Evaluation of The Effect of Consecutive Dental Visits on Dental Anxiety of Pediatric Patients

Ardışık Diş Hekimi Ziyaretlerinin Çocuk Hastaların Dental Anksiyetesi Üzerindeki Etkisinin Değerlendirilmesi

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ABSTRACT

INTRODUCTION: Childhood is period when dental anxiety is most common, and this behavioural disorder, which is common during this period, is associated with fear of dental procedures and the environment of the dental clinic. The study aimed to evaluate effect of two separate dental sessions on anxiety level of children in dental clinic.

MATERIAL and METHODS: 240 children aged 6-9 years who have two caries on mandibular primary molars were included current study. Before and after the dental procedures The Abeer Children Dental Anxiety Scale (ACDAS) was applied to all participants in consecutive visits. Physiological parameters were measured with pulse oximeter every five minutes during dental treatments. SPSS software (version 22.0, SPSS Inc, Chicago) was used for statistical analysis.

RESULTS: Participants' mean age was 6.9±1,18 years. Both preoperative and postoperative ACDAS scores were significantly higher at the first visit than at the second visit. Statistically significant differences were observed in heart rate scores between treatment sessions (p<0.001).

CONCLUSION: The results of this study demonstrated that consecutive dental visits decreasing the dental anxiety level of children aged 6-9 years. These findings emphasize the significance of consecutive treatment visits in pediatric dentistry.

Keywords: *Pediatric patients, dental anxiety, consecutive dental visits, behaviour management*

ÖZ

GİRİŞ: Çocukluk dönemi dental anksiyetenin en yaygın görüldüğü dönemdir ve bu dönemde sık görülen bu davranış bozukluğu, dental prosedürlerden ve diş kliniğinin ortamından korkmakla ilişkilendirilmektedir. Bu çalışmanın amacı, ardışık diş hekimi ziyaretlerinin çocukların diş kliniğindeki anksiyete düzeyi üzerindeki etkisini değerlendirmektir.

YÖNTEM ve GEREÇLER: Çalışmaya, mandibular süt birinci molar dişlerinde iki çürüğü bulunan 6-9 yaş arası 240 çocuk dahil edilmiştir. Diş tedavileri öncesinde ve sonrasında Abeer Çocuk Diş Anksiyete Ölçeği (ACDAS) tüm katılımcılara ardışık ziyaretlerde uygulanmıştır. Fizyolojik parametreler, diş tedavileri sırasında her beş dakikada bir puls oksimetre ile ölçülmüştür. İstatistiksel analizler için SPSS (versiyon 22.0, SPSS Inc, Chicago) yazılımı kullanılarak analiz edilmiştir.

BULGULAR: Katılımcıların ortalama yaşı 6,9 ± 1,18 yıldır. Hem preoperatif hem de postoperatif ACDAS skorları ilk ziyaret sırasında ikinci ziyarete göre anlamlı derecede yüksekti. Tedavi oturumları arasında kalp atım hızı değerlerinde istatistiksel olarak anlamlı farklar gözlemlenmiştir (p < 0,001).

SONUÇ: Bu çalışmanın sonuçları, ardışık diş hekimi ziyaretlerinin 6-9 yaş arası çocukların dental anksiyetesini azalttığını göstermektedir. Bu bulgular, pedodontide ardışık tedavi ziyaretlerinin önemini vurgulamaktadır

Anahtar Kelimeler: *Pediatrik hastalar, dental anksiyete, ardışık diş hekimi ziyaretleri, davranış yönlendirmesi*

