

# Prevalence of caries among preschool-aged children in a central Anatolian population

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## Abstract

**Objective:** Early childhood caries (ECC) is a particularly destructive form of tooth decay that afflicts young children. The etiology and associated factors of ECC should be studied adequately to overcome this health hazard. The aim of this study was to determine caries prevalence and its consequences in toddlers in an Anatolian city, Kırıkkale. **Materials and Methods:** Examinations were performed in family medicine centers by three calibrated dentists during a period of 6 months. The status of dental caries was recorded according to the World Health Organization (WHO) criteria. We recorded the clinical indexes of decayed, missed, and filled teeth (DMFT and dmft; upper-case letters refer to permanent and lower-case letters to primary teeth), and decayed, missed, and filled surfaces (DMFS). **Results:** Totally 3171 toddlers were included (52% males and 48% females). The mean age was  $25.8 \pm 10.1$  months. The prevalence of ECC in preschool children was 17.3%, while the mean df(t) was  $0.63 \pm 1.79$ . ECC increased significantly with age. Dental caries were mostly observed in primary maxillary central teeth. Occlusal and buccal surfaces were the most affected sites. The difference in distribution of caries between maxilla and mandibula was found to be statistically significant ( $P < 0.05$ ). **Conclusions:** When compared to other data obtained from various epidemiologic studies, the toddlers living in Kırıkkale city center had a significant caries level. This observation had clearly suggested that early preventive measures should urgently be put into effect all over the city.

**Key words:** Dental caries, df(t), early childhood caries, prevalence

## INTRODUCTION

Despite the fact that it is largely preventable, dental caries is the most common chronic disease of childhood, may be human life. Worldwide, the contribution of dental caries to the burden of oral diseases is about 10 times higher than that of periodontal disease, the other common oral condition.<sup>[1]</sup> In dentistry, dental caries is the most prevalent disease and the major reason for tooth loss, representing a major challenge for oral health care.<sup>[2]</sup>

Its devastating form named early childhood caries (ECC) is a condition characterized by the presence of at least one or more decayed missing filled teeth in primary dentition as soon as infant teeth erupt.<sup>[3]</sup> With its progressive nature, ECC is a serious public health problem in both developing and industrialized countries<sup>[4]</sup> and can be painful and debilitating, and significantly increases the likelihood of poor child growth, development, and social outcomes. ECC may also result in a substantial social burden on families and significant costs to the public health system.<sup>[5]</sup>

As reported by Beltran-Aguilar *et al.*, the two most recent US national surveys have demonstrated an increase in caries prevalence among 2-5 year olds.<sup>[6]</sup> This is also true for Brazil, North America, China, Australia, and Korea, with the prevalence rates of 27, 60, 67, 80, and 83.3, respectively.<sup>[7-10]</sup>

Recently, a national epidemiologic data clearly showed that for 5-year-old children, the caries value and prevalence were 3.7 and 69.8%, respectively. In the same survey, for

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Quick Response Code:	Website: www.jnsbm.org
	DOI: 10.4103/0976-9668.116995

12-year-old children, the concomitant data were 1.9 and 61.1%, respectively.<sup>[11]</sup>

These data strongly indicated that early caries experience could have an effect on later caries attack, especially at early permanent dentition. For this reason, epidemiologic data obtained from early life period could be a useful indicator for future projections.

There is a lack of data on the prevalence of ECC at a global, national, regional, and district level in Turkey. Hence, the severity and extent of the disease is unknown. Therefore, the purpose of this study was to investigate the prevalence of ECC among young children in city center of Kırıkkale, Turkey.

## MATERIALS AND METHODS

### Selection of subjects

The study was conducted in a group of 3171 children (52% males, 48% females), aged between 8 and 60 months (mean age =  $25.8 \pm 10.11$  months), examined in both family medicine centers in Kırıkkale city center, Turkey. Children in whom at least one tooth has erupted were included in the study. A tooth was considered erupted if any part of the crown had penetrated the mucosa.

