The Relationship between Early Childhood Caries with Mutans Streptococci and Lactobacilli in a Group of Preschool Children. Comparison of Initial - First Year Results

SUMMARY

Purpose: The aim of this study was to examine the relationship between Early Childhood Caries (ECC) with Mutans streptococci (MS) and Lactobacilli levels in 2-4 year old children, by comparing the initial and first year results.

Materials and Methods: In this study, 30 children with ECC as a study group and 30 caries-free children as controls were examined. Dental caries was assessed by using the WHO methodology under standardized conditions. The df-scores in children who had ECC were calculated. Microbiological examinations were carried out in both groups for determination of the level of MS and Lactobacilli in supragingival plaque. This process was repeated at an 1-year follow-up examination.

Results: There were statistically significant differences on the mean levels of MS and Lactobacilli at both initial and first year results between the study and control groups. However, there was not statistically significant increase in the level of MS and Lactobacilli, whereas the difference between df scores were found to be statistically significant when initial and first year results in both study and control groups were compared.

Conclusions: These findings prove that the early MS colonization is correlated with high caries risk.

Keywords: Early Childhood Caries; Mutans Streptococci; Lactobacilli; Dental Plaque

Introduction

Contemporary dental profession aims for both the eruption of teeth as healthy and the challenge to keep them that way. Dental professionals are concerned about a condition, known as baby bottle tooth decay and nursing caries, which has recently been referred to as early childhood caries (ECC). General caries in primary teeth have been declining over the years in the developed countries. However, ECC is still a major threat to oral health of infants and toddlers.

ECC can be defined as the occurrence of any sign of dental caries on any tooth surface during the first 3 years of life. It is widely accepted that early colonization of Mutans streptococci (MS), lack of oral hygiene routine, sweet drinks and infant formulas during bedtime or naptime, and parental education are associated with ECC.

MS colonization may occur shortly after the tooth eruption, and several studies have shown that the infection level increases with age. High counts in mothers are associated with an early colonization of their infants, and the earlier the establishment of a cariogenic flora, the more caries is likely to develop in the primary dentition.

ECC may influence the development of caries in the future, both in the primary and permanent dentition. The prevalence of ECC has been reported to differ among populations, varying from 1% to 70% in some ethnic
minority group, immigrants, and poor communities. Therefore, ECC is a public health problem, and health planners should give high priority to oral health education of parents. Moreover, studies to reduce the transmission of cariogenic microorganisms have also been performed as methods to prevent ECC.

The aim of this study was to examine the relationship between ECC and MS and Lactobacilli among 2-4 year old children, by comparing initial and first year results.

Material and Methods

This study was performed in a rural area of Diyarbakir-Turkey. 30 children with ECC were examined as a study group. The ages of the subjects ranged from 2 to 4 years. The children were examined in terms of socioeconomic status, education of parents, dietary risk habits, oral hygiene practice (deprived of brushing habit), and potential fluoride sources, which were taken into account as common features in the selection of the group members. 30 caries-free children at the same age as study group were examined in the control group.

Oral examinations were carried out by using dental mouth mirror and explorer in order to record the df-scores. Dental caries was assessed by using the WHO methodology under standardized conditions. Microbiological examinations were performed in both study group and control group for determination of the level of MS and Lactobacilli in supragingival plaque at the Dicle University, Medical Faculty, Department of Microbiology.

Parents and children were instructed on oral hygiene methods after initial examination. Toothpaste and toothbrush were distributed to all patients in both, control group and study group.

Since all the subjects were chosen from the same area, we had the advantage of having same patients throughout the study.

Samples of supragingival plaque in maxillary incisor teeth were removed with a sterile dental flat plastic instrument and immediately transferred to a transport fluid containing 0.01 peptone. The samples in transport fluid underwent 10-fold serial dilution before 0.1 ml was plated Rogosa SL agar (RSL, Merck) for growth of Lactobacilli and Mitis Salivarius agar (MS, Difco) with bacitracin for growth of MS. The plates were incubated in anaerobic conditions at 37°C in RSL for 4 days, and MS for 2 days, followed by 2 days of aerobic incubation. After incubation, total colony-forming units for each bacterial plates were separately counted. This procedure was repeated in an 1-year follow-up.

In statistical analysis, Student t-test was used to determine the relationship between initial and first year results.

Results

There was a statistically significant difference between the study group and the control group for the level of both, MS and Lactobacilli at the initial examination (Tab. 1). Similarly, there was a statistically significant difference between both groups for the level of MS and Lactobacilli at the end of the first year (Tab. 2).

However, there was no statistically significant difference between increase in the level of MS and Lactobacilli (p > 0.05), whereas the difference between df-scores was found to be statistically significant (p < 0.05) when initial and first year results in both groups were compared (Tabs 3 and 4).

There was a statistically significant difference between df-scores at initial and the first year results in both groups (Tab. 5).

