

# Do the more caries in early primary dentition indicate the more caries in permanent dentition? Results of a 5-years follow-up study in rural-district

C. T. Dülgergil, H. Çolak

Department of Restorative Dentistry, Kırıkkale University Dental Faculty, Turkey

Corresponding author (email:<hakancolak@kku.edu.tr>)

Dr. Hakan Çolak, Department of Restorative Dentistry, Kırıkkale University Dental Faculty, Kırıkkale, Turkey.

## Abstract

**Aim:** In the deprived communities with high caries incidence, determination of high-risk children in early age is a valuable tool to apply the individual and/or community-level preventive measures. The purpose of this 5-years follow-up study was to examine the relationship between early caries occurrence on primary incisors and the future caries occurrence on both first permanent molars and all permanent dentition in the children living in rural Turkey. **Materials and Methods:** Total 34 children living in rural-districts of southeastern Anatolia were included, and divided in both test (caries positive for maxillary primary incisors) and control groups (caries free on the same teeth). During the 5-years they were examined annually regarding new caries occurrence in either first permanent molars for the Decayed, Missing, Filled Tooth Index [(DMF(T)<sub>[6]</sub>)] or all permanent dentition (DMF(T)). **Results:** At the beginning of the study, the age range of the children was 3 to 5 (mean ± St dv; 4.03 ± 1.24), and d(t)<sub>[max 1,2]</sub> and df(t) indices for the deciduous dentition of test and control groups were 2.65 ± 0.78; 4.29 ± 2.08 and 0; 0.24 ± 0.43, respectively. After 5-years mean DMF(T)<sub>[6]</sub> and total DMF(T) for test and control groups were 1.88 ± 0.66; 3.12 ± 0.69 and 0.47 ± 0.62; 0.65 ± 0.93, respectively ( for each parameters the difference was statistically significant  $P < 0.01$ ). For test group the number of caries on primary-incisors (d(t)<sub>[max 1,2]</sub>) was correlated with the DMF(T)<sub>[6]</sub> ( $r = 0.80$ ) and DMF(T) ( $r = 0.59$ ). **Conclusion:** The caries-information including the early primary incisors could be helpful in identifying children with increased risk so that preventive measures could be directed at those who fit the high-risk-caries profile..

**Key words:** Anticipatory guidance, diet, early childhood caries, oral hygiene, patient centered dental home

## INTRODUCTION

In the last three decades, a significant decrease in caries prevalence has been observed, especially in developed countries.<sup>[1]</sup> However, Early Childhood Caries (ECC) continues to be a crucial public health problem in the deprived communities with low economic standards.<sup>[2-4]</sup> ECC is an acute, rapidly developing dental disease occurring initially in the cervical third of the

maxillary incisors, and eventually destroying the crown completely. Early onset and rampant clinical progression make ECC a serious public health problem. Due to varying clinical, etiological, localization, and prognostic features, this pathology is found under different names such as, labial caries (LC), caries of the incisors, nursing bottle mouth, rampant caries (RC), nursing bottle caries (NBC), nursing caries, baby bottle tooth decay (BBTD), early childhood caries (ECC), rampant infant and early childhood dental decay, and severe early childhood caries (SECC).<sup>[5-10]</sup> Generally, ECC affects the maxillary primary incisors immediately after the eruption of teeth and spreads over the other primary teeth quickly, causing early tooth lost.<sup>[11]</sup>

Despite a few confusing results, the children who develop caries at an early age run a high risk of further caries development in the primary dentition, and

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are more likely to develop caries in the permanent dentition.<sup>[12]</sup> This foresight may be a vital advantage in determining the patients at a high risk of caries, and in advising the individual on special preventive practices in early ages. This is especially true in our country, which has a substantial rural area without any established and economical dental system.<sup>[13]</sup> The children with caries in the early primary dentition develop significantly more lesions on the permanent teeth, especially the first molars, compared to caries-free children of the same age group. Children with ECC also have a much greater probability of subsequent dental caries, both in the primary and in the permanent dentitions.<sup>[14,15]</sup> Many studies have shown that nursing bottle caries is more prevalent in the lower social classes and some ethnic groups, probably due to lack of education and also because of low levels of fluoride supplement intake, further predisposing the patients to caries development.<sup>[7,16-18]</sup>

