

ResearchPaper: The Relationship between Child Temperament and Early Childhood Caries in 3 to 6 Year-old Children



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ABSTRACT



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Introduction: The etiology of Early Childhood Caries (ECC) is very complex and includes biological, behavioral, social and demographic factors. Regarding the importance of evaluating the factors affecting ECC, the present research was aimed to evaluate the relationship between temperament and ECC.

Materials and Methods: This descriptive-analytical study was performed on 150 children referred to kindergartens in Rasht. The Child Behavior Questionnaire (CBQ) was used to evaluate the temperament of children and clinical examinations were used to evaluate ECC. The collected data were analyzed by SPSS software version 24 and at a significance level of 5%.

Results: The descriptive findings showed that the temperament score in girls was higher than in boys. Also, temperament score, activity level, smile, perceptual sensitivity, and pleasure intensity had a negative and significant relationship with decay-missing-filled teeth (DMFT) and decay-missing-filled surface (DMFS) indices. Only the inhibitory control subscale had a positive and significant relationship with these two criteria. The subscales of discomfort, positive anticipation, and reactivity had a significant and negative relationship with DMFT. There was a positive and statistically significant relationship between the number of brushing times a day with inhibitory control, sadness, focusing, smile, perceptual sensitivity, pleasure intensity, reactivity, and temperament.

Conclusion: According to the results, temperament must be considered as an effective factor in ECC. Temperament and subscales of activity level, discomfort, inhibitory control, smile, positive anticipation, reactivity, perceptual sensitivity, and pleasure intensity were identified as the factors affecting ECC.

Keywords:

Dental caries
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1. Introduction

Early childhood caries (ECC) is a common disease in children. Although the disease is not life-threatening, it can lead to poor health and lack of growth (1,2). ECC is on the rise in many countries and has become a major health problem, especially in deprived areas (3,4). ECC is a term used to describe the presence of decayed, missed, or restored teeth in primary teeth of children under the age of six (5). Untreated decayed teeth cause sleep problems and eating disorders, as well as affecting the development of children (6).

The World Dental Federation (FDI) considers the ECC among the reasons for absentee from school in several countries (6). According to the WHO, 60 to 90% of students in the world suffer from tooth decay. The highest rate of tooth decay has been reported in students in Asian and Latin American countries (5). Parkash et al., Namal et al., Dawkins et al., Matonaki et al. reported that this rate is 27.5% (6), 76.8% (7), 49.7% (8), and 16.5% (9), respectively. This condition can progress rapidly, cause pain and infection, affect the quality of life associated with a child's oral health (7), and even be life-threatening (8). Despite the reduction in dental caries in adults, an increase in the incidence of caries among preschool children has occurred in many countries (9).

ECC is associated with some health problems, including local pain, abscesses, malnutrition, infections, chewing difficulty, gastrointestinal disorders, and sleeping difficulty. Based on the results of several studies, factors related to tooth decay in children include malnutrition, genetic predisposition, poor health function, special eating habits, age, gender, environmental factors such as fluoride and vitamin D deficiency, *Streptococcus mutans*, excessive carbohydrate intake in food, the visible dental plaque with poor oral health, oral hypoplasia, parental education, oral flora, economic and social status, children's residence, and ethnic and racial status (10,11).

Extreme prevalence, high costs, and negative results related to ECC have led some researchers to search beyond biological factors and behavioral aspects to understand better the ECC development and prevention (12,13). One of the risk factors that may have behavioral manifestations is the child's temperament, which includes individual differences in emotional processes and behavioral patterns, both appearing early in life and having a biological basis. Children are born with their natural style of interacting with people, places, and objects (14). According to Allpor, "temperament is a specific manifestation of a person's nature, including

sensitivity to emotional stimulation, normal strength, speed of response, and the quality of his dominant mood". Although temperament is considered a genetic determinant that remains stable throughout life, interestingly, it can also be changed by environmental influences (15–17). The relationship between ECC and factors such as oral health, diet, socioeconomic status, and parental stress has been closely examined. However, the role of psychosocial variables such as the temperament of the child, as one of the risk factors for caries, is still unknown. Therefore, the present study was conducted to assess the effect of a child's temperament on ECC in children.

