



## ASSESSMENT OF CARIES PREVALENCE AND ASSOCIATED RISK FACTORS AMONG TURKISH CHILDREN IN EDİRNE, TURKEY

### ABSTRACT

**Objectives:** Dental caries has a multifactorial etiology that has been associated with many risk factors such as improper dietary habits, poor oral hygiene, parental education and socioeconomic status of family. It is essential to identify the potential risk factors to improve the oral health of children. The aim of the present study is to evaluate dental caries prevalence and potential risk factors in a group of Turkish children residing in Edirne province.

**Materials and Methods:** Data of 704 children aged between 7 to 12 years old, who applied for examination/treatment to the Department of Pediatric Dentistry between April 2016 through June 2018 were evaluated for the present study. Dental caries status was recorded using the number of decayed, missing or filled teeth (dft/DMFT) and decayed, missing or filled surface (dfs/DMFS) indices. A structured questionnaire inquiring sociodemographics information, oral hygiene habits, and diet history of the children were employed to parents.

**Results:** The sample comprised of 365 males and 339 females. From overall children, 31.11% were caries-free, while the caries prevalence was found 68.89%. Dental caries scores of all children included in the study were calculated as dft:  $4.97 \pm 4.02$ , dfs:  $11.85 \pm 11.82$  for primary teeth and as DMFT:  $2.63 \pm 2.42$  DMFS:  $3.81 \pm 4.34$  for permanent teeth. Statistically significant differences were found between age groups according to caries prevalence in the primary dentition ( $p < 0.05$ ). Dental caries was associated with educational level of mother ( $p < 0.05$ ), educational level of father ( $p = 0.02$ ), gender ( $p = 0.007$ ) and family income ( $p = 0.03$ ).

**Conclusions:** The high prevalence of dental caries highlights the importance of comprehensive oral health interventions to improve the oral health of children residing in Edirne, Turkey.

**Keywords:** Child, dental caries, oral health.

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## **INTRODUCTION**

Oral diseases have an increasing effect on the health and wellbeing of children worldwide. The burden of oral diseases is still very high; in particular, dental caries affects between 60–90% of schoolchildren. Epidemiological evidence indicates that dental caries is a common and chronic disease that results in pain, infection and consequently, loss of the affected tooth if remain untreated.<sup>1,2</sup>

Dental caries that is a multifactorial disease develops as a consequence of acids produced from the fermentation of carbohydrates by cariogenic bacteria which results in demineralization of dental hard tissues.<sup>3</sup> Nutritional transition with easy access to refined carbohydrates, poor tooth brushing habits, low level of awareness, educational level and socioeconomic status are some factors that are involved in the development of dental caries.<sup>4,5</sup> The prevalence and severity of dental caries are thought to be associated with several risk factors, including socioeconomic status and educational level, dietary habits and oral hygiene practices.<sup>6,7,8</sup> Children who develop dental caries on their primary teeth in younger age are more prone to develop dental caries in their permanent dentition.<sup>9</sup> Therefore, assessment of caries risk and follow up with regular intervals are strongly advised for children with increased risk of dental caries.<sup>10,11,12</sup>

Edirne is a city which is located in the northwestern border of Turkey. Children residing in this city are mostly referred for their routine dental examinations and treatments to the only university-based pediatric dental clinic. In the Pediatric Dentistry Department importance is being given to preventive programmes that focus on improving oral health of children. For that reason, epidemiological studies that represent the oral health status of a specific population are needed to develop adequate oral health care programmes in this region.<sup>13</sup>

The aim of the present study was to evaluate dental caries prevalence and potential risk factors among a Turkish subpopulation living in Edirne, Turkey.

## **MATERIALS AND METHODS**

### ***Study Design***

The study was approved by the Ethics Committee of the Trakya University Faculty of Medicine (TÜTF-BAEK 2018/368) and was carried out in agreement with the Declaration of Helsinki principles. Data of 704 children aged 7 to 12 years old who applied to the Department of Pediatric Dentistry Clinic between June 2016 and October 2018 were evaluated. All children whose parents completed the questionnaire and provided written consent were enrolled in the study.

