

# Correlation between dental caries and hormonal, biochemical parameters in children with early childhood caries

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## Abstract

**Aim:** The aim of this study was to analyze the correlation between dental caries and hormonal, biochemical parameters in pediatric patients with early childhood caries (ECC).

**Methodology:** This study was conducted on fifty pediatric patients who presented with complaints of pain and caries and underwent dental treatment under general anaesthesia. In this study, the hormonal, biochemical parameters (glucose, urea, uric acid, creatinine, AST, ALT, GGT, CRP, Sodium, Potassium, Calcium, Glucose, Iron, TSH, FT3 and FT4) which were routinely taken from patients before general anaesthesia and the number of decayed, extracted and filled teeth (dmft) obtained as a result of clinical and radiographic examination were evaluated statistically in patients aged 2-6 years. Statistical analysis was performed using Mann Whitney U Test and Spearman correlation coefficient at a 0.05% significance level.

**Results:** According to the data obtained, the mean dmft of fifty children (male: 35; female: 15) included in the study was found to be  $8.66 \pm 3.17$ . The mean dmft was  $7.93 \pm 3.06$  in females and  $8.97 \pm 3.21$  in males. No statistical difference was found between dmft and gender in statistical analysis. ( $p > 0.05$ ). Uric acid and GGT values, which are among the hormonal and biochemical parameters, were found to be outside the normal range in 61.22% of the patients. However, statistical analysis revealed that there was no significant relationship between dmft and hormonal, biochemical parameters ( $p > 0.05$ ).

**Conclusion:** In this study, it was concluded that dental caries did not cause a significant change in hormonal and biochemical blood parameters in pediatric patients with ECC.

**Keywords:** Tooth decay, blood parameters, early childhood caries, primary tooth

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## Introduction

Early childhood caries (ECC) is the presence of one or more caries lesions (with or without cavities), loss of teeth (due to caries) or filling teeth in children under 6 years of age (1).

ECC is one of the most common chronic diseases in children. According to the 2016 Global Burden of Disease Study report, deciduous caries is the 12th most common disease affecting approximately 560 million children worldwide (2).

ECC is an etiologically multibacterial disease. Mostly the causative agents are *Streptococcus mutans* and *Lactobacillus* spp. In recent years, microbiological data have shown that fungal organisms are also associated with ECC. *Candida albicans*, in particular, has been frequently detected at higher levels in children with severe ECC (S-ECC) compared to children without ECC (2, 3). ECC has unique characteristics, both clinically and etiologically. More specifically, ECC occurs in children of families with low socioeconomic status, mothers with high levels of bacteria in the mouth, and children engaged in night-time feeding (such as milk, infant formula or fruit-containing nutrients) (4).

In ECC, dental caries usually begins on the labial side of the upper anterior incisors. The first lesion is whitish calcification along the gingival margin. These lesions become coloured over time; it spreads laterally and coronally. Most affected teeth are the upper incisors. At least the lower incisors are affected. Caries is seen in the fissure and pit areas of the molars and in the gingival area of the buccal surface (5).

Although no symptoms are present in the early stage of dental caries, discomfort or pain may occur as the lesion moves into the dentin or when it contains the dental pulp. Untreated ECC can cause difficulties in sleeping and eating. Therefore, it may affect the growth and development of children. Studies have reported that children with tooth decay have lower body weight and height than those without tooth decay. However, school absenteeism was found to be higher in children with ECC (6).

The aim of this study was to analyze the relationship between dental caries and hormonal, biochemical blood parameters in pediatric patients exposed to ECC.

## Materials and Methods

This study was conducted on 50 pediatric patients who applied to Harran University Faculty of Dentistry Department of Pediatric Dentistry with the complaint of pain and caries, who were exposed to ECC, who could not be cooperated and whose dental treatments would be performed under general anaesthesia. This study was approved by the Ethics in Research

Committee at Harran University Faculty of Medicine (Reference number: HRU-190714).

The investigation was designed as an analytical study. In this study, the hormonal, biochemical parameters (glucose, urea, uric acid, creatinine, AST, ALT, GGT, CRP, Sodium, Potassium, Calcium, Glucose, Iron, TSH, FT3 and FT4) which were routinely taken from patients before general anaesthesia and the number of decayed, extracted and filled teeth (dmft) obtained as a result of clinical and radiographic examination were evaluated statistically in patients between the ages of 2-6 years who did not have any systemic disorders. Decayed, extracted and filled teeth (dmft) of the patients were recorded, and their correlation with hormonal, biochemical blood parameters was examined. Parents were provided with consent forms and approved participation in this study.

