



THE RELATIONSHIP BETWEEN PARENTAL DEPRESSION AND ANXIETY AND CHILDREN'S EARLY CHILDHOOD CARIES

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Abstract

Objective: Early Childhood Caries (ECC) is one of the major health problems. Understanding how parental psychological status affects children's oral health is important. Therefore, the aim of this study was to investigate the relationship between parental depression, anxiety and stress with ECC.

Methods: In this cross-sectional study, children referring to the Shahrekord public and private dental centers in 2020 were included. Depression and anxiety of children's parents were determined by Beck questionnaire and their stress was determined by parenting stress questionnaire. Background information including gender, children's eating habits, number of children in the family and the reason for the children's first visit to the dentist were also obtained by the checklist. Pediatric DMFT and ECC index were determined through clinical examination and children were divided into two groups with and without ECC (88 and 44 patients, respectively). The analysis was performed by SPSS21 software.

Results: There was no significant difference between the two groups in terms of gender, father's level of education and parents' occupation, but there was a significant difference in terms of mother's level of education, sugar consumption and age (respectively $P=0/01$, $P=0/002$ and $P<0/001$). The mean score of parental depression in the group with ECC was significantly higher than the group without ECC ($P=0/003$) but stress and anxiety were not significantly different between the two groups. The mean scores of depression, stress and anxiety of parents in the two groups with and without ECC were not significantly different according to the sex of children. In additional, slight inverse linear correlations were observed between DMFT index and variables of parental depression and anxiety of children with ECC, but none of them were statistically significant.

Conclusion: The results of the present study showed the relationship between ECC and maternal's level of education, child's sugar consumption and parental depression.

Keywords: Stress, Anxiety, Depression, Early Childhood Caries (ECC), DMFT, COVID-19

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Introduction

Dental caries is the most common chronic disease in children and is 5 and 14 times more than asthma and chronic bronchitis, respectively.¹ The American Academy of Pediatric Dentistry has defined early childhood caries (ECC) as one or more decayed, missing, or filled surfaces in each primary tooth in a 71-month-old child or younger. In addition, every sign of caries on smooth surfaces in children under 3 years of age indicates severe ECC (S-ECC).²

Studies have shown that children with ECC grow slowly compared to caries-free children.³ Carious primary teeth can cause pain and abscess and disrupt children's nutrition.¹ Dental caries in children and infants increases with improper nutritional patterns with breast milk or powdered milk, especially during sleeping and nutrition by bottles containing sweetened liquids, especially before sleeping or during sleep.⁴

Depression is a common mental disorder that is debilitating and dangerous and affects a person's life and behavior.⁵ Depression not only disrupts a person's performance in different fields such as education, job, and interpersonal relationships but also increases crime and drug abuse rates and suicide risk. In addition, suicide risk in depression is higher than in other anxiety disorders.⁶

Anxiety is one of the most common mental disorders that disrupt daily routines and decrease quality of life. In addition, it is one of the features of modern life. It is assumed that anxiety is a natural reaction to stress and helps a person to face difficult conditions; however, when the severity and duration of anxiety signs continue, it may become pathological and should be treated.⁷

Previous studies show a correlation between a mother's anxiety and depression and children's oral health.^{8,9} There is even a correlation between high levels of depression in mothers with the consumption of sweets in their children because it seems that depressed mothers have a problem controlling suitable diets and good dietary habits of their children.¹⁰ In fact, they often nurture them with sweet products.¹¹ In addition, it has been shown that a mother's anxiety and stress can lead to a child's phobia about dentistry, and as a result, it causes them to avoid dental services.¹²

Concerning the high prevalence of ECC in children and its adverse effects on esthetic appearance, child's self-confidence, and costs on the society, knowledge of factors affecting it is very useful and practical for preventing and decreasing complications resulting from it.¹³ One of the effective factors on child's caries is parents' mental disorders, including depression and anxiety, because parents' mental health causes better care and attention to children in all aspects, such as observing oral health (especially in children under 5, whose teeth are brushed by parents). Therefore, early diagnosis and treatment of these mental disorders will be very important, especially when the person is unaware of them. Determination of the correlation between parents' anxiety and depression with ECC can increase parents' awareness about preventing and controlling ECC by treating their mental disorders and increasing care and attention to their children's oral health.¹⁴

Methods

This cross-sectional study was carried out on 132 children referring to public and private dental centers in Shahrekord (located in the west of Iran) in 2020. The children were <71 months old and placed in the first and second groups of ASA classification. In addition, one child from each family was included in the study. Parents signed an informed consent form and filled out Beck's anxiety and depression questionnaires and a checklist related to educational level, demographic indices, and the cause of first referral to dentistry. Two examiners, one senior dental student and one pediatric dentist, performed oral examinations of the children. The dental condition of each child was recorded according to the Palmer-Zigmond notation method, and the dmft index was calculated.

