Pesquisa Brasileira em Odontopediatria e Clínica Integrada 2025; 25:e240022
https://doi.org/10.1590/pboci.2025.050
ISSN 1519-0501 / eISSN 1983-4632

ORIGINAL ARTICLE

Dental Anxiety and Self-Esteem in Pediatric Patients Undergoing Maxillofacial Orthopedics

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Academic Editor: Alessandro Leite Cavalcanti

Received: March 06, 2024 / **Review:** June 03, 2024 / **Accepted:** June 14, 2024

How to cite: Mendoza GNB, Zambrano TBS, Wied AL. Dental anxiety and self-esteem in pediatric patients undergoing maxillofacial orthopedics. Pesqui Bras Odontopediatria Clín Integr. 2025; 25:e240022. https://doi.org/10.1590/pboci.2025.050

ABSTRACT

Objective: To investigate the correlation between dental anxiety and self-esteem in pediatric patients undergoing six months of maxillofacial orthopedic treatment in Portoviejo, Ecuador. **Material and Methods:** A quasi-experimental study was conducted on 92 children aged 7 to 11 with malocclusions. Participants completed a dental anxiety scale questionnaire and the House-Tree-Person (HTP) psychological graphic test before and after the installation of maxillofacial orthopedics. Confidence interval analyses were performed for qualitative variables, while mean values with standard deviations were calculated for quantitative variables. The relationship between self-esteem and dental anxiety was assessed using a chi-square test. **Results:** The mean age of participants was 9 years, with 86.96% residing in urban areas. Sociodemographic variables showed statistically significant differences ($p<0.05$). There were statistically significant differences in dental anxiety between the initial and final periods ($p<0.05$), with a decrease in anxiety observed after six months of treatment. As measured by the House drawing, self-esteem was significantly higher in the first period evaluated ($p<0.05$). **Conclusion:** The study found a decrease in anxiety after six months of maxillofacial orthopedic treatment. Higher self-esteem was associated with better oral health practices, highlighting the importance of the orthodontist's role in evaluating behavior to enhance treatment success and the mental health of pediatric patients.

Keywords: Self Concept; Anxiety; Orthopedics; Malocclusion.

Introduction

Dental anxiety and abnormal fear or apprehension of visiting the dentist have an impact on the quality of dental treatment and can have enduring implications on children [1]. Cross-sectional and cohort studies published between 2000 and 2014 have reported a prevalence of childhood dental anxiety ranging from 10% to 20% [1-3]. A common manifestation presented in dental clinics is malocclusion, which is a highly prevalent public health issue with a negative correlation with quality of life, self-esteem, psychological and emotional health, as well as social perceptions [4]. Malocclusion constitutes a distortion of normal growth and development, which can stem from either skeletal or dental origins. Malocclusions are challenging to preempt; they may be hereditary, linked to developmental deficiencies, prenatal trauma, non-functional oral habits, or be of unknown etiology [5-11].

Maxillofacial orthopedics in pediatric patients can significantly impact their psychological well-being. A positive correlation has been found between the duration of orthopedic treatment and high levels of dental anxiety in children [8-10]. This finding highlights the importance of addressing both dental and psychological aspects in pediatric patients undergoing maxillofacial orthopedics. On the other hand, a longitudinal study has been carried out that revealed an initial decrease in the self-esteem of pediatric patients during the early stages of orthopedic treatment, accompanied by an increase in dental anxiety [9-12]. However, as treatment progressed and improvements in facial function and aesthetics were observed, there was a positive trend towards improving self-esteem and reducing dental anxiety in children [9-13]. These findings emphasize the need for comprehensive interventions considering physical and psychological aspects in managing pediatric patients undergoing maxillofacial orthopedic treatment.

The effectiveness of orthopedic appliances, whether preventative or interceptive, is improved with increased patient adaptability linked to patient comfort with respect to the appliance and treating the oral habits associated with malocclusion [14-18]. The primary repercussions of malocclusion and orthopedic appliances are linked to emotional and social well-being, where at the ages 6-10 years old, the concept of aesthetics associated with health develops and becomes integrated into the young individual's self-esteem concept and identity [19-31]. Orofacial disorders can negatively affect the physical and psychosocial functions of children, adolescents, and young adults, ultimately influencing their quality of life [20,21].