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INTRODUCTION

Anxiety is related to fear, but these terms are used to describe two different conditions. Therefore, the terms anxiety and fear are debated by researchers. Dental anxiety is a state of apprehension that harmful practices will occur during dental treatments. In contrast, fear occurs as a normal emotional response to threatening situations.[1] In a systematic review, dental anxiety was reported to be a behavioural disorder occurring in 10-20% of children worldwide.[2] Childhood and adolescence are both the most common periods of dental anxiety, with prevalence rates ranging from 20% to 50%. This behavioural disorder, which is common during these periods, is associated with fear of dental procedures and the environment of the dental clinic.[1-3] In this context, researchers have reported that children with high dental anxiety have more decayed, missing and filled teeth.[4] Behaviour management problems in dental practice also occur as a result of dental anxiety, phobia or fear.[5] Due to these disadvantages, dental anxiety is recognised as a factor with negative effects on oral health. For dentists, it is difficult to distinguish between phobia and fear and therefore these conditions are referred to as dental anxiety.[6] When planning dental treatment of children, dental anxiety and fear are the most important components for understanding patients' cooperation and behaviour towards dental procedures. According to their attitudes towards treatment in the dental clinic, children are categorised as cooperative, potentially cooperative and non-cooperative.[5] Existing non-pharmacological techniques for behaviour management can be used for cooperative and potentially cooperative children, except for children who lack the ability to cooperate. This is because lack of ability to co-operate refers to children who are too young to communicate and who have partial or total disabilities.[7, 8] Most of the research on dental anxiety is based on questionnaires, which are considered the most acceptable method for assessing anxiety in children who have the cognitive ability to express their feelings on a questionnaire.[9-11] The use of the Abeer Children Dental Anxiety Scale (ACDAS) is an acceptable practice for determining dental anxiety in children aged 6 years and older.[7] Because ACDAS evaluating to anxiety of children by asking questions dentist, parents and children. This situation supports to in all its aspects evaluating anxiety of children. Therefore, further studies on Turkish paediatric patients using the ACDAS, which includes cognitive questions and has proven Turkish validity, are necessary to better understand the causes of dental anxiety and to assist paediatric dentists in behavioural management.[12]

Researchers have proposed that a child's initial reaction to a dental visit is largely influenced by fear of the unknown.[13,14] Furthermore, anxiety levels tend to be elevated in children who present to the dental clinic with pain. Venham et al. reported that negative behavioral responses were particularly pronounced during initial visits.[15] The first dental visit plays a pivotal role in sensitizing the child to subsequent dental procedures. Nevertheless, successive dental appointments may facilitate a process of systematic desensitization, thereby reducing anxiety levels over time. This phenomenon aligns with the perspective adopted in numerous studies, which conceptualize dental anxiety as an adaptive process—one that often originates in childhood and can be progressively mitigated through appropriate behavioural interventions.[13-15]

Studies suggest that dental anxiety in children may be related to adjustment to the dental clinic environment.[16,17] Therefore, dental procedures in the clinical setting may affect children's dental anxiety level. However, children's adaptation to the dental clinic environment may reduce the severity of dental anxiety. Sequential dental visits may positively affect the cooperation of paediatric patients and increase their adaptation to the dental clinic environment and reduce their anxiety levels.

The aim of this study was to evaluate the effect of consecutive dental visits on anxiety levels in group of Turkish children aged 6-9 years using physiological parameters such as heart rate and oxygen saturation and an anxiety scale.

MATERIALS AND METHODS

The Ethics Committee of Mehmet Akif Ersoy University approved the current study (No: GO 2024/401), which was conducted in accordance with the Declaration of Helsinki. All participants provided informed consent. The trial was registered at ClinicalTrials.gov (NCT06266156) on 12/02/2024.

The study aimed to determine an effect size of 0.88 with a significance level and power of 0.05 and 95%, respectively. The required sample size was calculated as 200; however, to account for possible data loss, the sample size was selected as 260. Participants were selected from healthy children aged 6-9 years with no mental or physical disability and no previous dental experience, who did not need emergency dental intervention, and who had dental caries limited to enamel and dentin and were included in ASA1 according to the American Society of Anaesthesiologists guidelines.[18] Children with physical or mental disabilities, without parental consent or with cardiovascular diseases affecting physiological parameters such as blood pressure, pulse rate or oxygen saturation were excluded. Of the 260 invited children, 20 were excluded because they did not attend the second visit, and the procedures were performed on 240 participants who met the inclusion criteria. Consecutive appointments were organised with a maximum interval of 2 weeks. The flowchart of study process is shown in Figure 1.

