Risk factors for caries - control and prevention

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ABSTRACT

Objectives. To investigate a prevalence of caries, filled permanent and extracted permanent teeth, as well as caries risk factors in school children aged 7, 9 and 11.

Methods. The survey included 800 children (296 children aged 7; 254 children aged 9 and 250 children aged 11) from the Mostar Municipality, 400 of them living in both rural and urban areas. A dental mirror and standard light of dental chair were used for examination. The DMF index (Dental Caries, Missing Teeth and Filled Teeth) was determined, as well as failure in keeping teeth hygiene, sugar intake with food, and incidence of oral cavity infection.

Results. The dental state of permanent teeth in children aged 7 and 9 has shown significant difference between the children from rural and urban areas (p < 0.001). Out of 2,698 and 2,790 permanent teeth in children aged 11 from rural and urban areas, 1,086 (40.25 %) and 884 (31.68 %) had caries, respectively (p < 0.01). The difference between these groups of children has been found in relation to the index of oral hygiene too (p < 0.05).

Conclusion. An identification of risk groups for getting caries was very important and could help health and social structures to maintain their programs in order to improve oral health.

Key words: carries, oral hygiene, risk factors
INTRODUCTION

The development of tooth caries is a dynamic process of demineralization of strong and healthy tooth tissue by the products of bacterial metabolism which is replaced by periods of demineralization (1,2). A significance of determination of the occurrence and causes of caries that impact public health does not only arise from the fact that caries is an epidemiological phenomenon. Moreover, caries is connected with some other factors which could be put under control by good public health programs (3, 4). As the leading pathogenic factors involved in caries appearance in children are an oral microflora (Streptococcus mutans and Lactobacillus spp.), a reduction of salivary gland function and the components of nutrition (2, 4-9). The Center for Disease Control and Prevention (Atlanta) pointed out that the prevalence of caries had significantly decreased among USA children from 90.4% to 6.2% in the periods from 1971 to 1999 because of the implementation of a widespread oral cavity care prevention program (3).

However, the leading cause of development of caries is a lack of oral hygiene (2,6-8,10). For that reason, a determination and examination of oral hygiene was included in most preventive programs aimed at prevention of caries appearance in children (11). According to the degree of gingival and sublingual tooth layers a state of oral hygiene can be estimated using the standard index of oral hygiene (12).

It has shown that the children aged 11 -12 with daily sugar intake of 163 g had approximately 5-6 teeth with caries, while children who eat less sugar (around 78 g) had 3 teeth with caries (7). Sugar intake also had positive correlation with caries prevalence (7-9,13). In children with excessive sugar intake in food, the effects of flour insufficiency prevention are minimized (8,14).

The aim of this paper was to investigate the prevalence of caries, filled permanent and extracted permanent teeth, as well as caries risk factors (failure in keeping teeth hygiene, sugar intake in food, and incidence of oral cavity infection) in school children aged 7, 9 and 11 in urban and rural areas of the Mostar Municipality, Bosnia and Herzegovina.

METHOD

The survey included 800 children (296 children aged 7; 254 children aged 9 and 250 children aged 11) from the Mostar Municipality, 400 of them lived in both rural and urban areas. A dental mirror and standard light on a dental chair were used for the examination.

The DMF index (Dental Caries, Missing Teeth and Filled Teeth) was determined, as well as failure in keeping teeth hygiene, sugar intake in food, and incidence of oral cavity infection. The DMF index values according to the World Health Organization were used (15): very low (the values from 0,0 to 1,1), low (the values from 1,1 to 2,6), middle (the values from 2,6 to 4,4), high (the values from 4,5 to 6,5), very high (the values over 6,5). In order to specify the oral hygiene condition the methodology for specifying the index of oral hygiene (OH) according to Green and Vermillion was used (16).

The sum of the dental layers values, for 6 specific teeth is divided by the numbers of examined teeth as follows:

<table>
<thead>
<tr>
<th></th>
<th>16</th>
<th>21</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>buccal side</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>41</td>
<td>36</td>
</tr>
<tr>
<td>oral side</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The teeth were coated with 1% gentiana-violet solution, and the mouth was rinsed out with water. The index of oral hygiene is determined on the basis of scores for the number of colored layers on the teeth, namely: score 0 = there were no colored layers; score 1 = there were some layers from 1/3 to 2/3; score 2 = there were layers from 2/3 to 3/3; score 3 = the whole observed tooth surface is covered with a colored layer.

The summed values of examined oral hygiene for the specified 6 teeth were divided by the number of the examined teeth.
As the main indicators of lack of an adequate level of oral cavity hygiene we considered: attitude, habits and frequency of tooth brushing (children did not brush more than once a day, never after main meals, had a short brushing period mostly in the morning), did not use mechanical tooth brushing, and rarely with a new tooth brush.

Dietary intake of sugar was considered high when a child ate pieces of sugar every day, drank milk with sugar and ate candies (or sweetened cakes) every day.

The calculation of caries prevalence in a surveyed population: caries prevalence was considered low if more than 20 % of the children in the group were caries-free; the prevalence was moderate if 5%-20% were caries-free; the prevalence was considered high if fewer than 5 % children in a group were caries-free (15).

The statistics hypotheses were tested by χ² test. Statistically significant difference was defined as a P value of <0.05.

