = 0.02) and neglect (OR = 5.3 (95% CI: 2.0-13.1); p = 0.0001), together with the levels of anxiety (OR = 1.3 (95% CI: 1.3-1.7); p = 0.01), were independently associated to the presence of dental fear. None of the variables were associated to the frequency of visits to the dentist. Results further revealed that the dentist dimensions of attitude and anxiety were associated to fear of visiting the dentist.

Keywords: Afraid, Anxiety, Fear, Dentist, Depression Scale

Introduction

Dealing with fear of the dental office is experienced daily by oral health care providers. Up to 40% of all individuals report of being fearful of the dentist (Pohjola *et al.*, 2011). In turn, 3-5% of the population has extreme phobia of dentists (Berggren, 2002). Such phobia can manifest in many different ways, including avoidance of the dental office, which in turn can result in neglected oral health care. Furthermore, awareness of personal poor oral health and emotions of shame perpetuate avoidance of the dentist. This has been described as a vicious cycle that accounts for avoidance behavior (Abrahamsson *et al.*, 2000). Extreme dental fear is also associated with different kinds of dental treatment secondary to deferred

attendance. In such cases, less conservative treatments are not available (Vassend, 1993).

Although these patients experience intense fear, they do subject themselves to the frightening stimuli, albeit with more canceled appointments than patients without phobia. These individuals who suffered from extreme dental fear felt pain and had experienced trauma when anesthesia was applied. Studies have shown that patient administered with dental therapies, such as drilling, extraction, injection, while others report fear of instruments like needles or explorers. Others attribute their fear of the dental office to the fact of being placed in a situation where they have no control and are regarded with disparagement (Abrahamsson *et al.*, 2001).

Dealing with these individuals is important to improve oral health care. A study by Vassend (1993) revealed that patient with intense fear have significantly greater number of missing teeth, more decayed tooth surfaces, more periradicular lesions and greater bone loss as compared to those without dental fear. Another study published by Kent (1985) demonstrated that this group of people considered such fear to significantly reduce their quality of life. Berggren (2002) reported that there was an increased in medication dosage, more missed working days and poor relationships among individuals.

Objectives of the STUDY

The present study considers three objectives:

- To described dental fears expressed by patients visiting the dental office
- Identify factors that are part of the concept of dental fear
- To identify factors that distinguished patients who have extreme dental fear from patients who have no dental fear

Materials and Methods

A cross-sectional clinical study was conducted to find out the components affecting dental fear in adults: A cross sectional study, involving the administration of The Hospital Anxiety and Depression scales (HAD) (Zigmond and Snaith, 1983) and questionnaire about fear of the dentist (Cuestionario de Miedos Dentales (CMD) (Navarro and Ramírez, 1996). The study included in this study were two private dental clinics in Seville (Spain) during a period of 13 months.

The Criteria

The criteria in this investigation were patients who speaks spanish, aged between 18-65 years, signed the consent form and must answer the anxiety and depression scale questionnaires (Hospital Anxiety and Depression Scale, HAD). The criteria excluded in this study were, use of psychotropic medication (antidepressants, benzodiazepines, antipsychotics) and patients diagnosed with alcohol or drug dependency.

The Respondents

The respondents were composed of 98 patients with a mean age of 37 years old. The researcher explained the objectives of the study to the intended participants.

Procedures

The data obtained from this study were analyzed using the Statistical Package for the Social Sciences (SPSS version 12). Associations were tested using descriptive, univariate and multivariate linear

regression analyses. Statistical significance was considered for $p < 0.05$.

Extraction of the dimensions of the CMD was carried out through principal components analysis, retaining those with eigenvalue > 1 , with varimax rotation.

Comparison of the subjects with low versus high fear was based on the chi-squared test and Student t-test. We subsequently applied a multivariate analysis using logistic regression. The dependent variables were fear of the dentist (low/high) and the frequency of visits (regular/not regular or never), while the independent variables were sex, age and the dimensions extracted from the principal component analysis that proved significant in the univariate analysis.

Results and Discussion

Sociodemographic Data

The study included 98 subjects consecutively visiting a private dental clinic in Seville (Spain). Four patients refused to answer the questions of the study and two had to be withdrawn due to errors in answering the scales. Fifty-nine of the subjects were women (60%). The mean age \pm Standard Deviation (SD) was 37.5 ± 12.6 years (Table 1).