Beck depression questionnaire second edition (BDI-II) is a 21-question questionnaire to assess the existence and severity of depression in individuals >13 years of age.¹⁵ In this questionnaire, each item (disease symptoms) is divided into four groups based on severity and ranked from zero to 3. Zero indicates the lowest level, and 3 indicates the highest level of severity of depression symptoms. The questionnaire's score range is 0–63.¹⁶

In this test, 0–13 range indicates minimum depression, 14–19 shows minor depression, 20–28 indicates moderate depression, and 29–63 shows severe depression.¹⁷ The second version of the questionnaire, an updated and revised model

of the original version of Beck's depression questionnaire, has cognitive, motivational, emotional, and physiological dimensions and other factors, too.¹⁸⁻²⁰ In Rajabi and Kasmayi's study, Cronbach's alpha factor coefficient was used to assess the reliability coefficient of Beck's depression questionnaire (second edition). The coefficient was estimated at 0.86 in the total sample, with 0.84 and 0.78 in the first and second factors. They were satisfactory in the total sample and the first factor (emotional cognitive) and the second factor (physical symptoms and negative attitudes). The coefficient correlation of the second and first factors was 0.75, too. These coefficients were at a significant level ($P < 0.001$). Validity coefficients were high between the total score of depression and emotional-cognitive factors (90%) and negative attitude and physical symptoms (95%) and between the two above factors (0.75), indicating the construct validity of Beck's depression questionnaire (Iranian second edition).²¹

Beck's anxiety questionnaire has been designed for measuring anxiety levels and includes 21 questions. Beck et al introduced the BAI index (Beck's anxiety questionnaire) in 1990.²² In this test, 0–7 indicates no or minimum anxiety, 8–15 shows mild anxiety, 16–25 indicates moderate anxiety, and 26–63 shows severe anxiety.²³ In a study by Kaviani and Musavi, results from computing the interclass correlation between two variables of scores resulting from the BAI questionnaire and clinician's assessment of the level of people's anxiety in an anxious population showed that this test had proper validity ($r = 0.72$, $P < 0.001$). The computation of interclass correlation between scores of tests and retest in the anxious population shows that the reliability of the BAI questionnaire in Iranians ($r = 0.83$, $P < 0.001$). Cronbach's alpha factor has been used to determine the consistency or internal correlation of BAI items which showed high internal consistency ($\alpha = 0.92$).²⁴

Descriptive statistics were reported as mean \pm SD. Comparisons between two groups were performed using an independent t-test and chi-squared test for quantitative and qualitative variables, respectively. Moreover, Spearman's or Pearson's correlation tests were used for the correlation assessment between quantitative variables with SPSS 21.0 at $P < 0.05$.

Results

A total of 138 children and their parents participated in this study. Six children were eliminated because they did not fill out the questionnaires or did not cooperate for proper examinations. Therefore, 132 children entered the statistical analysis in 2 groups (without ECC [$n = 44$] and with ECC [$n = 88$]).

The contextual information of the groups under study is shown in Tables 1 to 4. Mothers of caries-free children had higher educational levels than mothers of children with ECC, and this difference was significant ($P = 0.01$); however, there was no significant difference between these two groups in terms of gender, father's educational level, and parents' occupations (Table 1).

The mean age of children with ECC was 4.42 ± 1.09 years, which was significantly higher than caries-free children (3.07 ± 1.66) ($P < 0.001$).

The anxiety level of parents of children with ECC was higher than that of children without ECC (7.51 versus 5.48), but this difference was not significant. On the other hand, the mean depression score of parents of children with ECC was 11.32, which was significantly higher than the depression mean score of parents of children without ECC. ($P = 0.003$, 7.20). Further information has been provided in Table 2.