### ***Dental Examination***

Three calibrated examiners performed dental examinations at the pediatric dentistry clinic. The calibration of inter-examiner reproducibility and inter-examiner reliability was performed on 20 children. Kappa value for intra-examiner was found 0.91, and inter-rater reliability was calculated as 0.89. The status of dental caries was recorded using the guideline of World Health Organization (WHO) Oral Health Survey Basic Methods 1997.<sup>14</sup> Caries experience on permanent teeth was measured using DMFT index while dft index was used for primary teeth. The presence of caries was diagnosed if  $dft/DMFT > 0$ .

After dental examination, the parents were asked to fill a standardized questionnaire consisting of two parts. The first part consists of sociodemographic information, whereas the second part includes oral hygiene practices and dietary habits related questions as consumption of sweet snack (mean intake frequency/day), frequency of toothbrushing, use of toothpaste. The consumption of sugary snacks was investigated as never, 1-3 times a day and more than three times a day. The frequency of toothbrushing was evaluated as either or more than twice a day and less than twice a day. The economic status of the family was categorized as low, middle and high income. The educational level of both parents was also used as a representative of the socioeconomic level of the family.

### ***Data analysis***

Statistical analysis was performed using The IBM SPSS® version 22 (IBM Corp., NY, USA). A descriptive statistical analysis was performed. The chi-square test was used to evaluate the

relationships between the parameters with a statistical significance level of  $p < 0.05$ .

## RESULTS

Data of a total of 704 children, 365 (51.85%) males and 339 (48.15) females with a mean age of  $9.35 \pm 1.67$  were evaluated in the study (Table 1).

**Table 1.** The distribution of children according to age and gender

	Male n (%)	Female n (%)	Total n
Children n (%)	365 (51.85%)	339 (48.15%)	704
Age (Mean $\pm$ SD)	$9.39 \pm 1.68$	$9.29 \pm 1.66$	$9.35 \pm 1.67$

n Number of the patients, % percentage.

The distribution of gender, according to age groups, are presented in Table 2.

**Table 2.** The distribution of gender according to age groups

Age (years)	Male (n=365)	Female (n= 339)
7-8 (n=249)	122	127
9-10 (n=265)	146	119
11-12 (n=190)	97	93

n Number of the patients

Oral health attitudes and dietary habits are shown in Table 3.

**Table 3.** Distribution of oral health behaviour and daily sweet snack consumption of children

		n	%
Tooth brushing frequency (times per day)	$\geq 2$	425	60.37%
	$< 2$	279	39.63%
First brushing age (years)	$\leq 3$	337	47.87%
	$> 3$	367	52.13%
Toothpaste usage	Yes	660	93.75%
	No	44	6.25%
Frequency of daily sweet snacking (times per day)	1-3 times	426	60.51%
	$> 3$ times	244	34.65%
	None	34	4.84%

n Number of the patients, % percentage.

The mean age of the first dentist visit was found at  $7.59 \pm 2.42$ . In the whole sample, the mean and standard deviation of decayed, missing, filled tooth surfaces values were found as; dft:

$4.97 \pm 4.02$ , dfs:  $11.85 \pm 11.82$ , DMFT:  $2.63 \pm 2.42$  and DMFS:  $3.81 \pm 4.34$  for all group.

The distribution of caries experience by gender is displayed in Table 4.

**Table 4.** Dental caries experience according to gender

	Male (n=365)	Female (n= 339)	p-value
dft Mean $\pm$ SD	$5.11 \pm 4.08$	$4.81 \pm 3.96$	0.316
dfs Mean $\pm$ SD	$12.25 \pm 11.62$	$11.42 \pm 12.04$	0.338
DMFT Mean $\pm$ SD	$2.50 \pm 2.53$	$2.76 \pm 2.29$	0.151
DMFS Mean $\pm$ SD	$3.79 \pm 4.69$	$3.84 \pm 3.92$	0.848

Chi-Square test \*Statistically significant at  $p < 0.05$ .

No statistically significant differences were found between caries experience and gender ( $p>0.05$ ).

The age distribution of the caries experience is displayed in Table 5.