2. Materials and Methods

This is a descriptive-analytical cross-sectional study. The study population included 3 to 6-year-old children in Rasht who were enrolled in kindergartens. The sample consisted of 150 children aged 3 to 6 years who were randomly selected from each of the kindergartens in Rasht. Five kindergartens in Rasht were selected using random sampling method. Inclusion criteria were being children of 3 to 6 years of age regardless of gender and ethnic cultural characteristics, complete physical and mental health, children born and living in the study area, informed consent of one of the parents, and the minimum diploma education level of the parents. Exclusion criteria were the presence of any medical history in the child or the presence of serious mental and physical illness in the parents. In this study, a child behavior questionnaire and clinical examination were used to collect information.

In this research, Child Behavior Questionnaire (CBQ) is an instrument containing 94 items. In kindergarten, the questionnaire was given to children who met the inclusion criteria and it was completed by their parents. This questionnaire was designed by Rhotbart et al. (2001) to evaluate the temperament of children aged 3 to 7 years (15). At the beginning of the informed consent, the purpose of this research was explained to the parents. At the beginning of the questionnaire, demographic information including age and sex and the number of brushing times per day were asked. In Iran, this questionnaire had been translated by a psychiatrist and its validity and reliability had been assessed in several studies (18). The short version of the Child Behavior Questionnaire consists of 94 questions. Parents or guardians assign a score of 1 to 7 or "not applicable" to each questionnaire (the questionnaire is attached). The average score of temperament for each child is obtained by summing the scores assigned to the questions divided by the number of questions (18).

The clinical examination of children was performed by a senior dental student calibrated by a pediatric dentist to

diagnose caries. The examination was performed by flashlight, disposable mirror, and sterile dental gas to separate food debris in the kindergarten. For each child, the decay-missing-filled teeth (DMFT) and decay-missing-filled surface (DMFS) indices were measured based on the number of decayed, missed, and filled deciduous teeth, respectively.

In the present study, to describe the obtained data, we used descriptive statistical methods such as frequency, percentage, mean, and standard deviation. To select the relevant charts, the appropriate chart was selected according to the measurement scale of each variable. The normality of the groups and the homogeneity of the variance of the groups were investigated to assess the default of the parametric tests. The descriptive method was used to evaluate the normality and Kurtosis and skewness indices, and Levon's test was used to evaluate the homogeneity of variances. Chi-square test and Pearson correlation test were used to analyze the data. Moreover, Spearman's correlation was used to rank the number of brushing per day in the tests related to this variable. These calculations were performed using SPSS software version 24. The significance level was considered $p < 0.05$.

3. Results

In this study, 102 boys (68%) and 48 girls (32%) with a

mean age of 60.30 ± 10.44 months were evaluated. According to the results of the present study, 34% of the people brushed their teeth less than once a day, 60% of them brushed once a day, and 6% twice a day. Based on the obtained results, there was a statistically significant relationship between temperament score and gender ($p < 0.001$). The mean score in girls was higher compared to boys, but there was no significant relationship between DMFT and DMFS with gender. Based on the results listed in Table 1, a significant relationship was observed between the score of temperament, activity level, inhibitory control, smiling, perceptual sensitivity, and pleasure intensity with DMFT and DMFS. The results suggest the presence of a significant relationship between the score of discomfort, positive anticipation, and impulsivity with the amount of DMFT; however, no such a relationship was observed between these variables and DMFS. Based on the results, there was no significant relationship between fear, shyness, anger, sadness, focusing, and reactivity with DMFT and DMFS.

As can be seen from Table 2, there is a positive and significant relationship between the number of brushing per day with inhibitory control, sadness, focusing, smiling, perceptual sensitivity, pleasure intensity, reactivity, and temperament.