## Statistical Analysis

Statistical analyses were performed with IBM SPSS V23 (Chicago, USA). Mean, standard deviation (SD), median, minimum-maximum, and percent values were calculated for descriptive statistics. Normality of the data distribution was tested using histograms and the Kolmogorov-Smirnov test. As the data were not normally distributed, the Mann-Whitney U-test was used for between-group comparisons. The Spearman correlation coefficient was used to examine the correlation among the hormonal, biochemical blood parameters and dmft. In all analyses,  $p < 0.05$  was taken to indicate statistical significance.

## Results

The mean age of the 50 children (male: 35; female: 15) included in the study was  $3.94 \pm 1.11$  (male:  $4.09 \pm 1.15$ ; female:  $3.60 \pm 0.99$ ). The mean of dmft was  $8.66 \pm 3.17$ , and the median of dmft was 8 (2-20). The mean dmft was  $7.93 \pm 3.06$  in females and  $8.97 \pm 3.21$  in males. No statistical relationship was found between dmft and gender in statistical analysis ( $p > 0.05$ ) (Fig. 1, Table 1).

The highest dmft mean ( $9.67 \pm 4.33$ ) was found in children aged 3 years. The mean glucose, urea, uric acid, creatinine, AST, ALT, GGT, CRP Sodium, Potassium, Calcium, Glucose, Iron, TSH, FT3 and FT4 values obtained from the tests are shown in Table 2.

Uric acid and GGT values were outside the normal range in 61.22% of the patients. S-ECC rate was higher. As a result of statistical analysis, no significant correlation was found between dmft and the hormonal, biochemical blood parameters. ( $p > 0.05$ ) (Table 3).

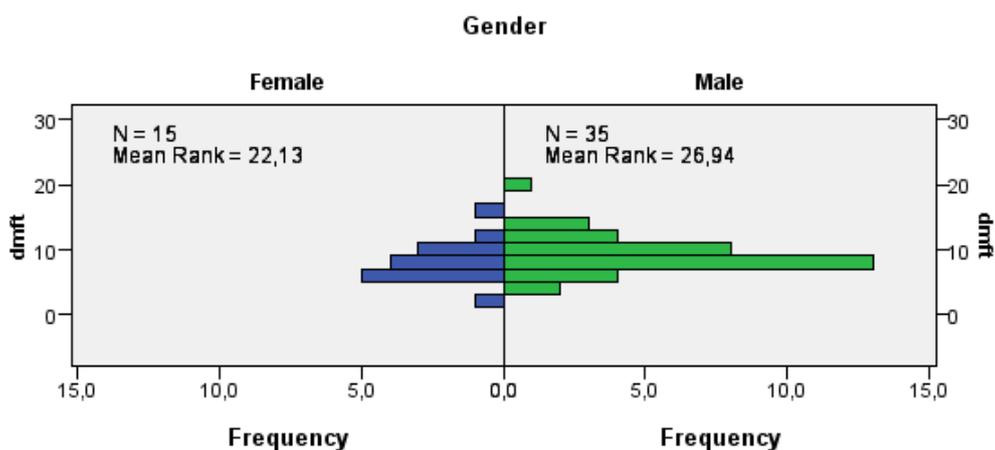


Figure 1. Distribution of the dmft values by gender

Table 1. Comparison of dmft values by gender

	N	Mean±SD	Median (min-max)	Mean Rank	Test Statistic	P value
Female	15	7.93±3.06	8 (2 - 15)	22.13	U=212	0.280
Male	35	8.97±3.21	8 (4 - 20)	26.94		
Total	50	8.66±3.17	8 (2 - 20)			

U: Mann Whitney U test statistic, SD: Standart Deviation

Table 2. The mean values of DMFT and hormonal, biochemical parameters

	N	Mean	Std. Deviation
Age	50	3.94	1.11
DMFT	50	8.66	3.17
Glucose	50	85.78	8.26
Urea	50	23.12	6.00
Creatinine	50	0.47	0.05
Uricacid	50	3.46	0.79
AST	50	33.10	7.52
ALT	50	16.22	5.73
GGT	50	12.00	4.94
CRP	50	0.35	0.36
Sodium	50	138.14	1.92
Potassium	50	4.50	0.44
Calcium	50	9.83	0.40
Iron	50	68.38	26.97
TSH	50	2.93	1.50
FT3	50	4.13	0.41
FT4	50	1.22	0.44