**Table 5.** Dental caries experience according to different age group

Age (years)	7-8 (n=249)	9-10 (n=265)	11-12 (n=190)	p-value
dft Mean±SD	7.26 ±3.78	5.23 ±3.37	1.63 ±2.72	<b>0.000*</b>
dfs Mean±SD	17.25±12.35	12.8±11.14	3.53 ±6.09	<b>0.003*</b>
DMFT Mean±SD	1.67 ±1.84	2.72±1.80	3.73±3.22	0.534
DMFS Mean±SD	2.24 ±2.98	3.93±3.62	5.7±5.76	0.480

Chi-Square test \*Statistically significant at  $p<0.05$ .

Children were divided into three age groups, as 7-8 year-old (35.37%), 9-10 year-old (37.64%) and 11-12 year-old (27.01%). Statistically significant differences were found between age groups according to caries prevalence in the primary dentition ( $p<0.05$ ). However, there were no

statistically significant differences in DMFT and DMFS scores at different age groups ( $p>0.05$ ).

There wasn't any statistically significant difference in caries prevalence according to the educational level of the mother, as shown in Table 6 ( $p>0.05$ ).

**Table 6:** Dental caries experience according to educational level of mother

	Primary School 383(54%)	High School 185(26%)	University 168(24%)	p value
dft Mean±SD	4.91 ± 4.19	5.292 ± 4.04	4.68 ± 3.48	0.375
dfs Mean±SD	11.90 ± 12.67	12.92 ± 11.80	10.213 ± 8.94	0.205
DMFT Mean±SD	2.88 ± 2.46	2.48 ± 2.42	2.08 ± 2.17	0.867
DMFS Mean±SD	4.50 ± 4.73	3.30 ± 4.04	2.55 ± 3.00	0.598

n Number of the patients % percentage.

Chi-Square test \*Statistically significant at  $p<0.05$ .

Statistically significant differences were found only at DMFS index scores according to the

educational level of father presented in Table 7 ( $p<0.05$ ).

**Table 7:** The distribution of educational level of father and caries prevalence

	Primary School 312 (44%)	High School 224(32%)	University 168(24%)	p value
dft Mean±SD	5.18±4.31	4.80±3.90	4.78±3.60	0.595
dfs Mean±SD	12.89±13.24	11.20±10.92	10,75±9.91	0.519
DMFT Mean±SD	2.74±2.38	2.48 ± 2.42	2.14±2.04	0.062
DMFS Mean±SD	4.19±4.44	4.14±4.80	2.65±3.12	<b>0.042*</b>

n Number of the patients, % percentage. Chi-Square test \*Statistically significant at  $p<0.05$ .

The parental income was not significantly associated with the caries prevalence of children

shown in Table 8 ( $p>0.05$ ).

**Table 8.** The caries experience of children according to family income level

	Low income (n=302)	Middle income (n=202)	High income (n=200)	p value
dft Mean±SD	5.11±4.22	4.75±4.10	4.96±3.63	0.621
dfs Mean±SD	12.39±12.76	11.59±12.00	11.25±10.06	0.537
DMFT Mean±SD	2.76±2.46	2.69±2.51	2.37±2.23	0.182
DMFS Mean±SD	4.36±4.65	3.73±4.36	3.08±3.69	0.262

n Number of the patients.

Chi-Square test \*Statistically significant at p&lt;0.05.

Among all children, 31.11 % were caries-free, while the caries experience (sum of decayed, filled and missing teeth due to caries) was found 68.89% (p<0.05). Statistically significant

differences were found between parental education level (p<0.05), gender (p= 0.007) and family income level (p=0.030) among children with and without dental caries shown in Table 9.

**Table 9.** Distribution of children according to caries experience

	Caries -free (n=219) 31.11%	Caries-active (n=485) 68.89%	p value
<b>Gender</b>			
Female (n=339)	90	249	<b>0.007*</b>
Male (n=365)	129	236	
<b>Mother Education</b>			
Primary School 383(54%)	101	282	
High School 185(26%)	64	121	<b>0.001*</b>
University 136(19%)	54	82	
<b>Father Education</b>			
Primary School 312 (44%)	97	225	
High School 224(32%)	69	155	<b>0.020*</b>
University 168(24%)	63	105	
<b>Family Income</b>			
Low income (n=302)	83	219	
Middle income (n=202)	65	136	<b>0.030*</b>
High income (n=200)	71	129	

Chi-Square test \*Statistically significant at p&lt;0.05.