In this five-year rural area study, we have evaluated the following:

- The effect of early caries lesions (ECC) on primary maxillary incisor teeth, on caries occurrence in the permanent dentition [DMF(T)] and permanent first molars [DMF(T)<sub>6</sub>];
- The effect of early and widespread caries occurrence on primary dentition [df(t)] on early caries occurrence in permanent dentition and the first molars.

## MATERIALS AND METHODS

This study has been carried out in the rural areas of Diyarbakir, a small village of 10 km radius and far from the city center. Children with a mean age of 3-5 years ( $4.03 \pm 1.24$ ) and who migrated from distant villages and have a lower socio-cultural level, have been included in the study.

The following observations were made in the 34 children included in the study:

- 17 of them had at least 2 caries on their primary maxillary incisor teeth (Defining Criteria) and were included in the study group (ECC- those with caries).
- Remaining did not have any caries on their maxillary incisor teeth and were included in the control group (those who are caries-free) incisor. The oral examination of the children was completed by the same researcher in day sun light and in a lying position in their house garden.

### Initial records (March-April-May 2000)

The values of df(t) for the deciduous dentition for each child was determined ( $n = 34$ ) for the group with caries, mean number of caries [ $d(t)_{\max 1-2}$ ] on primary maxillary incisor teeth has also been determined ( $n = 19$ ). The number of MS (*Mutans Streptococcus*) and LB (*Lactobacillus*) in the samples of plaque was determined.

### The results of the fourth year (March-April 2005)

The values of df(t) and DMF(T) for each child have been determined ( $n = 34$ ). The number of MS and LB in the samples of plaque was determined. In this session, the MS level in the child's plaque was determined by the modified-strip method (CRT Bacteria, Vivadent, Liechtenstein) as described by Bratthall *et al.*<sup>[19]</sup> The plaque MS level of the children was expressed in four different scores [score 0: no bacterial grow, score 1: bacterial growth between  $10^3$  and  $10^4$ , score 2: bacterial growth between  $10^4$  and  $10^5$ , and score 3: bacterial growth more than  $10^5$ ], and all the statistical calculations of the bacterial levels were carried out according to these scores. Plaque samples were not taken from infants who did not have teeth erupted yet, and the MS levels for them were recorded as score 0. The values of MS and LB have been evaluated according to  $\log_{10}$  basis for ease of statistical calculation. Student t (independent-t test) has also been used in the statistical analysis of data.

## RESULTS

All the children could be reached during the study (proportion of separation % 0). Table 1 shows the number of carious teeth and decayed surfaces [df(s)] belonging to the control and study groups in the beginning of the study. Initial mean number of carious teeth [df(t)<sub>max 1,2</sub>] and decayed surfaces [df(s)<sub>max 1,2</sub>] of primary incisor teeth belonging to the study group were  $2.65 \pm 0.78$  and  $3.47 \pm 1.54$ , respectively. A significant statistical difference was found between the initial rates of control and study groups ( $p < 0.05$ ). Plaque examples obtained from children in the beginning of the study was showed that MS and LB values were  $7.41 \pm 3.04$  and  $1.88 \pm 3.12$  for study group and  $4.59 \pm 2.5$  and  $2.12 \pm 3.55$  for control group, respectively. The difference between the MS and LB levels in the control and study group was found as statistically insignificant. Similar result was obtained at the end of the fourth year, as well.