### Clinical examinations

Examinations were performed in family medicine centers by three research assistants. To ensure reliable, valid results, a dentist calibration was done in the days before performing the examination. The calibration consisted of activities (theoretical and practical: The criterion was agreement on photography and teeth models) to train the dentists to carry out the examination and to agree on diagnostic and practical criteria. A practical validation was performed in a school with 20 children per examiner. The inter- and intra-examiner reliability agreement was calculated by Kappa statistic. Both inter- and intra-examiner reliability data showed high mean percentages of agreement (86.3% and 87.2%, respectively). The examination was carried out in supine position under daylight, and mouth mirrors and probes were utilized. Examinations were performed according to the criteria of World Health Organization (WHO).<sup>[12]</sup> All information was recorded on a specially printed form, including the name, age, address, school, date of examination, and dental record according to the WHO guidelines. The status of each tooth was coded using visual-tactile method for analysis. According to the WHO criteria, the dental status of primary teeth was coded with the letters from A to G (healthy tooth, filled, decayed, fissure sealing, etc.). Permanent teeth were coded with the numbers from 0 to 9 according to the

WHO codes, with 0 referring to “healthy,” 1 referring to “decayed,” etc.

Caries was diagnosed when there was at least discoloration or opacity, together with a slight stickiness of the probe in pits or fissures of a frank cavitation on the occlusal or plane surface of the tooth. Approximately, opacity of marginal ridges was sufficient to diagnose a carious lesion. No radiographs were taken. Surfaces which had caries were recorded with details using “schematized box system.” Also, especially buccal-vestibular tooth surfaces which had demineralization areas were recorded, too.

Treatment and prevention needs to be applied for primary teeth were assessed using the inspection form of WHO. Suspicious cases were evaluated by two separate people for confirm findings. All examinations were completed between November 2010 and May 2011.

### Ethical considerations

The protocol for research was first submitted to the Faculty Research Committee, Kırıkkale University Dental Faculty, for approval. Consent for undertaking the research was obtained from the school principals. The survey and aim were explained to them and permission sought to perform the examinations. Permission was also obtained in writing from the parents or guardians to perform the examinations. Only the children of those parents or guardians who gave permission or returned permission forms were included in the study, thus giving informed consent. Parents/guardians had the right to withdraw at anytime.

### Statistical analysis

Data were centralized and processed using Microsoft Office Access Database 2007 and Microsoft Spreadsheet Excel 2007. Mean values were calculated for the studied variables and the statistical significance of differences between mean values was assessed using the Chi-square test ( $P < 0.05$ ).

## RESULTS

Totally 3171 children were examined (1522 girls and 1649 boys). The mean age was  $25.8 \pm 10.11$  months, mean  $df(t)$  value was  $0.63 \pm 1.79$ , and caries prevalence was 17.7% [Table 1]. Method of measurement of caries prevalence was according to the number of persons with caries. Two thousand six hundred and eleven children had no caries experience [ $df(t) = 0$ ], of which 1347 were boys (52%) and 1264 were girls (48%).

Mean  $df(t)$  values were  $0.13 \pm 0.97$ ,  $0.22 \pm 0.86$ ,  $0.78 \pm 1.94$ , and  $1.84 \pm 3.02$  for 8-12, 12-24, 24-36, and 36-60 month

age groups, respectively. Maximum increase of  $df(t)$  value was found in children between 3 and 5 years of age [Figure 1].

The distribution of caries in different types of primary teeth is shown in Table 2. According to the table, dental caries was mostly observed in primary maxillary central teeth. The difference in distribution of caries between maxilla and mandibula was found to be statistically significant ( $P < 0.05$ ).

The carious involvement of specific tooth surfaces is shown in Table 3. The examination of the surfaces of primary teeth showed that occlusal and buccal surfaces were the most affected sites.

The highest prevalence of dental caries was reported in the age group between 3 and 5 years [Table 4].

## DISCUSSION

Even though 17% caries prevalence with 0.63  $df(t)$  value obtained in this study was nearly the same as reported from various Western European countries including Sweden and Norway, these results could be problematic for future caries experience in our area.