**Table 3.** Correlation between DMFT and hormonal, biochemical parameters

Hormonal and Biochemical Parameters			
	DMFT		
	N	Correlation Coefficient	P-value
Glucose	50	,055	,704
Urea	50	,163	,258
Creatinine	50	-,066	,650
Uricacid	50	,072	,620
AST	50	-,004	,980
ALT	50	,002	,991
GGT	50	,095	,510
Sodium	50	-,090	,536
Potassium	50	,189	,189
Calcium	50	,162	,260
Iron	50	,140	,332
TSH	50	,068	,639
FT3	50	-,180	,210
FT4	50	,050	,729
CRP	50	-,183	,202

\*. Correlation is significant at the 0.05 level

## Discussion

The results of the present study indicate that there was no statistically significant correlation between dental caries and the hormonal, biochemical blood parameters in pediatric patients with ECC.

ECC is the primary cause of toothache and loss during primary dentition. ECC, which can be stopped with early diagnosis and care, causes clinically white spot lesions and loss of dental mineralization (7). Of the patients in our study, 87.75% had S-ECC. These patients applied to our clinic with a complaint of pain.

Various studies have investigated whether there is a relationship between dental caries and vitamin D and iron in patients with ECC; however, other blood parameters have not been studied (8-10). Vitamin D deficiencies and anaemia have been reported to be more common in children with S-ECC. It was stated that a detailed diet history should be taken in S-ECC to assess the risks of deficiency. (10) In our study, vitamin D deficiency and anaemia were not detected in the patients' history. However, it was found that all of our patients had night feeding history.

In children with need of special care, vitamin D deficiency and ECC were correlated with each other (8). In another study, iron deficiency anaemia was associated with S-ECC (9). In another study, it was reported that ECC was associated with blood groups.

The risk of ECC development is high in children in the AB blood group and the lowest in the O blood group (11).

Diet plays a vital role in ECC formation in children. Especially sucrose-rich diet is critical. In a previous study, it was stated that sucrose acts as a substrate for the production of acid and exopolysaccharides by microorganisms that produce and accumulate cariogenic biofilms (12). Night feeding was performed in all patients in our study. It was found that the parents did not take any protective measures against the formation of dental caries.

In the studies, ECC has been reported to cause nutritional and sleep problems, poor quality of life as well as toothache (7, 13). Of the patients in our study, 59.18% were found to have dental caries-related infection. All of these patients had a history of toothache at night and feeding problems.

The growth of children involves both physical and mental development. In a study, it was found that kindergarten children had higher levels of ECC (dmft > 3 - 8). It was also stated that ECC is associated with specific symptoms of developing psychomotor deficiency (i.e., the concept of expression language and understanding) (7). In a study conducted by Lai et al. in preschool children, they stated that the quality of life related to oral health deteriorated in children with S-ECC (14). Approximately 87.75% of the patients in our study were preschool children and S-ECC was detected in 86.04% of these patients.

Mansoori et al. found that children with S-ECC had more pain, swelling, bad breath, sleep disturbance, malnutrition, and absenteeism related to tooth decay than ECC. They found the mean dmft value was 5.67 ( $\pm$  3.72) (15). In our study, it was found that pain and malnutrition problems were present in all patients in the anamnesis taken; swelling and sleep disturbance were found in patients with S-ECC.

Duangthip et al. stated that ECC was prevalent in preschool children and that the duration of traditional dental treatment would be long and cooperation would not be possible. Therefore, treatment of these children should be under general anaesthesia and under the supervision of a specialist dentist. However, because of ECC was common in rural areas, the lack of specialized dentists in these regions and the risk of general anaesthesia in children of this age group, atraumatic restorative treatment and topical fluoride administration would be beneficial (1).

Jiang et al. found that the treatment of children with ECC under general anaesthesia had a positive effect on the quality of life. However, they stated that the formation of caries might occur again. Therefore; they reported that follow-up and oral hygiene guidance of these patients would be crucial after treatment (16). The treatment of the patients in our study was performed under general anaesthesia and the patients were routinely checked one week after the treatment and 6 months later. It was stated by the parents that pain relief and nutritional problems of the patients disappeared after treatment. However, in the clinical and radiological examination performed 6 months after the treatment, it was found that 4.08% of the patients had recurrent caries.