Forty-nine of the interviewed patients (50%) visited the dentist regularly, while 43 only visited the dentist when they experienced discomfort (44%) and 6 claimed to never visit the dentist (6%).

Regarding fear of visiting the dental clinic, 81% of the patients ($n = 79$) reported low fear: 45% ($n = 44$) reported no fear, while 36% ($n = 35$) admitted feeling some fear. In turn, 19 patients (19%) reported high fear of the dentist.

The mean scores \pm Standard Deviation (SD) on the anxiety and depression subscales of the HAD were 3.1 ± 2.4 and 7.3 ± 3.2 , respectively (Table 1).

Factors Extracted from the Principal Components Analysis of the Dental Fear Questionnaire (CMD)

Following the principal components analysis of the dimensions of the CMD with varimax rotation, we extracted four factors with an eigenvalue > 1 (Table 2): "Dental care", accounting for 25.8% of the variance; "attitude of the dentist", accounting for 15.7% of the variance; "neglect", accounting for 13.8% of the variance; and "organization", accounting for 13.2% of the variance.

The first factor ("dental care") included the following items: The work is done by the assistants, injuring my lips with some instrument, brusqueness on the part of the dentist, unpleasant assistants, the attendance of many patients at the same time, impolite dentist, dentist with bad breath, injuring my mouth, lack of gentleness in treatment.

Table 1. Sociodemographic factors and Hospital Anxiety and Depression (HAD) scores

	N(%)
Sex (females)	59 (60%)
Frequency of visits to the dentist	
Regularly	49 (50%)
Only in case of discomfort	43 (44%)
Never	6 (6%)
Fear of the dentist	
Low fear	79 (81%)
Not at all	44 (45%)
A little	35 (36%)
High fear	
A lot	19 (19%)
	Mean (SD)
Age (years)	37.5 (12.6)
HAD-anxiety	3.1 (2.4)
HAD-depression	7.3 (3.2)

Table 2. Factors extracted from the principal components analysis

	Factor “dental care”	Factor “attitude of the dentist”	Factor “neglect”	Factor “organization”
The work is done by the assistants	0.81			
Injuring my lips with some instrument	0.79			
Brusqueness on the part of the dentist	0.72			
Unpleasant assistants	0.69			
The attendance of many patients at the same time	0.67			
Impolite dentist	0.67			
Dentist with bad breath	0.58			
Injuring my mouth	0.56			
Lack of gentleness in treatment	0.56			
Reprimands		0.85		
Bad mood on the part of the dentist		0.75		
Injection into the gums			0.76	
Bleeding in the mouth			0.72	
Use of the oral retractor			0.64	
Mistakes in placing the injection			0.59	
Old magazines in the waiting room			0.51	
Delays in attending				0.81
Distribution of the dental clinic				0.74
Percentage cumulative variance	25.8%	41.5%	55.3%	68.5%

The second factor (“attitude of the dentist”) included the following items: Reprimands and bad mood on the part of the dentist.

The third factor (“neglect”) included the following items: Injection into the gums, bleeding in the mouth, use of the oral retractor, mistakes in placing the injection.

Lastly, the fourth factor (“organization”), related to management issues in the dental clinic, included the following items: Delays in attending and distribution of the dental clinic.

Factors Associated to Fear of the Dentist

Univariate Analysis

In the univariate analysis, the score of the anxiety subscale of the HAD (HAD-A), together with the factors “neglect” and “attitude of the dentist” (the latter being at

the limit of significance), were found to be associated to patient perceived fear of visiting the dentist.

Those with high fear showed a higher HAD-A score than those with low fear (9.2 ± 3.2 Vs. 6.8 ± 3.0 ; $p<0.005$). Likewise, those with high fear of the dentist reported increased discomfort compared with those presenting low fear, in terms of the items related to the factors “neglect” (0.79 ± 0.70 Vs. -0.19 ± 0.96 ; $p<0.0001$) and “attitude of the dentist” (0.35 ± 0.9 Vs. -0.84 ± 1.0 ; $p<0.07$).