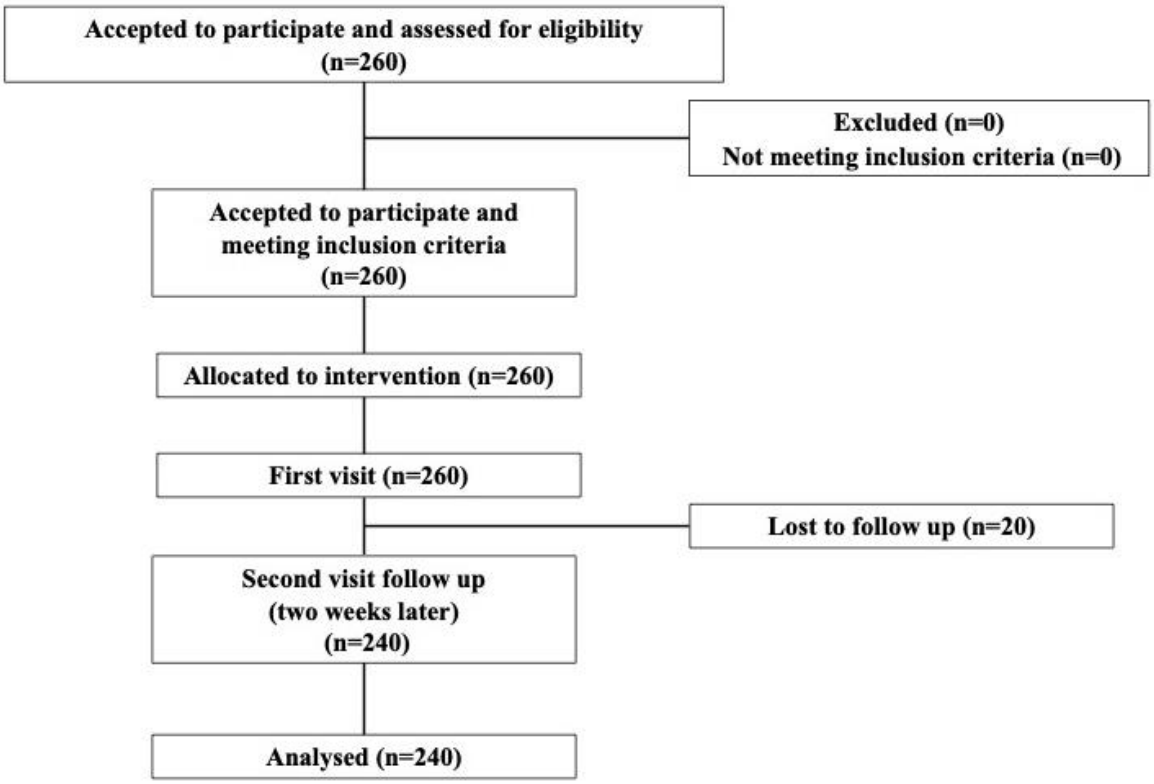

Figure 1. The flowchart of entire process from participant selection and end of study

In order to measure anxiety, a three-part ACDAS was used, in which the child was evaluated, and dental and cognitive parameters were measured in addition. In the dental part of the scale, which consists of 19 questions in total, there are 13 questions in which children express their feelings using facial expressions and are scored from 1 to 3. Total scores ranged from 13 to 39, with scores of 26 and above indicating anxiety (Figure 2). The child's parents and the paediatric dentist (HT) completed the cognitive and child assessment sections of the scale. The children were initially examined clinically and radiographically without any dental treatment. At subsequent visits, all participants received topical (lidocaine 5% gel) and buccal infiltration anaesthesia (68 mg articaine hydrochloride + 0.017 mg epinephrine / 1.7 ml) prior to cavity preparation in the mandibular primary first molar. All carious lesions were limited to dentinal caries based on conventional radiographic and clinical assessment, ensuring moderate lesion depth in mandibular primary first molars, consistent with Class I or II cavity preparations. The ICDAS classification was used, the selection of lesions was standardized to ensure moderate, non-complex lesions (ICDAS Class 5). Rubber dam isolation, use of the same compomer restorative material, and a uniform restorative technique were applied in all cases. All treatments were performed by the same pediatric dentist (HT) using the tell-demonstrate-apply behavioural guidance technique. The ACDAS was administered before and after the procedure during both visits.

Objective anxiety symptoms were assessed by measuring heart rate and oxygen saturation using a pulse oximeter (High Accuracy Fingertip Pulse Oximeter Model: XM-112, Joytech Sejoy, CHINA). These physiological parameters were recorded every 5 minutes during dental procedures in both visits.

Statistical Analysis

SPSS software (version 22.0, SPSS Inc, Chicago) was used for statistical analysis. Sample size calculations were performed using G-Power (version 3.1.9.6, Germany). Normality of the data was determined by Kolmogorov-Smirnov and parametric tests. According to normality tests, all data obtained were normally distributed. In descriptive statistics, numerical and categorical variables are presented as mean, standard deviation and percentage, respectively. The differences between the heart rate, oxygen saturation and ACDAS scores of the participants were determined using two sample t-test.