Table 2 shows the values of df(t), df(s), DMF(T), DMF(S), DMF(T)<sub>6</sub>, DMF(S)<sub>6</sub> belonging to control and study groups in the fourth year. At the end of the

**Table 1: The number of filled teeth and decayed surfaces in the deciduous dentition [df(s)] and *Mutans Streptococcus* and *Lactobacillus* levels belonging to the control and study groups in the beginning of the study**

	Control group	Study group	P
df(t)	0.24 ± 0.43	4.29 ± 2.08	< 0.05
df(s)	0.35 ± 0.7	6.12 ± 3.70	< 0.05
df(t)üst 1,2	0.0 ± 0.0	2.65 ± 0.78	< 0.05
df(s)üst 1,2	0.0 ± 0.0	3.47 ± 1.54	< 0.05
MS	4.59 ± 2.5	7.41 ± 3.04	> 0.05
LB	2.12 ± 3.55	1.88 ± 3.12	> 0.05

df(t) = Decayed and filled teeth in the deciduous dentition; df(s) = Decayed and filled surfaces in the deciduous dentition; df(t)üst 1,2 = Decayed and filled primary incisor teeth; df(s)üst 1,2 = Decayed and filled primary incisor surfaces; MS = *Mutans Streptococcus*; LB = *Lactobacillus*.

**Table 2: The values of df(t), df(s), DMF(T), DMF(S), DMF(T)6, DMF(S)6 belonging to control and study groups in the fifth year of the study**

	Control group	Study group	P
df(t)	1.82 ± 1.01	5.76 ± 1.56	< 0.05
df(s)	2.29 ± 1.49	10.24 3.01	< 0.05
DMF(T)	0.65 ± 0.93	3.12 ± 0.69	< 0.05
DMF(S)	0.71 ± 0.98	4.35 0.93	< 0.05
DMF(T)6	0.47 ± 0.62	1.88 0.6	< 0.05
DMF(S)6	0.53 ± 0.71	2.65 0.93	< 0.05

df(t) = Decayed and filled teeth index in the deciduous dentition; df(s) = Decayed and filled surfaces index in the deciduous dentition; DMF(T) = Decayed and filled teeth index in the permanent dentition; DMF(S) = Decayed and filled surfaces in the permanent dentition; DMF(T)6 = Decayed and filled permanent first molar tooth; DMF(S)6 = Decayed and filled surfaces on the permanent first molar tooth.

five year period, the children with ECC in the primary dentition developed 5 times more decayed surfaces compared to those in the control group. The difference was statistically significant. When compared to the control group, it has been observed that the children with ECC have about 4 times more caries occurrence on their permanent first molars. This difference has been obvious in terms of the number of new decayed surfaces occurring again on the first molars, and has been found statistically significant. The children with ECC have exhibited about 5 times more values of DMF(T) and 6 times more values of DMF(S) at the end of the fourth year in terms of their caries occurrence on the the permanent dentition, and as compared to those in the control group. The difference between the two groups has been found significant in terms of both the variants.

## DISCUSSION

Because dental caries is no longer a ubiquitous disease,

interest in identifying caries prone individuals has increased. It is estimated that at least 60% of the total caries is seen in only about 20% of the population.<sup>[13,20,21]</sup> It is well established that the caries status in the young permanent dentition is related to the corresponding status in the primary dentition.<sup>[22]</sup> Nevertheless, this relationship is not sufficiently clear for the measurement of caries experience in the primary teeth and predict the caries occurrence in the permanent teeth. The potential caries promotive exposure times vary between dentitions,<sup>[23]</sup> as does the range of interrelated factors acting in the caries process. These make the ideal stability for prediction impossible. Within these limitations, when caries is established, past caries experience remains the most powerful known influencing factor. Caries prediction is the goal of academics and practitioners, as they strive to establish more efficient dental care delivery systems. Caries risk assessment may also involve simply looking at the patient's clinical appearance. A patient with two or more carious lesions may be considered at a high risk of developing caries in the future.<sup>[24]</sup>

The results of this study have indicated that the children with ECC and caries in the deciduous dentition and living in the rural areas of Southeastern Anatolia, developed more decayed lesions in the permanent and first molar teeth in a five-year period, also seen in their urban counterparts.