Other factors such as age, sex and depressive symptoms (HAD-D score) were not associated to patient fear of the dentist, in the same way as the factors “dental care” and “organization” (Table 3).

Multivariate Analysis

In the multivariate analysis, the factors “neglect” and “attitude of the dentist”, as well as HAD-A, age and sex

were entered as independent variables. The three variables found to be independently associated to fear of the dentist were HAD-A (OR = 1.3 (1.0-1.7); $p < 0.01$), the factor neglect (OR = 5.3 (2.0-13.7); $p < 0.0001$) and the factor “attitude of the dentist” (OR = 2.4 (1.1-5.4); $p < 0.0001$) (Table 4).

Factors Associated to the Frequency of Visits to the Dentist

As shown in Table 5, none of the studied factors were found to be associated to the frequency of visits to the dental clinic.

Discussion

The main finding of this study is that the factors “neglect” and “attitude of the dentist” are independently associated to high fear of the dentist.

In the present study, fear of the dentist was associated to high anxiety scores. Likewise, dental anxiety is related to the general anxiety condition of the patient

(Economou, 2003). This could suggest that fear of visiting the dentist may be included among the range of phobias. Consequently, it could be deduced that interventions which have been shown to be effective in treating specific phobias may also be applied to patients with fear of the dentist. The use of such techniques would afford improvements in dental treatment, resulting in a lesser anesthesia waiting time, a need for lesser amounts of anesthetic, fewer cancelled visits and more frequent visits to the dental clinic (Hmud and Walsh, 2009).

Dental anxiety has been related to deficient oral health in both children and adults (Pohjola *et al.*, 2008; Armfield *et al.*, 2009; Murthy *et al.*, 2014). Eitner *et al.* (2006) concluded that the avoidance of dental treatment is related to high anxiety scores and high DMFT index (decayed, missing, filled teeth) scores. Consequently, these patients present a greater risk of irregular visiting and/or of cancellation of visits to the dental clinic (Moore *et al.*, 1993; Sohn and Ismail, 2005).

Table 3. Univariate analysis of factors associated to fear of the dentist

	Low fear of dentist	High fear of dentist	P-value
	Mean ±SD	Mean ±SD	
Age (years, ±SD)	36.9±12.9	40.2±11.2	0.31
Factors			
“Dental care”	-0.72±1.0	0.30±0.81	0.14
“Attitude of the dentist”	-0.84±1.0	0.35±0.9	0.07*
“Neglect”	-0.19±0.96	0.79±0.70	0.0001**
“Organization”	-0.00001±0.99	0.0003±1.0	0.99
HAD-Anxiety	6.8±3.0	9.2±3.2	0.005**
HAD-Depression	3.2±2.5	2.5±1.9	0.26
Sex (females, %)	N (%)	N (%)	
Sex (females, %)	47(59.5%)	12(63%)	0.77
Frequency of visits to the dentist Low	38(48%)	11(57%)	0.44

Table 4. Logistic regression analysis of perceived dental fear (high versus low)

	B	Wald (df = 1)	OR (95%CI)	P-value
HAD-A	0.320	6-4	1.3 (1.0-1.7)	0.010
“Attitude of the dentist”	0.900	5.000	2.4 (1.1-5.4)	
	0.020			
“Neglect”	1.600	12.200	5.3 (2.0-13.7)	0.000
Age	-0.002	0.008	0.99 (0.93-1.0)	0.920
Sex	0.800	1.300	2.2 (0.56-8.7)	0.250

Table 5. Factors associated to the frequency of visits to the dentist

Factor	Regular visits	No regular visits	P-value
	(Mean ± SD)(n = 49)	(Mean ± SD)(n = 49)	
“Dental care”	0.005±1.0	-0.005±1.0	0.95
“Attitude of the dentist”	-0.07±1.1	0.07±0.88	0.46
“Neglect”	-0.10±0.98	0.10±1.0	0.32
“Organization”	0.12±1.0	-0.12±0.92	0.23
HAD-A	7.1±2.7	7.5±3.6	0.49
HAD-D	2.8±2.3	3.4±2.5	0.23

A number of studies have shown that patients with suffering from anxiety need more time to be attended- this implying an added cost for the dental professional. Moreover, patients of this kind are less likely to be satisfied with the treatment received; their adequate care therefore can represent a challenge for the dentist (Coffey and Giusto, 1983; Lehrner *et al.*, 2000). The levels of anxiety and depression were similar to those reported in a large sample of patients with acute back pain (Turk *et al.*, 2015).