Although a reduction in the prevalence of caries in preschoolers has been observed, ECC is still considered a public health problem. For Turkey, this observation has been proved by the recent survey including three city centers.<sup>[13]</sup> In that study, the caries prevalence rates were 33.0%, 78.4%, and 18.1% for Karaman, Kütahya, and

Mardin city centers, respectively. Similarly, the prevalence of ECC has been reported to be different in different countries, which was 62.6% in Puerto Rico,<sup>[14]</sup> 26.8% in Brazil,<sup>[15]</sup> 40% in Australia,<sup>[5]</sup> and 50.6% in Lithuania.<sup>[16]</sup>

Although it has not been followed in the present study, the potential risk factors for dental caries in children under 7 years of age were shown to be bad oral hygiene, cariogenic diet, bacterial exposure, socioeconomic status, factors relating to breast and bottle feeding, fluoride exposure, and parental smoking. The presence of these factors was not necessarily predictive of decay. A child appears to be at risk of caries the most if he/she acquires oral mutans streptococci at a young age. A high level of oral mutans streptococci may be partly compensated by other factors such as good oral hygiene and a non-cariogenic diet.<sup>[17]</sup> For these reasons, in our study, we had planned to conduct programs in family physicians' centers where babies with their mothers were easily available. So, mother's education about oral health and baby oral problems could be carried out easily. This is in line with the USA varnish programs performed in various states such as Connecticut, Utah, and California. The prevalence and severity of dental caries in pre-school children can be quite high as demonstrated by several studies. Thus, it is of great importance to begin preventive efforts at a very young

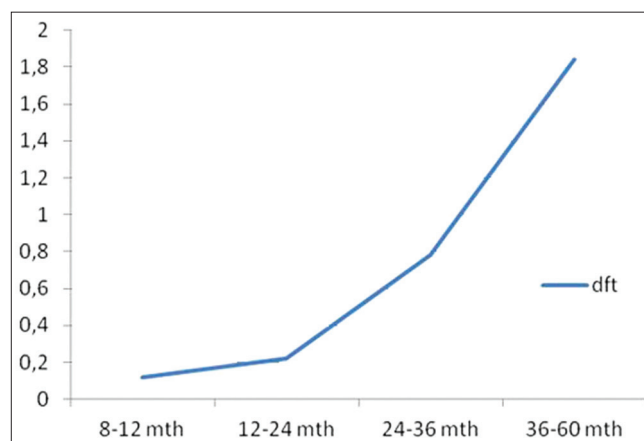


Figure 1: Change in  $df(t)$  values according to age range

**Table 1: The distribution of age-sex- $df(t)$  and prevalence of children in Kırıkkale**

Gender	Mean age	$df(t)$	Caries prevalence (%)
Male	25.48±9.92	0.63±1.74	16.7
Female	26.28±10.29	0.63±1.84	17.9
Total	25.8±10.11	0.63±1.76	17.7

**Table 2: The distribution of the number of caries in different types of primary teeth**

Arch	V	IV	III	II	I	I	II	III	IV	V
Maxilla	42	117	24	195	262	255	200	27	121	54
Mandibula	122	124	19	27	58	54	29	18	128	105

**Table 3: The number of carious surfaces in different primary teeth**

Surface	51	52	53	54	55	61	62	63	64	65	71	72	73	74	75	81	82	83	84	85	Total
Buccal	86	78	18	3	0	89	78	19	7	1	26	15	7	2	0	27	16	9	5	4	490
Mesial	48	28	1	6	1	46	27	1	9	1	10	3	3	3	1	12	2	2	3	3	210
Distal	10	2	0	2	3	8	2	2	1	2	2	2	1	4	1	1	0	2	4	1	54
Palatal/lingual	5	9	1	1	6	8	7	1	3	9	2	1	3	1	0	1	2	2	1	0	65
Occlusal	0	0	0	67	22	0	0	0	63	34	0	0	0	93	93	0	0	0	95	104	571

**Table 4: The distribution of caries prevalence according to age ranges**

Months	Number of children (%)	Caries prevalence (%)
8-12	187 (5.8)	2.6
12-24	1400 (44)	8.9
24-36	1185 (37)	22
36-60	399 (12.5)	40

age in vulnerable populations; however, information has been somewhat lacking concerning individual risk factors or specific factors to address preventive programs for the very young children.<sup>[6]</sup>

The American Academy of Pediatrics established a policy in 2003 that every child should receive an oral health assessment (including caries risk assessment) by 6 months of age, to be administered by a qualified pediatrician or pediatric healthcare professional.<sup>[18]</sup> For this reason, recently, we have started the “Family Physician System,” which has been in practice since 2008 in Turkey.