A comparison of children's age and parents' depression and anxiety in children without ECC is presented in Table 3 based on gender.

According to the results, there was no significant difference in the mean age of children without ECC and parents' depression and anxiety between girls and boys. A comparison of children's age and parents' depression and anxiety in children with ECC is presented in Table 4 based on gender.

According to the results, there was no significant difference in the mean age of children with ECC and parents' depression and anxiety between girls and boys. The results of Pearson's correlation test indicated a very strong and significant correlation between parents' anxiety and depression of children with ECC. However, there was a slight and inverse linear correlation between the dmft index and parents' depression and anxiety variable of children with ECC, which was not significant (Table 5).

Discussion

The results of this study showed that parents' anxiety levels of children with ECC were higher than parents of children without ECC, but this difference was not significant. In one case-control study by Seow et al. on 617 children in Austria

using the depression, anxiety, and stress scale questionnaire (DAS questionnaire), the mothers of children with ECC had more anxiety levels than the mothers of children without caries.⁸ Costa et al studied 537 mothers and children in Brazil using the early childhood oral health impact scale (ECOHIS), reporting that mothers with both depression and anxiety symptoms had a more negative impact on oral health-related quality of life than mothers without any symptoms.²⁵ Nevertheless, a cross-sectional study by Hatipoglu and Aksitbicak on 258 children and their mothers in Turkey using the Turkish version of the Spielberger trait anxiety questionnaire showed no significant correlation between mothers' anxiety levels and their children's DMFT.²⁶ In addition, Gichu et al. studied 330 children 3–5 years of age in Nairobi and reported no correlation between parents' or caregivers' anxiety and children's behavior during treatment or dental caries development in them.²⁷ Accordingly, Aksit and Hatipoglu reported that a particular level of anxiety might cause the mothers to take better oral care of their children, but high anxiety levels might reduce function. Furthermore, since dental caries is a multifactorial disease, many factors such as cariogenic bacteria, diet, socioeconomic factors, and behavioral traits might cause it.²⁶ On the other hand, studies have shown that a mother's anxiety and stress can cause phobia in the child about dentistry, resulting in avoiding dental services.¹² Regarding inconsistent findings of studies regarding parents' anxiety and caries, further studies are necessary to determine the correlation between anxiety levels (mild, moderate, and severe) and ECC.

In addition, this study showed that the mean depression score of parents of children with ECC was 11.32, which was significantly higher than that of the parents of children without ECC (7.2). Souza et al (2006, Brazil) used a self-report questionnaire to assess depression and reported that dental caries in 2–3-year-old children with depressed mothers was more than in children whose mothers were not depressed,⁷ consistent with the present study. A case-control study by Sow et al. using the DAS questionnaire in Australia showed that mothers of children with ECC had higher levels of depression than mothers of children without ECC.⁷ Furthermore, Al-Jewair used the center for epidemiological studies depression scale questionnaire (Toronto, Canada) and reported that children with depressed parents and

caregivers had higher ECC rates.²⁸ In a cohort study by Dos Santos Pinto et al in Brazil on 538 subjects, a mini-international neuropsychiatric interview (MINI PLUS) was used to evaluate mothers' major depression. They reported a correlation between mothers' major depressive disorder and a high prevalence of caries in children.²⁹ In one study conducted by Costa et al in Brazil using the early childhood oral health impact scale (ECOHIS) on 537 mothers and children, it was observed that depressed mothers had a more negative influence on the oral health-related quality of life than mothers without depression. In addition, this negative effect was almost 2.5 times higher in depressed and anxious mothers than in mothers without depression and anxiety.²⁵ A cross-sectional study by Gavic et al in Croatia (2018) on 235 children using the DASS questionnaire showed a significant correlation between DMFT in children and the depression level of the parents.³⁰

In addition, studies have shown that a high level of depression in mothers is related to the higher consumption of sweets in their children because it seems that depressed mothers have a problem adopting a suitable diet and good eating habits for their children. In fact, they often feed their children with sweetened products.⁹ The study above is consistent with this study and shows the role of parents' depression in compromising children's oral health care behaviors.