Factors such as dentist-patient interaction are crucial for the control of anxiety. In this context, the attitude and comments of the dentist were identified as very important factors in our study. Moore *et al.* (1993), found negative contacts with the dentist to cause patients to identify the origin of their anxiety in the dental office. In this regard, we identified the “attitude of the dentist” as an independent factor associated to high fear of the dentist.

Patients with important anxiety tend to be overly tired after a dental visit. Intense anxiety can have important cognitive effects in patients, with negative thoughts, fear, crying, aggressiveness, sleep disturbances and alterations in eating habits, increased self-medication and a lack of personal confidence (Cohen *et al.*, 2000). Relaxation and distraction techniques have been found to be effective in lessening anxiety among patients visiting the dental clinic (Hainswoth *et al.*, 2005; Corah *et al.*, 1979). Some distraction techniques in dental practice are aroma therapy (Jafarzadeh *et al.*, 1985), music therapy (Aitken *et al.*, 2002), the viewing of relaxing pictures or images (Fox and Newton, 2006) and the use of virtual reality techniques with 3D glasses (Sullivan *et al.*, 2000). Other anxiety-lowering techniques include the progressive muscle relaxation technique developed by Jacobsen, which induces relaxation through the reduction of muscle tension by contracting and relaxing the muscles by groups (Kohl, 2002). Another simple method to produce relaxation comprises rhythmic breathing exercises, in which the patient inhales deeply, holding the breath for 5 sec and then exhaling over another 5 sec interval (Busch *et al.*, 2012).

Hypnosis is considered as an important tool for overcoming dental fear. Results confirm that hypnosis is beneficial as an adjunct intervention to reduce anxiety in patients, particularly in view of its noninvasive nature. Some findings show that hypnosis is not only beneficial, but is also very readily accepted by patients. The implementation of hypnosis in routine dental care should be encouraged (Glaesmer *et al.*, 2015).

The administration of relaxants such as benzodiazepines via different routes (oral, rectal, intranasal intravenous) is effective and is commonly prescribed for preventing anxiety in dental practice.

Their combination with sedation (nitrous oxide and oxygen) is effective and constitutes an alternative to general anesthesia (Wood, 2010). These drugs act quickly and briefly, patient condition will return to its normal state in a short period of time (Coulthard and Craig, 1997).

Two factors were related to high fear of the dentist in our study: The “attitude of the dentist” and concerns about “neglect”. In this context, dentist-patient communication plays a crucial role. Verbal support and reassurance are commonly used strategies and moreover should be practiced by all the dental team members. Accordingly, dental appointments involving particularly anxious patients should be of longer duration, in order to allow the dentist to thoroughly explain the procedure and provide the required treatment (Schou, 2000).

In this study, concern about neglect was one of the factors associated to fear of the dentist. A number of authors have attempted to lessen anxiety by means of different techniques such as psychoeducational interventions that have been found to be effective in other disciplines (Shah *et al.*, 2014).

Thus, simple interventions are available that can be applied by the dentist and team members in the dental clinic. In order to do so, we first must detect those patients with important anxiety and assess the procedure best suited to each individual case. The inclusion of behavioral concepts and dental education measures in the dental training programs could improve the capacity of future dental professionals to adequately deal with patients who suffer high levels of anxiety (Shahmansouri *et al.*, 2014).

Conclusion

Anxiety and fear of the dentist are multifactorial and common phenomena in the general population. Dental professionals must be able to identify patients with important anxiety and should be familiarized with the procedures applicable before dental treatment, in order to secure successful patient management.

The factors “attitude of the dentist” and “neglect”, together with anxiety, has been identified as independent parameters associated to high fear of dental treatment.

Acknowledgment

The authors wish thanks Clinica dental Dr. Jorge Vázquez Corripio and Clinica dental El Fontanal for their assistance in data collection.

Author’s Contributions

All authors equally contributed in this work.

Conflict of Interest

All authors declare no conflicts of interest.