## Conclusions

ECC is one of the most common chronic diseases in children. It affects the quality of life and development of children. In this study, it was concluded that there was no statistically significant relationship between dental caries and the hormonal, biochemical blood parameters in pediatric patients with ECC. Future investigations are necessary to validate the kinds of conclusions that can be drawn from this study.

**Ethical Approval:** Ethics committee approval was received for this study from Harran University (HRU-190714).

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## References

- Duangthip D., Chen KJ., Gao SS., Lo ECM., Chu CH. Managing Early Childhood Caries with Atraumatic Restorative Treatment and Topical Silver and Fluoride Agents. *Int J Environ Res Public Health* 2017;14(10):1204. ([Crossref](#))
- Duangthip D. Early childhood caries and candida albicans. *Evid Based Dent* 2018;19(4):100-1. ([Crossref](#))
- Xiao J., Moon Y., Li L., et al. Candida albicans Carriage in Children with Severe Early Childhood Caries (S-ECC) and Maternal Relatedness. *PLoS One* 2016;11(10):e0164242. ([Crossref](#))
- Angelopoulou M V., Shanti SD., Gonzalez CD., Love A., Chaffin J. Association of food insecurity with early childhood caries. *J Public Health Dent* 2019;79(2):102-8. ([Crossref](#))
- Fung MH., Wong MC., Lo EC., Chu C. Early Childhood Caries: A Literature Review. *J Oral Hyg Heal* 2013;01(01):1-7. ([Crossref](#))
- Chen KJ., Gao SS., Duangthip D., Lo ECM., Chu CH. Prevalence of early childhood caries among 5-year-old children: A systematic review. *J Investig Clin Dent* 2019;10(1):e12376. ([Crossref](#))
- Liang C-Y., Liu Y-CG., Shieh T-Y., Tseng Y-C., Teng AY-T. Higher Levels of Early Childhood Caries (ECC) Is Associated with Developing Psychomotor Deficiency: The Cross- Sectional Bi-Township Analysis for The New Hypothesis. *Int J Environ Res Public Health* 2019;16(17):3082. ([Crossref](#))
- Seminario AL., Jumani K., Velan E., Scott JM., Latimer J., Schroth RJ. Suboptimal Serum Vitamin D Associated with Early Childhood Caries in Special Health Care Needs Children. *J Dent Child (Chic)* 2018;85(3):93-101.
- Bansal K., Goyal M., Dhingra R. Association of severe early childhood caries with iron deficiency anemia. *J Indian Soc Pedod Prev Dent* 2016;34(1):36-42. ([Crossref](#))
- Deane S., Schroth RJ., Sharma A., Rodd C. Combined deficiencies of 25-hydroxyvitamin D and anemia in preschool children with severe early childhood caries: A case-control study. *Paediatr Child Health* 2018;23(3):e40-5. ([Crossref](#))
- Govindaraju L., Jeevanandan G., Subramanian EMG. ABO blood grouping: A potential risk factor for early childhood caries - A cross-sectional study. *Indian J Dent Res* 2018;29(3):313-6. ([Crossref](#))
- Hajishengallis E., Parsaei Y., Klein MI., Koo H. Advances in the microbial etiology and pathogenesis of early childhood caries. *Mol Oral Microbiol* 2017;32(1):24-34. ([Crossref](#))
- Acs G., Shulman R., Ng MW., Chussid S. The effect of dental rehabilitation on the body weight of children with early childhood caries. *Pediatr Dent* n.d.;21(2):109-13.
- Lai SHF., Wong MLW., Wong HM., McGrath CPJ., Yiu CKY. Factors influencing the oral health-related quality of life among children with severe early childhood caries in Hong Kong. *Int J Dent Hyg* 2019;idh.12414. ([Crossref](#))
- Mansoori S., Mehta A., Ansari MI. Factors associated with Oral Health Related Quality of Life of children with severe -Early Childhood Caries. *J Oral Biol Craniofacial Res* 2019;9(3):222-5. ([Crossref](#))
- Jiang H., Shen L., Qin D., He S., Wang J. Effects of dental general anaesthesia treatment on early childhood caries: a prospective cohort study in China. *BMJ Open* 2019;9(9):e028931. ([Crossref](#))