Table 1. Relationship between DMFT and DMFS and child behavior questionnaire score in 3-6-year-olds

	DMFT	DMFS
Temperament	$r = -0.345$ $p < 0.001$	$r = -0.265$ $p = 0.001$
Fear	$r = -0.153$ $p = 0.061$	$r = -0.031$ $p = 0.705$
Shyness	$r = 0.012$ $p = 0.880$	$r = -0.009$ $p = 0.916$
Activity level	$r = -0.182$ $p = 0.26$	$r = -0.205$ $p = 0.012$
Anger	$r = -0.081$ $p = 0.325$	$r = -0.002$ $p = 0.970$
Discomfort	$r = -0.193$ $p = 0.018$	$r = -0.138$ $p = 0.093$
Inhibitory control	$r = 0.183$ $p = 0.025$	$r = 0.164$ $p = 0.045$
Sadness	$r = -0.094$ $p = 0.251$	$r = -0.031$ $p = 0.709$
Focusing	$r = 0.013$ $p = 0.872$	$r = -0.048$ $p = 0.564$
Smiling	$r = -0.232$ $p = 0.004$	$r = -0.123$ $p = 0.009$
Positive anticipation	$r = -0.192$ $p = 0.018$	$r = -0.105$ $p = 0.202$
Impulsivity	$r = -0.193$ $p = 0.018$	$r = -0.119$ $p = 0.148$
Perceptual sensitivity	$r = -0.275$ $p = 0.001$	$r = -0.270$ $p = 0.001$
Pleasure intensity	$r = -0.314$ $p < 0.001$	$r = -0.288$ $p < 0.001$
Reactivity	$r = -0.013$ $p = 0.870$	$r = -0.063$ $p = 0.477$

Table 2. Relationship between temperament score in different areas in children 3-6 years old with the number of brushing times per day

	Fear	Shyness	Activity level	Anger	Discomfort
	$r = 0.103$	$r = 0.149$	$r = 0.116$	$r = 0.044$	$r = -0.083$
	$p = 0.211$	$p = 0.069$	$p = 0.158$	$p = 0.596$	$p = 0.312$
	Inhibitory control	Sadness	Focusing	Smiling	Positive anticipation
The number	$r = 0.042$	$r = 0.295$	$r = 0.304$	$r = 0.350$	$r = 0.004$
of brushing	$p = 0.610$	$p < 0.001$	$p < 0.001$	$p < 0.001$	$P = 0.963$
times per day	Impulsivity	Perceptual sensitivity	Pleasure intensity	Reactivity	Temperament
	$r = -0.022$	$r = 0.280$	$r = 0.287$	$r = 0.186$	$r = 0.411$
	$P = 0.787$	$p < 0.001$	$p < 0.001$	$p = 0.022$	$p < 0.001$

a. Spearman's Correlation

Based on non-standard regression coefficients, regarding the effect of each of the temperament subscales on the total temperament score, it can be stated that the variables of perceptual sensitivity, smiling, sadness, fear, and pleasure intensity did not have a significant effect on temperament. Also, temperament has a greater impact on DMFS than DMFT. The effect of each of the temperament subscales on the total temperament score is calculated based on standard regression coefficients. The range of changes in the standard coefficient is between 0 and 1. Therefore, the closer this value is to 1, the greater the effect of that variable on the temperament score. According to the analysis, the highest effect was related to the subscale of Impulsivity and the lowest effect was related to perceptual sensitivity. Also, the intensity of pleasure had a small effect on temperament.

4. Discussion

This study aimed to evaluate the relationship between temperament and the rate of ECC in children aged 3 to 6 years. The results of the study of the relationship between temperament and gender of children indicated that the score of temperament in girls is significantly higher than in boys. These results are consistent Peretz study. They also reported a significant difference in scores between the behavior of boys and girls (19). In contrast, Tabatabai and Brill did not report a significant relationship between these two variables (20,21) These discrepancies in the results of different studies can be attributed to the differences in demographic characteristics or sample size.

In evaluating the relationship between temperament with DMFT and DMFS, a negative and significant relationship was observed. With increasing the positive score of temperament, DMFT and DMFS decreased accordingly. Zahra Jabin et al. (2014) investigated the relationship between child temperament and ECC in 1,300 school children aged 3 to 6 years. They reported a significant relationship between these two variables (22). Aminabadi et al. (2014) investigated the relationship between a child's temperament and ECC in 373

kindergarten children in the age range of 18 and 38 months to determine the relationship between different aspects of child temperament with ECC through nutritional habits and oral health (23). Jindal et al. (2013) conducted the effect of the temperament of the child on ECC to determine the relationship between a mother's perception of the temperament of her child and the rate of dental caries (24). Both studies by Aminabadi and Jidal found a significant relationship between temperament and dental caries. In contrast Oliveira et al. (2017) found no difference regarding the temperament of children with and without caries (25).