Table 1. The relationship between the mean of level of MS and lactobacilli in the study group and control group at the initial examination

<table>
<thead>
<tr>
<th></th>
<th>Study group N=30</th>
<th>Control group N=30</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>6.57 ± 3.94</td>
<td>3.70 ± 2.79</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>Lactobacilli</td>
<td>2.43 ± 3.65</td>
<td>0.73 ± 1.20</td>
<td>P&lt;0.05</td>
</tr>
</tbody>
</table>

Table 2. The relationship between the mean of level of MS and lactobacilli in the study group and control group at the end of the first year

<table>
<thead>
<tr>
<th></th>
<th>Study group N=30</th>
<th>Control group N=30</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>7.80 ± 2.34</td>
<td>4.06 ± 2.54</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Lactobacilli</td>
<td>3.66 ± 2.95</td>
<td>1.03 ± 1.12</td>
<td>P&lt;0.001</td>
</tr>
</tbody>
</table>

Table 3. The relationship between the mean of level of MS and lactobacilli at initial and first year results in study group

<table>
<thead>
<tr>
<th></th>
<th>Initial N=30</th>
<th>First year N=30</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>6.57 ± 3.94</td>
<td>7.80 ± 2.34</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Lactobacilli</td>
<td>2.43 ± 3.65</td>
<td>3.66 ± 2.95</td>
<td>P&lt;0.05</td>
</tr>
</tbody>
</table>

Table 4. The relationship between the mean of level of MS and lactobacilli at initial and first year results in control group

<table>
<thead>
<tr>
<th></th>
<th>Initial N=30</th>
<th>First year N=30</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>3.70 ± 2.79</td>
<td>4.06 ± 2.54</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>Lactobacilli</td>
<td>0.73 ± 1.20</td>
<td>1.03 ± 1.12</td>
<td>P&gt;0.05</td>
</tr>
</tbody>
</table>
Table 5. The relationship between df-scores at initial and first-year results in study and control group

<table>
<thead>
<tr>
<th>Df%</th>
<th>Initial N=30</th>
<th>First year N=30</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study group</td>
<td>4.56%</td>
<td>6.3%</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Control group</td>
<td>0</td>
<td>1.4%</td>
<td>P&lt;0.05</td>
</tr>
</tbody>
</table>

Discussion

Several microbiological tests have been performed in order to establish the number of people who have the sensitivity of teeth to dental caries. These tests are mostly focused on MS and Lactobacilli counts. It has been known that there has been a positive correlation between the MS, Lactobacilli and caries prevalence. Microbiological cultures taken from cariogenic dental plaque and shallow carious lesion indicate that S. mutans particularly is a pathogen for tooth caries. On the other hand, it was reported that Lactobacilli were related with the development of caries lesions after their emergence.

The basic process is that cariogenic microorganisms act on fermentable carbohydrates to produce acids. A sucrose-rich diet facilitates the initial establishment of MS in plaque, and a prolonged exposure to carbohydrates enhances a further accumulation of acidic bacteria, such as MS, Lactobacilli and low pH. This ecologic shift creates a long-term low pH environment that can demineralise tooth enamel rapidly. In early childhood, several factors are involved, which are unique for this age group, as:

1. **Microorganisms** (early colonization of S. mutans; lack of oral hygiene routines);
2. **Substrate** (sweet drinks, milk, and infant formulas during bedtime or naptime; high frequency of sugar consumption from drinks and solid food; nursing bottles and pacifiers and sucking habits; prolonged feeding pattern);
3. **Host** (low salivary flow rate at night; newly erupted, immature teeth; immature specific and non-specific defence system; high prevalence of hypoplastic defects in primary dentition; medical conditions);
4. **Social variables** (parental education; socioeconomic status; siblings).

We thought that it would be appropriate to create a group which has similar features like nutrition, socioeconomic conditions and educational level, in order to demonstrate the effective role of early MS and Lactobacilli colonization on ECC. As a result of our study, it was found that the level of MS and Lactobacilli in children having ECC was considerably higher than in those that were caries-free.

Köhler and Bjarnason also showed the high existence of MS and Lactobacilli in saliva of children aged 11-12 years in Iceland, together with the accompanying high caries prevalence, and explained the high Lactobacilli rate with too many lesions. As confirmed in many studies, the direct relation between the microorganisms in saliva and existence of caries is compatible with the result of our study in terms of the relation between microorganism in plaque and the existence of caries.

In other study, the age at which MS could be detected in the plaque of Finnish children was a reliable predictor of subsequent caries activity. Children who harboured MS in their plaque by age of 2 years developed 10.6 dmfs by age 4. In contrast, children in whom MS were detected between ages 2 and 4 years developed 3.4 dmfs by age 4 and children in whom MS could not be detected were essentially caries-free by age 4. Similarly, Chosack et al stated that dmft in children between ages 3.5 and 5 involving MS in high concentration in their saliva increased with age.

Different studies have also investigated the relationship between dental caries in the primary dentition and subsequent dental caries in the permanent dentition. Hill et al reported that caries rate at the age of 6 years was a good indicator of future caries. The same conclusion was suggested by Gray et al, who concluded that caries in 3 or more primary molars at the age of 5 was the best predictor of caries development in the first permanent molars in 565 children.

These data indicate the diagnostic value of early MS detection, suggesting that treatment strategies and tactics that delay the colonization of MS could cause a reduction in decay. Furthermore, these findings prove that the early MS colonization, both in the primary and permanent dentition, is correlated with high caries risk. Therefore, we firstly aimed to educate all our patients about oral hygiene. The objective of education was to improve the dental habits of parents and children by increasing their knowledge about ECC. We distributed toothbrushes and toothpaste to all our patients in the selected area, which was thoroughly deprived of oral hygiene instruction and facilities for tooth-brushing.

There was an increase in the level of MS and Lactobacilli at the end of the first year. However, there was not statistically a significant increase in the level of MS and Lactobacilli, when initial and first year results in both study and control group were compared. Moreover, there was a statistically significant difference between df-scores when initial and first year results in both study and control group were compared. This result also showed that only oral hygiene would not be sufficient. In paediatric dentistry, this conclusion has emphasized the importance of preventive measures and education in order to be protected against ECC.

References