The present study showed that groups of children with and without ECC did not have a significant difference in terms of the educational levels of fathers and parents' jobs but exhibited significant differences in terms of mothers' education, and the mothers of children with ECC had lower education, indicating the effect of mothers' culture and awareness on children's dental health. Similar to the results of this study, a study by Kinirons and Mccahe in Ireland showed a significant correlation between mothers' educational levels and children's dental caries; however, there was no significant correlation with fathers' education. Mothers usually take children to a dental office. As a result, children's dental caries decreases significantly by increasing mothers' education.³¹ In a study by Jain et al in India, there was a correlation between children's dental caries and mothers' education; however, there was no relationship with fathers' education, consistent with the present study.³² A study by Gavic et al. in Croatia showed a correlation between children's ECC prevalence and parents' education, with no relationship with their job.³⁰ In

that study, the correlation between dental caries and parents' education was considered, but 80% of parents participating in their study were mothers. Their findings were similar to this study, indicating a correlation between mothers' education and ECC. Hatipoglu and Aksit-Bicak studied (Turkey, 2019) 258 children and their mothers and showed a correlation between increased dental caries rate in children and mothers' low educational levels,²⁶ consistent with the present study. In a cross-sectional study by Correa-Faria et al on 593 preschool children in Brazil, there was a significant correlation between parents' educational levels and ECC in their children.³³ Cianetti et al. showed a correlation between increased dental caries rate in children and parents' low educational level.³⁴ The differences in the results of these two studies and the present study in terms of the correlation of fathers' educational levels can be attributed to population and cultural differences and a higher rate of fathers' participation in their children's health in some regions. Since 70% of mothers were housewives in this study, it seems that taking care of children or their health has been mothers' responsibility; therefore, there has been a significant correlation between their education and their children's dental caries. In a meta-analysis of 18 studies, there was a correlation between mothers' education in 10 studies and fathers' education in 7 studies and children's ECC.³⁵

This study showed no significant correlation between children's ECC and the number of children in the family. Nevertheless, the frequency of being an only child in the caries-free group was higher than in the group with caries. Correa-Faria et al., reported a significant correlation between the number of children in the family and their ECC and increased ECC rate with an increase in the number of children to more than two.³³ Gavic et al. showed a correlation between children's DMFT and the number of children in the family.³⁰ Salem et al. showed a significant, direct correlation between the number of children and the DMFT index; in addition, DMFT increased with an increase in the number of children to >3.³⁶

In addition, in this study, there was a significant difference between children with and without ECC based on age, and children with ECC were older. Pahlavani et al showed no significant difference between the age of ECC occurrence and children's age.¹ However, in Nabipour et

al's study on kindergarten children in Varamin, Iran, there was a significant correlation between the prevalence of ECC and children's age; ECC increased with age.³⁷ In a study by Ghandehari et al., the mean dmft of 3–5-year-old children was 2.45 in Tehran, and it was shown that the mean caries rate increased with age.³⁸ Asdagh et al studied children in Ardebil and reported a significant correlation between age and ECC.³⁹ The significant correlation between age and ECC is due to the nature of dental caries that increases with age.

Furthermore, aging and growth cause the child's teeth to be exposed to sweets for a longer time. It must be mentioned that children >2 years of age want to be independent, and they do not allow their parents to brush their teeth, resulting in tension between children and parents. They neglect to supervise the quality and method of their children's brushing to avoid this tension, believing that brushing by the child is enough.

In addition, this study showed no significant difference between the groups with and without caries regarding gender distribution. However, 54.5% of children with caries were boys, indicating a higher prevalence of dental caries in boys. Pahlevani et al showed no statistically significant correlation between children's dental caries and their gender, consistent with this study¹. Zerfowski et al (Germany) reported a significant correlation between children's dental caries and their gender, consistent with the present study.⁴⁰ However, studies by Saravanan et al.⁴¹, Menghini et al.⁴², and Peltzer and Mong Kolchat⁴³ showed that the risk of caries progression in boys was significantly higher than in girls. Salem et al. showed that dental caries was more common in girls.³⁴