In addition to the anxiety that may be associated with their malocclusions and physical appearance, pediatric patients may also present anxiety related to the dental office, where dental fear can be considered a significant challenge in patient care and treatment. Anxiety can be defined as feelings of worry, uneasiness, or fear where studies have observed physiological changes such as increased arterial pressure and threshold resistance to pain [15-21]. Previous studies have observed that younger children demonstrate higher levels of anxiety compared to other age groups [22-24]. Dental anxiety manifests a considerable prevalence among pediatric patients; for instance, 21% of 5-year-old children and 17% of 8-year-old patients conveyed feelings of anxiety to their parents regarding dental visits, reporting moderate to severe dental anxiety during dental appointments [25,26].

These factors are important to consider when providing patient care and designing orthopedic treatment in young individuals, where orthopedic appliances have been observed to have a positive functional and psychosocial effect on an individual's quality of life. According to existing studies, indicators for assessing dental treatment's positive or negative impact are the evaluation of variables such as self-esteem and anxiety levels. Self-esteem is confidence in personal characteristics such as individual abilities, worth, appearance, etc. An individual's self-perception translates into either a positive or negative attitude [27-32], where the negative

aspect of self-esteem is associated with feelings of worthlessness and failure, while the positive aspect is linked with feelings of contentment and self-appreciation [28-30].

It is important to consider these factors when providing patient care and designing orthopedic treatments for young people, where orthotics have been observed to have a positive functional and psychosocial effect on the individual's quality of life. According to existing studies, the indicators to evaluate dental treatment's positive or negative impact are the evaluation of variables such as self-esteem and anxiety levels. Self-esteem is confidence in personal characteristics, such as abilities, worth, appearance, etc. An individual's self-perception translates into a positive or negative attitude [27-33], where the negative aspect of self-esteem is associated with feelings of worthlessness and failure, while the positive aspect is linked with feelings of satisfaction and self-worth [28-30]. Highlighting the importance of addressing dental and psychological aspects during treatment.

These results highlight the complexity of the interactions between dental anxiety, self-esteem, and orthopedic treatment and underline the need to understand and manage the patient's emotions towards the dentist since the lack of psychological analysis through projective tests in the evaluation of pediatric patients undergoing orthodontic treatment [34-40] affects patient care. The purpose of the present study is to determine the relationship between dental anxiety and self-esteem in pediatric patients undergoing 6 months of maxillofacial orthopedic treatment.

Material and Methods

Study Design and Sampling

The study entailed a quasi-experimental methodology conducted in private dental clinics in Portoviejo-Manabi, Ecuador, to analyze patient dental anxiety and self-esteem before and after installing orthopedic maxillofacial appliances in children 7 to 11 years old with oral pathological habits and dental malocclusions. The study involved collaboration with orthodontic specialists and utilized a non-probabilistic convenience sampling method. The sample size was determined using a population proportion estimation formula with a confidence level of 95% and a precision of 10%.

Data Collection

Data collection involved administering a questionnaire (9 questions from the short version of the Dental Anxiety Scale) [41] and a psychological projective test ("house, tree, person" - HTP) [42]. The questionnaire [41] comprises nine questions with dichotomous answers in which quantitative values of 0 for NO and 1 for YES were assigned. In each of the questions, with a total scale ranging from 0 to 9. The sum of all the questions was performed to categorize patients with a value of 0 as patients without anxiety and all others as patients with anxiety. In the questionnaire, values equal to or greater than 1 were used, which indicates that the patient is anxious about dental treatment.

The psychologist evaluated the drawings belonging to the HTP Test [39-41]. Based on the observation of each graph and the meaning of the lines, according to Buck [42], the psychologist identified the characteristics, selecting only those that allowed for determining the presence or absence of dental anxiety. Self-esteem, high or low, in each of the drawings, was also evaluated. Data on general aspects related to each of the respective person, house and tree drawings were collected. For dental anxiety, 0 if absent and 1 if present; For self-esteem, 1 high and 2 low. The aspects of the drawings were separated by house, tree, person, and general characteristics of the drawings. For drawings that presented poor quality or some inconsistency, a relationship of evaluation data

between the drawings was generated, together with the questionnaire data [43]. An identification code was assigned from 001 to 92 to guarantee the patients' anonymity.

After receiving informed consent from the participants and their legal guardians, data from the Dental Anxiety questionnaire and HTP test were obtained before and after 6 months of orthopedic treatment. Approval for the recollection of data in this study was obtained from an Ethics committee, ensuring the confidentiality and well-being of the participants were prioritized in the present study.