## DISCUSSION

Dental caries developing during childhood continues to be a significant public health concern that needs a worldwide consideration for prevention and treatment.<sup>15,16,17</sup> The assessment of its prevalence, together with the associated risk factors, has a significant role in improving oral health. Careful monitoring and preventive interventions could decrease the risk for dental

caries and reduce the need for invasive treatment procedures.<sup>15</sup> The present study aimed to evaluate the prevalence of dental caries and potential risk factors in a group of Turkish children attending to Department of Pediatric Dentistry.

The prevalence of dental caries in this study was found as 68.89% with the mean dft score of 4.97 and mean DMFT score of 2.63 for all children. The general data about the dental caries

prevalence of children in Turkey comes from the two surveys of 1988 and 2004 in which the caries prevalence and DMFT score of 12-year-old children were found as 84% and 2.7 in 1988, and as 61% and 1.9 in 2004.<sup>18,19</sup> Aktas *et al.*<sup>20</sup> reported the mean dft score of 5 to 15 years old Turkish children as 4.25 and the mean DMFT score as 2.34. Cantekin *et al.*<sup>21</sup> evaluated the association of body mass index and dental caries in their study and reported the mean DMFT scores of 12-year-old Turkish children as 1.75. Another study which evaluated the dental health status of Turkish children reported the prevalence of dental caries as 61.1% at age 12 and DMFT score was found as 1.9 for 12 year-old school children.<sup>22</sup> In the present study, caries prevalence and DMFT score of 12-year-old were found 74.25% and 3.73. The mean DMFT score reported in our study was higher than the results of the national surveys conducted in 1988, 2004 and the other studies from Turkey. Prevalence of dental caries in some countries around the world was found as 75% in Brazil<sup>23</sup>, 37% in Kenya<sup>24</sup>, 30.5% in Sudan<sup>25</sup>, and 21.8% in Bahirdar city Ethiopia.<sup>26</sup> All the above-mentioned studies followed DMFT/dft index to assess the dental caries prevalence. In the present study, caries prevalence was determined by using DMFT/dft index established by WHO.<sup>14</sup> The difference with these studies might be due to different study population and the social and demographic variations between those countries.<sup>13</sup>

Farooqi *et al.*<sup>27</sup> reported caries prevalence among 6-9 years-old children as 77.8% with a mean dft score of 3.66, while in children aged between 10 - 12, the caries prevalence was found 68% with a mean DMFT score of 1.94. Kaptan *et al.*<sup>28</sup> evaluated oral health status of preschool children in a Turkish subpopulation. According to their study results, the mean dft score was found as 1.63 in the three years of age group; 2.72 in the four years of age group; 3.04 in the five years of age group, and 3.64 in the six years of age group. It was also reported that the evaluation of dft scores according to different ages was found statistically significant ( $p < 0.05$ ).

In the present study, statistically significant differences were found between age groups

according to caries prevalence in the primary dentition ( $p < 0.05$ ). The mean dft score of was found 7.26 and mean DMFT score was 1.67 among 7-8 year-old whereas the mean dft was 5.23 and the mean DMFT was found 2.72 among 9-10 year-old children. The advancing caries experience in permanent teeth with increasing age might be as a consequence of the caries susceptibility of newly erupted teeth with poor oral hygiene conditions. El Meligy *et al.*<sup>29</sup> reported in their study that the younger age groups (6-11), in case of primary teeth and the older age groups (12-13), in case of permanent teeth had a higher prevalence of dental caries which was in accordance with our study results.

In the current study, oral hygiene behaviour and consumption of sweet snack frequency (times per day) were assessed together with sociodemographic factors as risks factors for dental caries status of children. There are a few studies evaluating the behavioural and socioeconomic factors on the oral health of children in Turkey.<sup>15, 21,30,31</sup> According to these studies, oral health status improves and dental visit rates increase when the educational level of the parents increase.<sup>15</sup> Educational level of mother plays an essential role in the oral health of children and a higher socioeconomic status effects the frequency of dental visit and oral health of the children.<sup>22</sup> Similar to these studies, in the present study parent's education level and income level were associated with the caries experience between caries-free and caries-active children.