The medical community is increasingly recognizing caries as an infectious disease, and researchers have urged primary care providers to integrate caries prevention (including fluoride varnish) into well-child health visits. The Centers for Disease Control and Prevention reports that topical fluoride application may prevent early childhood caries in high-risk populations.<sup>[19]</sup> Moreover, parents should be provided with information on dental care during pregnancy, which favors the scheduling of an early dental appointment for the baby. However, the main limitation of this topic is that dental attendance before the age of 2 years is rare, with only 7% to 12% of 1-3 year olds in various countries having ever seen a dental professional. Finally, this advice may be best delivered by non-dental healthcare providers who are more likely to see infants and toddlers before ECC manifests clinically. As a solution, medical appointments are very frequent at this age, which makes the presence of a dental professional in the medical office interesting, so that children can also have a dental follow-up since their birth.<sup>[20]</sup> In accordance with these recommendations, mothers have been educated about infant dental care, brushing habit, and healthy diet at specific time intervals in our program.

Confirming the findings of other studies, caries of upper anterior teeth were found to contribute significantly to the overall level of caries, and the most affected teeth were the maxillary incisors<sup>[20,21]</sup> [Table 2]. Similar to other reports,<sup>[22-24]</sup> this study showed that *df(t)* values and the severity of the disease increased according to age [Table 1]. This fact suggests that teeth are affected by caries in the sequence of eruption if no measure is adopted to control the risk factors as soon as the first sign of caries is detected.

Thus, the need for dental assistance during the first year of life must be pointed out, as at that time it is still possible to prevent the development of initial lesions or to control the disease in case it is already established.

Common demineralization areas were reported in this study (35.6% of the children). It has also been reported in many other studies. Santos *et al.*<sup>[20]</sup> reported that the most common lesion found was the white spot (24.7% of the children). This type of lesion can develop in children under 12 months.

The association between age group and the presence of caries was statistically significant ( $P < 0.001$ ). All the 187 children who belonged to the age group of 8-12 months had 2.6% caries prevalence, but among the 399 children aged 36-60 months, 160 (40%) had caries [Table 4]. According to another study, all the 8 children who belonged to the age group of 0-12 months were caries-free, but among the 43 children aged 25-36 months, 18 (41.8%) had caries.<sup>[20]</sup>

Even though not included in this study, the short-term consequences of untreated decay in children's teeth include pain, with up to 12% of 5 year olds reported to have experienced toothache, systemic infection, and abscesses. In the longer term, there is strong evidence that children who experience ECC are much more likely to develop further dental problems as they get older. Given that past caries experience is the single most powerful predictor of future caries experience, for these reasons, early prevention is highly needed for ECC. Epidemiological data show that the most effective approach for the control of ECC is based on the prevention and not on the restorative treatment.

## CONCLUSIONS

Dental caries in general and ECC in particular represent a serious public health problem for all children. There was no preventive program organized by governmental institutions before in Turkey.

To stop or reduce dental caries, primary prevention must start in the prenatal stage to fulfill the needs of pregnancy. Parents should be encouraged to avoid bad feeding habits and to instruct and supervise their children in tooth brushing. Mothers should take their children for regular examinations before the age of 1 year.

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**How to cite this article:** Dogan D, Dülgergil ÇT, Mutluay AT, Yıldırım I, Hamidi MM, Çolak H. Prevalence of caries among preschool-aged children in a central Anatolian population. *J Nat Sc Biol Med* 2013;4:325-9.

**Source of Support:** Nil. **Conflict of Interest:** None declared.