Data Analysis

Statistical analyses included confidence interval analysis, chi-square tests, descriptive statistics, Shapiro-Wilk tests, univariate analyses, binary logistic regression, and Pearson correlations. SPSS software, version 26 (IBM Corp., Armonk, NY, USA), was used for statistical analyses, with a significance level of α=0.05. The study aimed to identify predictors for dental anxiety and self-esteem, considering variables such as age, gender, and place of residence.

Results

For this study, a total of 92 children participated in both phases (initial and final), consisting of 57 boys (62%) and 35 girls (38%). The mean age was 9, with 86.96% of the surveyed population residing in urban areas. Significant differences were found for each of the studied sociodemographic variables with a p-value<0.05. From the total of 184 participants in the sample, 8 participants (age 7). The age groups of the sample were observed as 8 participants being 7 years old, 15 participants being 8 years old, 22 being 9 years old, and 24 and 23 participants were recorded as 10 and 11 years old, respectively, age 10 (n=24), age 11(n=23). The study examined the impact of oral appliances on patients with anxiety.

Table 1 shows significant differences in anxiety levels before and 6 months after appliance use (p<0.05), with more anxiety observed in the individuals in the initial phase. The short dental anxiety questionnaire revealed statistical significance (p<0.05) for all questions, indicating higher anxiety levels in the first phase and a lower percentage of anxious patients after 6 months of appliance use. With respect to the variable of self-esteem, significant differences (p<0.05) were found in the House drawing and general characteristics of the drawings, indicating higher self-esteem in the first phase compared to the second phase.

Table 1. Anxiety and Self-Esteem in participants surveyed.

Variables	Phase One N (%)	Phase Two N (%)	p-value
Anxiety			0.0001
Yes	75 (82.0)	7 (8.0)	
No	17 (18.0)	85 (92.0)	
Self-esteem			0.0001
High	54 (59.0)	28 (30.0)	
Low	38 (41.0)	64 (70.0)	

The results of the binary logistic regression analyses predicting positive outcomes for anxiety and self-esteem according to the survey stages phase 1 are presented in Table 2. The binary logistic regression model for anxiety and self-esteem was not statistically significant for either of the two study periods, considering the sociodemographic variables of age, gender, and location. This indicates that there is no statistical correlation between the variables of anxiety and self-esteem as evaluated.

Table 2. Binary logistic regression analysis to predict antecedents on perceived tests of anxiety and self-esteem for phase 1.

Sociodemographic Profile	First Phase Anxiety			First Phase Self-Esteem		
	OR	95% IC	p-value	OR	95% IC	p-value
Age						
Reference (7 years old)			0.60			0.47
8	1.05	0.09-11.82	0.96	0.43	0.84-2.26	0.32
9	0.60	0.10-3.46	0.56	0.38	0.99-1.47	0.16
10	0.95	0.17-5.30	0.95	0.43	0.12-1.48	0.18
11	0.36	0.08-1.63	0.18	0.87	0.25-2.98	0.83
Sex						
Reference (female child)			1.00			1.00
Male child	0.63	0.22-1.83	0.39	0.1243	4.62-2.36	0.12
Localization						
Rural			1.00			1.00
Urban	0.63	0.15-2.65	0.53	0.30	0.08-1.08	0.66

OR = Odds Ratio; 95% CI = 95% Confidence Intervals.

The results of the binary logistic regression analyses predicting positive outcomes for anxiety and self-esteem based on the survey phases in phase two are presented in Table 3. The binary logistic regression models for anxiety and self-esteem in phase two were not statistically significant, considering the sociodemographic variables of age, gender, and location. This indicates that there is no statistical correlation between the variables anxiety and self-esteem as assessed.

Table 3. Binary logistic regression analysis predicts factors associated with perceived anxiety and self-esteem in phase 2.

Sociodemographic Profile	Second Phase Anxiety			Second Phase Self-esteem		
	OR	95% IC	p-value	OR	95% IC	p-value
Age						
Reference (7 years old)	0.95		0.87			0.74
8	1.02	0.08-10.72	0.96	1.70	0.30-9.37	0.54
9	0.00	0.15-7.00	0.97	1.03	0.23-4.50	0.96
10	0.29	0.00	0.99	1.96	0.55-6.91	0.29
11	0.15	0.28-3.01	0.30	0.94	0.25-3.50	0.94
Sex						
Reference (female child)			1.00			1.00
Male child	0.63	0.11-3.43	0.59	0.69	0.27-1.76	0.44
Localization						
Rural			1.00			1.00
Urban	1.12	0.12-10.21	0.91	1.16	0.32-4.24	0.81

OR = Odds Ratio; 95% CI = 95% Confidence Intervals.