A. Dental Part

I would like you please to tell me how relaxed or scared you feel at the dentist. Please use the scale below from 1 to 3 and tick (✓) under the face that shows us how you feel now.

How do you feel about:	1: Happy 1	2: Ok 2	3: Scared 3
1. Sitting in the waiting room?			
2. A dentist wearing a mask on his face?			
3. Laying flat on the dental chair?			
4. A dentist checking your teeth with a mirror?			
5. Having a strange taste in your mouth e.g. a filling or gloves?			
6. Having a "pinch" feeling in your gum?			
7. The feeling of numbness (fat lip or tongue)?			
8. A dentist cleaning your teeth by buzzy electric arm that's spraying water?			
9. The sounds that you hear at the dentist?			
10. The smell at the dentist?			
11. Having a tooth taken out?			
12. Wearing a small rubbery mask on your nose to breathe special gas to help you feel comfortable during treatment?			
13. Having a "pinch" feeling on the back of your hand?			

B. Cognitive Part

14. Do you feel shy at the dentist? 1. Yes 2. No
15. Do you feel shy because of the way your teeth look? 1. Yes 2. No
16. Are you worried about losing control at the dentist? 1. Yes 2. No

C. Child Assessment

For legal guardian:

17. Has your child had previous dental treatment? 1. Yes 2. No
18. How do you expect your child's behaviour today?
    1. Happy 2. Ok 3. Scared

For operator:

19. At the end of this visit, what is your rating for the child's behaviour?
    1. Happy 2. Ok 3. Scared

Figure 2. Information about Abeer Children Dental Anxiety Scale (ACDAS)

RESULTS

Descriptive analyses of the participants are shown in Table 1. The minimum and maximum ages of the children were 6 and 9 years, respectively, and the mean age was 6.9±1.18 years. Participants were distributed across age groups as follows: 6 years (n=65), 7 years (n=64), 8 years (n=55), and 9 years (n=56). Comparative analysis of ACDAS scores and physiological parameters across these age groups revealed no statistically significant differences ($p>0.05$). Therefore, age was not identified as a confounding variable in the anxiety reduction observed between visits. Statistical analyses of the mean ACDAS scores of the first and second visits are shown in Table 2. When the ages and genders of all participant children were compared, no significant difference was found in terms of ACDAS scores and physiological parameters ($p>0.05$). The mean ACDAS score obtained from the participants at the first visit before dental procedures was significantly higher compared to the second visit ($p<0.001$). After dental procedures, the mean ACDAS score was 25.23±1.82 and 23.07±1.98 at the first and second visits, respectively. The post-operative ACDAS score at the second visit was statistically significantly lower than the post-operative ACDAS score obtained at the first visit ($p<0.001$). When the pre- and post-operative mean ACDAS scores were compared at the first visit, the post-operative mean ACDAS score was statistically significantly lower than the pre-operative mean ACDAS score ($p<0.001$). Similar to these results, at the second visit, the post-procedure mean ACDAS score was significantly lower than the pre-procedure mean ACDAS score ($p<0.001$). Physiological parameters measured every 5 minutes at the first and second visits are shown in Table 3. There were no statistically significant differences between the oxygen saturation values obtained from the patients every 5 minutes at the first and second visits ($p>0.05$). When the heart rates measured at the first and second visits were

compared, it was observed that the heart rate measured at the first visit was significantly higher than the second visit (p<0.001).

Table 1. Demographic analyses of the participants

Variables	
Gender, n (%)	
Female	115 (48)
Male	125 (52)
Total	240 (100)
Age, mean± SD	6.9±1.18

Abbreviation: SD, standart deviation.

Table 2. Analyses of the mean ACDAS scores of the first and second dental visits

	First Visit, (mean± SD)	Second Visit, (mean± SD)	*p-Value
Pre-operative ACDAS Score	27.52±1.96	25.01±1.21	**<0.001**
Post-operative ACDAS Score	25.23±1.82	23.07±1.98	**<0.001**

Abbreviation: SD, standard deviation
*p-two sample t-test value

Table 3. Comparison of physiological parameters obtained from the first and second dental visits

		First Visit, (mean± SD)	Second Visit, (mean± SD)	*p-Value
Oxygen Saturation	5th minute	98.52±1.96	98.23±1.82	0.083
	10th minute	98.01±1.21	98.07±1.98	0.091
	15th minute	98.61±1.38	98.81±1.21	0.073
Heart Rate	5th minute	99±3.11	93±3.78	**0.001**
	10th minute	96±4.01	90±4.21	**0.001**
	15th minute	92±3.89	87±4.39	**0.001**