More studies are required concerning the consistency of study results related to the correlation between gender and ECC. Generally, the results of this study indicated a significant correlation between parents' depression and children's ECC. In addition, despite greater anxiety in parents of children with ECC, a significant correlation was not observed related to this issue, probably due to the positive role of some anxiety levels in improving oral healthcare behaviors. Therefore, further studies are suggested to evaluate the correlation between different levels of parents' anxiety and children's ECC. It was also observed that mothers' education and children's age were related to children's dental caries. Therefore, educational sessions should be held to change parents'

attitudes to promote oral health.⁴⁴ We hope that behaviors to improve oral health will increase, and harmful behaviors, including high sweet consumption, will decrease due to increasing mothers' awareness. Some limitations of this study include the collaboration of parents and children, obtaining consent for participation in the study, the cross-sectional nature of the study, the COVID-19 pandemic, and the small sample size. Therefore, more longitudinal studies with larger sample sizes are suggested.

Conclusions

The results of this study showed that children with early childhood caries had more depressed parents, and caries-free children had mothers with higher education and younger age.

Declarations

Data availability statement: All data generated or analyzed during this study are included in this published article (and its supplementary information file).

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Conflict of interest disclosure: The authors declare that they have no conflict of interest.

Ethics approval statement: This study protocol was approved by Ethic Committee of University of Shahrekord (IR.SKUMS.REC.1400.007)

Patient consent statement: Informed consent was obtained from all individual participants included in the study.

Permission to reproduce material from other sources: Not applicable.

Clinical trial registration: Not applicable.

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TABLE 1-4 Background information of the groups under study

P value	Children with ECC		Children without ECC		subgroups	variable
	percent	Number	percent	Number		
0.33	54.5	48	45.5	20	Boy	gender
	45.5	40	54.5	24	Girl	
0.74	11.4	10	6.8	3	Illiterate	Fathers' education level
	34.1	30	29.5	13	Diploma	
	39.8	35	47.7	21	Bachelor's degree	
	14.8	13	15.9	7	Master degree and higher	
0.01	9.1	8	9.1	4	Illiterate	Mother's education level
	37.5	33	11.4	5	Diploma	
	45.5	40	61.4	27	Bachelor's degree	

	8	7	18.2	8	Master degree and higher	
0.38	12.5	11	18.2	8	Part-time	Father's job
	87.5	77	81.8	36	Full-time	
0.86	17	15	15.9	7	Part-time	Mother's job
	12.5	11	15.9	7	Full-time	
	70.5	62	68.2	30	housewife	
<0.001	19.3	17	100	44	examination	Reason of first visit
	43.2	38	0	0	caries	
	33	29	0	0	pain	
	4.5	4	0	0	abscess	
0.002	17	15	45.5	20	mild	Consumption of suger
	44.3	39	34.1	19	moderate	
	38.6	34	20.5	9	sever	
0.36	25	22	36.4	16	one	Number of children
	54.5	48	43.2	19	two	
	20.5	18	20.5	9	Three or more	

Table 2-4 comparisons of children's age and parental depression and anxiety in studied groups

P value	Children with ECC		Children without ECC		variable
	Standard deviation	mean	Standard deviation	mean	
<0.001	1.09	4.42	1.66	3.07	age
0.003	9.48	11.32	5.93	7.20	Parental depression
0.11	9.41	7.51	4.90	5.48	parental anxiety
<0.001	4.07	9.41	0.0	0.0	index DMFT

Table 3-4 comparisons of children's age and parental depression and anxiety in Children without ECC by gender

P value	Boys without ECC		Girls without ECC		variable
	Standard deviation	mean	Standard deviation	mean	
0.77	1.69	3.15	1.69	3.00	age
0.57	7.48	7.80	4.35	6.71	Parental depression
0.07	6.15	7.05	3.12	4.17	Parental anxiety

Table 4-4- comparison of children age and parent's anxiety and depression with ECC according gender

p-value	Boys with ECC		Girls with ECC		variable
	Standard deviation	mean	Standard deviation	mean	
0.23	1.15	4.29	1.01	4.58	age
0.50	10.04	10.69	8.83	12.08	Parent's depression
0.36	10.99	8.35	7.09	6.50	Parent's anxiety

Table 5-4- correlation between DMFT index and depression and anxiety variables of parents of children with caries

index DMFT	Anxiety of parent	Depression of parent	variable
		1	Depression of parent
	1	0.55	Anxiety of parent
1	-0.17	-0.12	index DMFT