Bekiroglu *et al.*<sup>30</sup> reported that only 30.9% of the children brush their teeth once a day and 58.3% brush their teeth twice a day in their study among Turkish school children. In another study from Turkey, Dogan *et al.*<sup>31</sup> reported that 43.1% of the school children brushed their teeth at least twice a day, and 99.05% of children were using toothpaste. In the present study, it was found that 60.37% of the school children brushed their teeth at least twice a day; 39.63% brushed their teeth less than twice a day, and 93.75% of children were using toothpaste. Increasing knowledge and awareness of oral health can improve oral health attitudes and practices. However, oral health

cannot be improved by focusing only on health related behaviour; socioeconomic and cultural environment children are residing should also be taken into consideration.

The present study emphasizes particularly the importance of risk assessment for early intervention programs for the oral health of school children. However, it has some limitations. First of all, the study population which was selected from faculty based pediatric dental clinic, may not present all children population in this region. Furthermore, the children were evaluated only for one time and data was obtained through questionnaire which may have recall bias. Therefore, further research with larger sample size are needed where the oral health status of children and related risk factors are investigated with longitudinal studies.

## CONCLUSIONS

In this study population, the mean dft showed a downward trend and decreased with age. In contrast, the mean DMFT showed an upward trend and increased with age which can be concluded as regarding age groups, younger children, in their primary teeth and older children, in their permanent teeth had a higher prevalence of dental caries. Interventions, including comprehensive oral health education programs for both children and their parents, can contribute to improve oral health status of children residing in Edirne, Turkey.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

### *Edirne İlindeki Türk Çocuklarında Diş Çürüğü Prevalansı ve İlişkili Risk Faktörlerinin Değerlendirilmesi*

## ÖZ

**Amaç:** Diş çürüğü, uygun olmayan beslenme alışkanlıkları, yetersiz ağız hijyen alışkanlıkları, ailenin eğitim düzeyi ve gelir düzeyi gibi çok faktörlü bir etiyojiye sahiptir. Çocukların ağız ve diş sağlığının iyileştirilmesi için çürük oluşumunda rol oynayan risk faktörlerinin belirlenmesi oldukça

önemlidir. Bu çalışmanın amacı, Edirne ilinde yaşayan okul çocuklarının çürük prevalansının belirlenmesi ve diş çürüğü ile ilişkili potansiyel risk faktörlerinin araştırılmasıdır. **Gereç ve Yöntemler:** Çalışmaya, Nisan 2016-Haziran 2018 tarihleri arasında Çocuk Diş Hekimliği Anabilim Dalı'na muayene /tedavi için başvuran 7 ile 12 yaş aralığında 704 çocuğun verileri dahil edilmiştir. Süt ve daimi dişlerdeki diş çürükleri; çürümüş, eksik veya dolgulu diş sayısı (dft/DMFT) indeksi ile süt ve daimi dişlerde çürümüş, eksik veya dolgulu diş yüzeyi (dfs/DMFS) indeksi kullanılarak değerlendirilmiştir. Ebeveynler sosyodemografik bilgiler ile beraber çocukların ağız hijyen ve beslenme alışkanlıklarına dair sorular içeren bir anket formu doldurulmuştur. **Bulgular:** Araştırmaya 365 erkek ve 339 kız dahil edilmiştir. Çürük prevalansı %68,89 olarak tespit edilmiştir. Çocukların %31,11 inde çürük gözlenmemiştir. Çalışmaya dahil edilen tüm çocukların süt dişlerindeki çürük skorları; dft:  $4,97 \pm 4,02$ , dfs:  $11,85 \pm 11,82$  olarak, daimi dişlerinde ise DMFT:  $2.63 \pm 2.42$  DMFS:  $3,81 \pm 4,34$  olarak tespit edilmiştir. Diş çürükleri annenin eğitim düzeyi ( $p<0,05$ ), babanın eğitim düzeyi ( $p=0,02$ ), cinsiyet ( $p=0,007$ ) ve gelir düzeyi ( $p=0,03$ ) ile ilişkilendirilmiştir. **Sonuçlar:** Edirne ilindeki okul çağı çocuklarından tespit edilen yüksek çürük prevalansı, bu bölgedeki çocukların ağız sağlığının iyileştirilmesi için kapsamlı ağız sağlığı ve koruyucu uygulamaların gereksinimi vurgulamaktadır. **Anahtar kelimeler:** Çocuk, diş çürükleri, ağız ve diş sağlığı.

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