In the study of subscales of temperament, the subscales of activity level, smiling, perceptual sensitivity, and pleasure indicated a negative and significant relationship with DMFT and DMFS. Only the subscale of inhibitory control had a positive and significant relationship with these two criteria. The subscales of discomfort, positive anticipation, and impulsivity had a significant and negative relationship with DMFT. Jabin et al. (22) reported that among five factors of temperament, the factors of social, energy level, attentivity, and rhythmicity were significantly related to ECC. They did not report any significant relationship between the emotional factor and ECC. According to these authors, children with ECC were less social, less energetic, and less focused compared to the children without ECC. In the present study, low-energy children with lower activity levels showed more caries, which is consistent with the study of Jabin et al. (22) and Aminabadi et al. (23) reported that among the 18 aspects of temperament considered, changes in attention, fear, frustration, low happiness, sadness, and shyness were significantly higher in children with ECC (23). Perceptual sensitivity, positivity, and impulsivity were significantly higher in the group without caries. In the present study, the characteristics of impulsivity and perceptual sensitivity in children were associated with increased brushing per day and reduced caries in children. Children with high perceptual sensitivity quickly notice the slightest changes in their

surroundings and body and are more inclined to brush their teeth. The results of our study were different from those of Aminabadi (2014) (23) in some subgroups of temperament. It is of note that the type of tests used in the study of Aminabadi et al. and the age of the children was different from our study. In the present study, we evaluated the relationship between the temperament subscales and the rate of caries in each child. The results produced by our method are statistically more accurate. Jindal et al. (24) reported that children with easy temperament were more inclined to breastfeed before bedtime (72%). Besides, children with difficult temperaments often fell asleep with a bottle (77%) and had more caries problems (79%). The temperament of boys was more difficult than girls (59%). Children with easy temperament brushed their teeth twice a day (14.5%). Finally, they concluded that the temperament of children might be a significant risk factor for ECC. Overall, although the results obtained in the Jindal study were not exactly the same as ours, they had a general consistency with our study. Riko Quinns (2000) investigated the relationship between child temperament and ECC in 58 children with the physical status of ASA 1 and 18 to 70 months of age who referred to a dental clinic in Manitoba, Canada (17). They measured ECC based on two criteria: the number of decayed teeth and the number of decayed tooth surfaces without radiographs. Another person who was unaware of children's ECCs interviewed their parents about breastfeeding rates, both in bottles and directly from the breast. Parents answered the ESA Temperament Survey questionnaire to determine the child's temperament in terms of four factors: emotional, activity, social, and shyness. The results indicated that the child's temperament did not affect how long the baby was fed; however, with increasing duration of breastfeeding and shyness, the levels of both factors of ECC increased. Although the type of questionnaire in this study was different from our study, the results were consistent with our study.

In the last part of the study, the relationship between the number of brushing per day with temperament and temperament subscales was investigated. The results revealed a statistically significant and positive relationship between the number of brushing per day with

inhibitory control, sadness, focusing, smiling, perceptual sensitivity, pleasure intensity, impulsivity, and temperament. Children with higher inhibitory control are children who follow better instructions and have more patience. According to the results of the present study, these children brushed more times a day, but caries rates were not necessarily lower. This can be attributed to the tolerance level of these children with dental caries problems. Jindal et al. (24) examined this goal differently but with the purpose of this study and reported a significant relationship.

5. Conclusion

According to the obtained results, temperament is considered an effective factor in ECC. The temperament and subscales of activity level, discomfort, inhibitory control, smiling, excitement, impulsivity, perceptual sensitivity, and pleasure intensity were identified as factors affecting ECC.

Ethical Considerations

Compliance with ethical guidelines

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Authors' contributions

Atousa Janeshin: Conceptualization, Methodology, Writing - Review & Editing Mostafa Haghighi: Writing - Original Draft, Data Curation, Supervision Armaghan Hojjati Sabet: Resources, Investigation, Visualization

Conflict of Interests

The authors declare no conflicts of interest.

Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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