The determining criteria for ECC may differ according to different researchers:

- Caries occurrence on just one of the maxillary primary incisor teeth<sup>[25,26]</sup>
- Caries occurrence on two of them<sup>[27,28]</sup>
- Caries occurrence on three of them<sup>[29]</sup>
- Caries occurrence on primary molars together with maxillary primary incisor teeth,<sup>[30]</sup> or
- Caries occurrence just on the buccal-lingual surfaces of maxillary primary teeth<sup>[10]</sup>

This difference in the involvement of teeth in ECC may also influence the future caries occurrences. For instance, Johansen *et al.*<sup>[31,32]</sup> have indicated that the children with the buccal-lingual caries sample on any of their primary teeth or with the proximal surface caries, except on the maxillary and mandibular second primary molars, have developed more primary molar teeth caries compared to those without ECC. In a long term *in vivo* research, Kaste *et al.*<sup>[33]</sup> have reported that the samples of buccal-lingual caries on the maxillary primary incisor teeth cannot be used as an indicator for a further caries estimation, and moreover, 5 or more decayed-missed-

filled teeth (dmft) in the primary dentition may indicate the possibility of 5 or more caries in the permanent dentition as well. Further, the researchers have described that in mean 4.4 aged patients, 2.4 times more permanent caries developed when they were about 15 years old.

In our study, ECC has been defined as caries on at least two maxillary primary incisor teeth. As it can be understood from Table 1, number of caries on the primary dentition (dft) in children with ECC is about 15 times more compared to those without ECC ( $p < 0.05$ ). Even the scores of  $df(t)$  or  $[d(t)_{\max 1,2}]$  can be evaluated independently, and the results that the children with ECC run a higher risk of developing caries in the future can be inferred from these results. Al Shalon *et al.*<sup>[15]</sup> have reported that patients with ECC have about 4 times more caries, extracted and restored teeth (CERT) values compared to those without ECC. Further, it has also been shown that children with ECC developed about 2.5 times more permanent molar caries as compared to those without ECC. This finding is in concordance with our study and has emphasized that the children with ECC and living in the rural areas may exhibit more harmful caries in the permanent dentition compared to their urban counterparts.

Poulsen and Holm<sup>[34]</sup> concluded that screening based on dental caries experience in the primary dentition at age 3 seems to have little practical value in identifying children who would develop caries in the permanent teeth in the future. They attributed their conclusion to the general decline of caries in the Scandinavian countries. A similar conclusion was also reached at by Hill *et al.*<sup>[35]</sup> and they stated that the prevalence caries at the age of 6 instead, may be a more valid indicator. On the other hand, Gray *et al.*<sup>[36]</sup> have stated that in 565 children examined, 3 or more primary molar caries at the age of about 5 more correctly determined the correlation with a high incidence of caries in the permanent dentition in the future. This result is of importance as it explains the initial higher dmft values and obvious DMF(T)<sub>6</sub> figures taken 4 years later from the children with ECC in our study, and emphasizes that ECC and dft index calculated in the deciduous dentition, may be important determinants of future further caries experience.

## CONCLUSION

The studies that we have done in the outskirts and near rural areas of Diyarbakir in the last 5 years have indicated that, especially the permanent first

molars have decayed earlier in children deprived from oral hygiene instruction and in those who have demonstrated more harmful caries activities in the earlier stages. We may be able to prove this risk if the pre-school children living constantly in the same region are observed for a longer period of time, right from the stage of their primary dentition. Thus, we may be able to observe the patients and reach more conclusions in an economical way, rather than using more expensive and detailed bacteriological diagnosis. Hence, more studies are required to prove that the ECC or  $df(t)$  scores have a high correlation with the future caries incidence. Thus, within the limitations of the study, it can be concluded that, for children who live in the outskirts or in rural areas with poor or no access to oral health care, and who lose primary incisor teeth at an early age because of caries or have a high dmft, the risk of caries in the permanent first molars is higher. This situation is of vital importance, especially in the rural areas, and the first molars in these children in the age group of 6-8 years should be accepted as the target teeth, and proper dental care should be instituted to avoid any intensive dental decays in the permanent dentition of these children as they reach the age group of 9-12 years.

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