References

- Abrahamsson, K.H., U. Berggren and S.G. Carlsson, 2000. Psychosocial aspects of dental and general fears in dental phobic patients. *Acta Odontol. Scand.*, 58: 37-43. DOI: 10.1080/000163500429415
- Abrahamsson, K.H., U. Berggren, M. Hakeberg and S.G. Carlsson, 2001. Phobic avoidance and regular dental care in fearful dental patients: A comparative study. *Acta Odontol. Scand.*, 59: 273-279. DOI: 10.1080/000163501750541129
- Aitken, J.C., S. Wilson, D. Coury, A.M. Moursi, 2002. The effect of music distraction on pain, anxiety and behavior in pediatric dental patients. *Pediatr. Dent.*, 24: 114-118. PMID: 11991313
- Armfield, J.M., G.D. Slade and A.J. Spencer, 2009. Dental fear and adult oral health in Australia. *Community Dent. Oral Epidemiol.*, 37: 220-230. DOI: 10.1111/j.1600-0528.2009.00468.x
- Berggren, U., 2002. Long-term management of the fearful adult patient using behavior modification and other modalities. *J. Dent. Educ.*, 65: 1357-1368. PMID: 11780654
- Busch, V., W. Magerl, U. Kern, J. Haas and G. Hajak *et al.*, 2012. The effect of deep and slow breathing on pain perception, autonomic activity and mood processing- an experimental study. *Pain Med.*, 13: 215-228. DOI: 10.1111/j.1526-4637.2011.01243.x
- Coffey, P.A. and J. Di Giusto, 1983. The effects of waiting time and waiting room environment on dental patients' anxiety. *Aust. Dent. J.*, 28: 139-142. DOI: 10.1111/j.1834-7819.1983.tb05268.x
- Cohen, S.M., J. Fiske and J.T. Newton, 2000. The impact of dental anxiety on daily living. *Br. Dent. J.*, 189: 385-390. PMID: 11081950
- Corah, N.L., E.N. Gale and S.J. Illig, 1979. The use of relaxation and distraction to reduce psychological stress during dental procedures. *J. Am. Dent. Assoc.*, 98: 390-394. DOI: 10.14219/jada.archive.1979.0049
- Coulthard, P. and D. Craig, 1997. Conscious sedation. *Dent. Update*, 24: 376-381.
- Economou, G.C., 2003. Dental anxiety and personality: Investigating the relationship between dental anxiety and self-consciousness. *J. Dent. Educ.*, 67: 970-980. PMID: 14518835
- Eitner, S., M. Wichmann, A. Paulsen and S. Holst, 2006. Dental anxiety- an epidemiological study on its clinical correlation and effects on oral health. *J. Oral. Rehabil.*, 33: 588-593. DOI: 10.1111/j.1365-2842.2005.01589.x
- Fox, C. and J.T. Newton, 2006. A controlled trial of the impact of exposure to positive images of dentistry on anticipatory dental fear in children. *Community Dent. Oral. Epidemiol.*, 34: 455-459. DOI: 10.1111/j.1600-0528.2006.00303.x
- Glaesmer, H., H. Geupel and R. Haak, 2015. A controlled trial on the effect of hypnosis on dental anxiety in tooth removal patients. *Patient Educ. Couns.*, 98: 1112-1115. DOI: 10.1016/j.pec.2015.05.007
- Hainsworth, J.M., H. Moss and K.J. Fairbrother, 2005. Relaxation and complementary therapies: An alternative approach to managing dental anxiety in clinical practice. *Dent. Update*, 32: 90-92. PMID: 15819152
- Hmud, R. and L.J. Walsh, 2009. Ansiedad dental: Causas, complicaciones y métodos de manejo. *J. Minim. Interv. Dent.*, 2: 237-248.
- Jafarzadeh, M., S. Arman and F.F. Pour, 1985. Effect of aromatherapy with orange essential oil on salivary cortisol and pulse rate in children during dental treatment: A randomized controlled clinical trial. *Adv. Biomed. Res.*, 2: 10-10. DOI: 10.4103/2277-9175.107968
- Kent, G., 1985. Cognitive processes in dental anxiety. *British J. Clin. Psychol.*, 24: 259-264. DOI: 10.1111/j.2044-8260.1985.tb00658.x
- Kohl, F., 2002. Progressive muscle relaxation according to E. Jacobson. A modern relaxation technique. *Med. Monatsschr. Pharm.*, 25: 77-87. PMID: 11925766
- Lehrner, J., C. Eckersberger, P. Walla, G. Pötsch and L. Deecke, 2000. Ambient odor of orange in a dental office reduces anxiety and improves mood in female patients. *Physiol. Behav.*, 71: 83-86. DOI: 10.1016/S0031-9384(00)00308-5
- Moore, R., H. Birn and E. Kirkegaard, 1993. Prevalence and characteristics of dental anxiety in Danish adults. *Commun. Dent. Oral Epidemiol.*, 21: 292-296. DOI: 10.1111/j.1600-0528.1993.tb00777.x
- Murthy, A.K., M. Pramila and S. Ranganath, 2014. Prevalence of clinical consequences of untreated dental caries and its relation to dental fear among 12-15-year-old schoolchildren in Bangalore city, India. *Eur. Arch. Paediatr. Dent.*, 15: 45-49. DOI: 10.1007/s40368-013-0064-1
- Navarro, C. and R. Ramírez, 1996. Un estudio epidemiológico acerca de la prevalencia de ansiedad y miedos dentales entre la población adulta de la gran área metropolitana de Costa Rica. *Psicol. Conductual*, 4: 79-95.
- Pohjola, V., A.K. Mattila, M. Joukamaa and S. Lahti, 2011. Anxiety and depressive disorders and dental fear among adults in Finland. *Eur. J. Oral Sci.*, 119: 55-60. DOI: 10.1111/j.1600-0722.2010.00795.x