Abbreviation: SD, standart deviation
*p-two sample t-test value

DISCUSSION

The participants included in this study were in the age range of 6-9 years. The inclusion of paediatric patients in this age group was based on previous studies on dental anxiety.[19-21]

These studies have reported that the level of dental anxiety in paediatric patients increases especially between the ages of 6-9 years. Children between the ages of 6-9 years show a rapid development in mental skills and are able to describe their experiences and emotions, both good and bad, more effectively.[19-22] Paediatric patients aged between 6 and 9 years do not have an effective cognitive ability to describe good or bad experiences and emotions.[23]

Wong-Baker FACES Pain Rating Scale was used in a study on the subject. This scale is not reliable enough because no validity and reliability study has been conducted in the Turkish population.[17] For this reason, in the present study, in order to increase the power of the results as a scale to evaluate the level of anxiety, the Turkish validity and reliability of the ACDAS, which has been tested, was selected.[12] This scale allows the assessment of children's emotional and physical behaviour to promote a better understanding of dental anxiety. Another major advantage of this scale is that it allows the child to answer the questions by choosing one of three facial figures: happy, sad and indifferent. In addition, the ACDAS as a scale assesses anxiety with responses from the child, the dentist and the parents or legal guardians.[7] One of the most outstanding advantages of the present study is the assessment of children's dental anxiety levels with a cognitive scale measuring anxiety according to the responses of children, parents and dentist.

The data obtained from the study showed that there was no statistically significant difference between consecutive dental visits in terms of gender and age. There was no statistically significant difference between the results of anxiety levels in all age ranges for both genders in the first and second visits of the patients. These findings of the present study are consistent with the studies of Rodrigues and Damle[24], Rayen et al.[25], Fux-Noy et al.[26] and Karaca[17].

The mean ACDAS scores and heart rates recorded during the first dental visit were significantly higher than those recorded during the second visit (p<0.001). The observed differences in anxiety levels and physiological parameters across both visits may be attributed to increased familiarity with the dental clinic environment, the pediatric dentist, and dental treatment procedures. The findings of the present study are consistent with previous research that characterizes dental anxiety as an

adaptive process—particularly prominent in pediatric patients—that can diminish over time through appropriate behavioral interventions, environmental adaptation, and enhanced emotional regulation.[13–15] Furthermore, the outcomes align with those reported by Menezes Abreu et al.[27] and Karaca,[17] who also demonstrated that sequential dental visits contribute to a reduction in dental anxiety levels observed during dental treatments in children.

All participants received local anaesthesia to ensure procedural consistency and ethical pain management. While injection procedures may themselves contribute to anxiety, their uniform application across visits minimized confounding in comparative analyses.[28] Future studies incorporating a non-invasive control group or stratified anaesthesia protocols may offer further insight into the isolated impact of anaesthesia on dental anxiety.

The participants included in this study were patients who did not require emergency dental care. The structured scheduling of consecutive, non-emergency dental appointments served as a non-pharmacological behavioral management strategy, resulting in reduced anxiety levels and lower heart rates—an objective physiological marker of anxiety. This finding is particularly relevant for patients with no prior dental experience or those classified as potentially cooperative, as previously reported in the literature.[13–15,17,27] However, contrary to the present study's findings, in patients requiring emergency dental care, anxiety reduction has been reported to occur only after multiple consecutive treatment sessions.[29] This discrepancy may be due to the fact that these patients present with dental pain, which may exacerbate initial anxiety levels.

In contrast to these findings, the findings of the present study are inconsistent with the results of the study by Cademartori et al.[30] who reported that multiple dental visits resulted in increased levels of dental anxiety in children. These differences may be explained by the complex way in which dental treatment experiences affect children's dental anxiety.

The present study has several limitations:

- The homogenous nature of the study sample, which was confined to a single geographic and cultural region in Türkiye.
- The potential for selection bias, as participants were recruited from individuals presenting with non-emergency conditions and classified as potentially cooperative.
- The need for multicenter studies involving diverse populations to enhance external validity and generalizability of the findings.

CONCLUSION

The primary aim of this study was to investigate the effect of consecutive dental visits on dental anxiety in children. The present study emphasises that dental treatment experiences and acclimatisation of the child to the dental clinic environment may positively affect the dental anxiety levels of pediatric patients after consecutive dental visits.

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