RESULTS

A dental state of permanent teeth in both groups of children aged 7 and 9 has shown significant difference between the children from rural and urban areas (p < 0.001) (Table 1, Table 2). Among 2,698 and 2,790 permanent teeth in children aged 11 from rural and urban areas, 1,086 (40.25 %) and 884 (31.68 %) had caries, respectively (p < 0.01) (Table 3).

The average value of the DMFT among school children from rural areas was 10.06, while the DMFT among children in urban areas was 7.58 (Table 1). The statistically significant difference between these groups of children has been found for the index of oral hygiene too (p < 0.05). The children of all age groups from the rural area of the Mostar Municipality had low oral hygiene level, ranging from 0.6 among children of 9 to 1.28 among children of 11 years of age (Table 4).

Considering the data from the medical charts a discontinuation in maintenance of teeth hygiene in children from both urban and rural areas for all the age groups was noted (from 94, 11 % to 96 %); in 2-6 % of cases causes of caries development were oral infections, and in 6 % it was a higher level of sugar intake.

DISCUSSION

The most significant cause of developing caries among children in our survey was a lack of oral hygiene, frequent sugar intake and oral infections. The average DMF in school children from rural areas was much higher than the average DMF among children from urban areas.

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All the examinations have shown that any excessive sugar intake through food significantly influences presence of caries in children. The surveys conducted in some countries have shown that daily sugar usage was significantly increasing the DMF (17).

The public health monitoring of caries occurrence and oscillations in many countries has shown a shift from epidemic to sporadic appearance (18,19). In order to put caries under control, the aims and ways of caries prevention are established (18). The control of oral infection, usage of tooth paste with the flour and introduction of fluorinated drinking water are of special significance (18).

Although there has been a low caries prevalence in the last 15 years, the annual cost for caries treatment in Canada is about $3.1 billion, and it is twice lower as compared to 1980 (20). The positive correlation between caries genesis and the presence of specific microorganisms in saliva, like Streptococcus mutans and Lactobacillus was proved and well documented, as well as the lack of oral hygiene and high sugar and juice intake (21,22,23). The epidemiological statistical data have shown that the caries in many areas of the world was the most frequent cause of children’s disease (19,22,24). Although the examples from the USA have shown that the caries prevalence is under full control, it is still a serious public health problem. Actually, the children who migrated from Mexico to the USA had caries prevalence from 21% to 46 %, and it was higher than in Central America where caries prevalence was from 6 % to 9%. The reason of this increase of caries prevalence among the specific group was connected with lower oral hygiene, and with nutritional habits of the population (21,24,25).

It’s shown that the influence of risk factors to caries prevalence was very high among the Indian children in the USA reservations as compared to other areas (21). The programs aimed at improvement of health care in the developed countries fully focus on the primary and secondary prevention of oral health (19,23,24). The risk of caries genesis is multicausal; it is influenced by direct and indirect risk factors. It is highly important to educate mothers and to make them motivated for these programs (19,21,23). In spite of the hard work of health services in the Eastern European countries to decrease caries prevalence, the results come very slowly. The DMF in 12-year old children in Lituanies was about 7.7, and in Poland 5.5 (25). As caries represents a public health problem, only epidemiological research could show the real indicators and find out the factors which influence the caries genesis. Many epidemiological studies have shown a dynamic correlation between the sugar intake, as well as the intake of other carbohydrates and oral hygiene (10,24-27).

However, in the developed Western European countries the correlation between the sugar consumption and the caries is negative (0.013), which shows that caries genesis could be prevented with proper teeth hygiene and appropriate flour intake although the high sugar intake was present (27).

The results related to the dental status of school children in this study should concern health workers but also social and policy makers.

### Table 3. Dental status in age group 11

<table>
<thead>
<tr>
<th>Area of residence</th>
<th>No. of children examined</th>
<th>No. of present teeth</th>
<th>No. of children with caries</th>
<th>No. of missing teeth</th>
<th>No. of teeth with fillings</th>
<th>No of DMF*</th>
<th>DMF average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>125</td>
<td>2.698</td>
<td>1.086</td>
<td>90</td>
<td>82</td>
<td>1,258</td>
<td>10.06</td>
</tr>
<tr>
<td>Urban</td>
<td>125</td>
<td>2.790</td>
<td>884</td>
<td>23</td>
<td>41</td>
<td>948</td>
<td>7.58</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>5.488</td>
<td>2.070</td>
<td>113</td>
<td>123</td>
<td>2,206</td>
<td>8.25</td>
</tr>
</tbody>
</table>

*DMF: Dental Caries, Missing Teeth or Extracted Teeth, Filled Teeth

### Table 4. The index of oral hygiene broken down by the area of residence and age

<table>
<thead>
<tr>
<th>Area of residence</th>
<th>7 years of age</th>
<th>9 years of age</th>
<th>11 years of age</th>
<th>Oral hygiene index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban area</td>
<td>1.72</td>
<td>1.82</td>
<td>1.42</td>
<td></td>
</tr>
<tr>
<td>Rural area</td>
<td>2.80</td>
<td>2.80</td>
<td>2.70</td>
<td></td>
</tr>
</tbody>
</table>
The most significant reason for developing caries is a lack of oral hygiene and it is not getting better even in older age groups. Therefore, education on oral hygiene and oral health is equally poor in all age groups of children. Oral health is strongly connected with many other diseases (like rheumatic disease) and it is proved that a prevention is better and cheaper than a treatment; it is especially true in the postwar period in Bosnia and Herzegovina when poor economy is still present (23).

REFERENCES