- Pohjola, V., S. Lahti, M.M. Vehkalahti, M. Tolvanen and H. Hausen, 2008. Age-specific associations between dental fear and dental condition among adults in Finland. *Acta Odontol. Scand.*, 66: 278-285. DOI: 10.1080/00016350802293960
- Schou, L., 2000. The relevance of behavioural sciences in dental practice. *Int. Dent. J.*, 50: 324-332. DOI: 10.1111/j.1875-595X.2000.tb00582.x
- Shah, L.B., P. Klainin-Yobas, S. Torres and P. Kannusamy, 2014. Efficacy of psycho education and relaxation interventions on stress-related variables in people with mental disorders: A literature review. *Arch. Psychiatr., Nurs.*, 28: 94-101. DOI: 10.1016/j.apnu.2013.11.004
- Shahmansouri, N., M. Janghorbani, A. Salehi Omran, A.A. Karimi and A.A. Noorbala *et al.*, 2014. Effects of a psychoeducation intervention on fear and anxiety about surgery: Randomized trial in patients undergoing coronary artery bypass grafting. *Psychol. Health Med.*, 19: 375-83. DOI: 10.1080/13548506.2013.841966
- Sohn, W. and A.I. Ismail, 2005. Regular dental visits and dental anxiety in an adult dentate population. *J. Am. Dent. Assoc.*, 136: 58-66. DOI: 10.14219/jada.archive.2005.0027
- Sullivan, C., P.E. Schneider, R.J. Musselman, C.O. Dummett Jr and D. Gardiner, 2000. The effect of virtual reality during dental treatment on child anxiety and behavior. *ASDC J. Dent. Child.*, 67: 193-196.
- Turk, D.C., R.H. Dworkin, J.J. Trudeau, C. Bendon and D.M. Biondi, 2015. Validation of the hospital anxiety and depression scale in patients with acute low back pain. *J. Pain*, 16: 1012-1021. PMID: 26208762
- Vassend, O., 1993. Anxiety, pain and discomfort associated with dental treatment. *Behav. Res. Ther.*, 31: 659-666. DOI: 10.1016/0005-7967(93)90119-F
- Wood, M., 2010. The safety and efficacy of intranasal midazolam sedation combined with inhalation sedation with nitrous oxide and oxygen in paediatric dental patients as an alternative to general anaesthesia. *SAAD Dig.*, 26: 12-22. PMID: 20151606
- Zigmond, A.S. and R.P. Snaith, 1983. The hospital anxiety and depression scale. *Acta Psychiatr. Scand.*, 67: 361-370. DOI: 10.1111/j.1600-0447.1983.tb09716.x