As can be seen in Table 4, there is no correlation between anxiety and self-esteem for the first phase of the study.

Table 4. Pearson correlation for anxiety and self-esteem, first phase.

		Anxiety	Low Self-esteem
Anxiety	Pearson Correlation	1	-0.001
	Sig. (two-tailed)		0.991
	N	92	92
Low Self-esteem	Pearson Correlation	-0.001	1
	Sig. (two-tailed)	0.991	
	N	92	92

In Table 5, no correlation is observed between anxiety and low self-esteem for the second phase of the study, as the p-value is greater than 0.05.

Table 5. Pearson correlation for anxiety and low self-esteem, second phase.

		Anxiety	Low Self-esteem
Anxiety	Pearson Correlation	1	-0.012
	Sig. (two-tailed)		0.912
	N	92	92
Low Self-esteem	Pearson Correlation	-0.012	1
	Sig. (two-tailed)	0.912	
	N	92	92

Discussion

The present study addressed the influence of oral appliances in pediatric patients with anxiety, revealing significant results in various sociodemographic dimensions. In line with previous research [44,45], the findings showed significant differences in gender, age, and residential environment. Specifically, a higher prevalence of male participants and a demographic concentration in urban areas were found. These results coincide with the literature that suggests disparities in the prevalence of anxiety disorders depending on gender and socio-environmental context [46,47]. Furthermore, the variability in the age of the participants reflects the diversity in the stage of cognitive and emotional development, which can influence the perception and management of anxiety regarding orthodontic treatment [48].

Regarding the results related to anxiety and self-esteem, the data support the effectiveness of orthodontic treatment in modulating these psychological variables. Specifically, a significant reduction in anxiety levels was observed after six months of using the appliance, aligning with research that highlights the positive impact of orthodontic intervention on patients' mental health [49,50]. This phenomenon could be attributed to improved self-image and self-confidence derived from correcting malocclusion, as suggested by previous studies on the relationship between dental aesthetics and psychosocial well-being [51,52]. However, it is essential to highlight the need to further evaluate the mechanisms underlying these psychological changes and consider possible mediating or moderating variables that may influence long-term results.

The study by Supriya et al. [53] offers an important perspective on the relevance of anxiety and fear in dentistry as motivational conflicts in oral health behaviors. Their findings highlight the complex interaction between emotional and behavioral aspects of oral health. This research contributes significantly to understanding how negative emotions, such as anxiety and fear, are associated with visiting the dentist and can influence people's attitudes and behaviors toward oral care. Furthermore, it highlights the importance of addressing these emotional concerns in dental practice to promote better adherence to oral hygiene habits and increase patient satisfaction. These findings highlight the need for preventive and therapeutic strategies that address both emotional and behavioral aspects to improve oral health and patients' overall well-being.

Projective tests such as HTP can assess the self-esteem of individuals through the examination of the size of the drawings, where small drawings have been positively associated with social competence in male elementary school students, while different results were observed in girls [34-36]. Similarly, it has been shown that low-quality human figures are linked to issues of unstable identity [34]. In cases where drawings exhibit low quality, a triangulation of drawing evaluation data is proposed, along with interview data and behavior observations [35]. The utilization and interpretation of projective tests involve integrating clinical history data

and allowing for the detection of distress in children. However, more knowledge is needed regarding applying and evaluating tests like the projective test within the scope of pediatric dentistry or orthopedics [34,36].

Pediatric patients often experience fear when subjected to dental procedures, especially when the procedures are more invasive, such as the administration of anesthesia with a syringe and tooth extractions. It is worth noting that the level of distress experienced by the children was higher prior to dental treatment, and these figures decreased after six months of dental treatment. The results concerning the drawn elements by the children after six months of orthopedic maxillofacial treatment indicate an increase in self-esteem and a decrease in anxiety. Evaluating a child's behavior through longitudinal studies proves to be an effective strategy for monitoring oral anxiety. Dentists should be familiar with children's behavior to provide appropriate treatment and achieve successful orthodontic outcomes [33].

Anxiety is among the most common of these negative responses, as high levels of anxiety can be detrimental to both physiological and psychological well-being in children [25]. In this study, it is observed elevated levels of anxiety in children at the initiation of orthodontic treatments. It is worth mentioning that after 6 months of treatment, the levels of anxiety decreased in the children who participated in the research. Children with anxiety disorders are more likely to develop mental health issues later in life [26]. There are no previous studies on dental anxiety in Ecuadorian children, making studies like the present work significant in providing new relevant data on children from the Ecuadorian coastal region.

The present investigation found a decrease in the emotion of fear 6 months after treating the child in the orthodontist's clinic. In a study conducted in Japan, 8% of children aged 5 to 12 were classified as fearful based on their behavior in a dental clinic [1]. Dental fear generally refers to a normal unpleasant emotional reaction to specific threatening stimuli that occur in situations associated with dental treatment. Research in children is the gold standard and a critical benchmark for understanding the neurobehavioral expression of anxiety [1]. The discontinuation of orthodontic treatment due to factors such as dental anxiety is one of the major challenges faced by children [32]. It is important for children and adolescents to receive painless dental treatment to reduce their anxiety and fear and increase their probability of accepting and completing future treatments [33]. In our study, the number of children wanting to discontinue orthodontic treatment decreased after 6 months.

Interestingly, sweating and tremors were observed in the waiting room among children before and after 6 months of treatment. This supports the idea that one of the environmental factors that can contribute to feelings of anxiety before dental treatment involves the waiting room experience, specifically the amount of time spent awaiting treatment and the ambiance of the waiting area [25,32]. Anxiety can be triggered by sensory stimuli such as the sight of instruments and sounds of air turbine drills and screams, as well as the appearance of dentists and the clinical environment, which can increase a child's anxiety [1,25]. Another critical variable in child dental anxiety is the lack of knowledge about dental treatment, which stems from the parents' ethnic, racial, socioeconomic, cultural, religious, and educational backgrounds [1,25,26].

Self-esteem can be defined as a child's positive or negative attitude toward themselves as a whole. Studies have found that higher self-esteem in children is associated with better dental health practices [5], whereas in the present study, an improvement in self-esteem of the children was observed after 6 months of orthodontic treatment. It is important to consider the influence of the social environment and self-perception as important factors that play a vital role in a child's self-esteem concerning their malocclusion conditions [18,19]. Of particular concern in primary school children is achieving good oral health due to their dynamic growth periods

where dissatisfaction with body image is a complex indicator. For this reason, body image dissatisfaction is associated with poor self-perception of oral health status [18-20].

Conclusion

The research comprehensively addressed the influence of oral appliances in pediatric patients, highlighting their impact on anxiety and self-esteem. The findings revealed significant differences in levels of anxiety and self-esteem before and after orthodontic treatment, underscoring the need for comprehensive dental care that recognizes and addresses patients' emotional concerns, as well as its implications for adherence to dental care and an improvement in the psychological well-being of patients over time. In addition, sociodemographic variables that may influence these results were identified, such as gender, age, and residential environment. These results underline the importance of considering clinical and psychosocial aspects in designing effective orthodontic interventions. By understanding and properly managing these emotions, oral health professionals can significantly improve the patient experience, promote healthier oral hygiene habits, and contribute to the general well-being of the population. Future research is needed to better understand the mechanisms underlying these changes and develop personalized strategies that address patients' emotional needs, thereby contributing to more holistic and satisfying care in dental practice.

Authors' Contributions

GNBM	https://orcid.org/0000-0003-4240-0662	Investigation, Data Curation, and Writing - Original Draft.
TBSZ	https://orcid.org/0000-0002-8585-4763	Methodology, Formal Analysis, Investigation, Writing - Review and Editing and Supervision.
ALW	https://orcid.org/0009-0008-9493-9874	Conceptualization, Methodology, Investigation, and Data Curation.

All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

Financial Support

None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

Acknowledgements

The authors would like to thank the psychologist, Lady Laura Mero Reyes, for her contribution in evaluating the drawings. Thanks also to the authorities of the San Gregorio University of Portoviejo and the Instituto Italiano del Rosario of Argentina, to the orthodontic clinics: CeChing, Espinozadentalgroup, Ortosegcuba, Dentalplu, OralDent and Centro dental Las Acacias.

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