RELATIONSHIP BETWEEN LEVELS OF STREPTOCOCCUS MUTANS AND SOCIOECONOMIC STATUS OF SCHOOLCHILDREN IN IASI, ROMANIA

Livia Ionela Bobu, Lucia Bârlean*, Magda Bârlean
“Grigore T. Popa” University of Medicine and Pharmacy Iasi
Faculty of Dental Medicine
Department of Surgery (I)
*Corresponding author. E-mail: lucba53@yahoo.com

RELATIONSHIP BETWEEN LEVELS OF STREPTOCOCCUS MUTANS AND SOCIOECONOMIC STATUS OF SCHOOLCHILDREN IN IASI, ROMANIA (Abstract). Aim: To evaluate the dental and salivary level of Streptococcus Mutans among Iasi schoolchildren in relationship with their family socioeconomic status. Material and methods: This cross-sectional study included 533 schoolchildren aged 7-12 years from Iasi town. The level of Streptococcus Mutans on dental surfaces (mesial and occlusal surfaces of the molars 1.6 and 3.6) and in saliva was assessed using Dentocult® SM Strip mutans kits (Orion Diagnostica Oy) according to manufacturer’s instructions. Subjects were given one of the following scores: 0 = <10⁴ CFU/ml; 1 = <10⁵ CFU/ml; 2 = 10⁵–10⁶ CFU/ml; 3 = > 10⁶ CFU/ml. Parental occupation, income and number of children in the family were considered for the assessment of the socioeconomic status. Results: Score 0 was predominant both in saliva and on the mesial and occlusal surfaces of first permanent molars of children of high socioeconomic status. Scores 2 and 3 were predominant in children of medium socioeconomic status, while score 3 was predominant on dental surfaces and in the saliva of children of low socioeconomic status. Conclusions: Children from families with low socioeconomic status have a higher prevalence of increased levels of Streptococcus Mutans, as compared to children from families with high socioeconomic level, underlining the need for complex prevention programs that should reduce inequalities in children oral health status caused by socioeconomic factors. Keywords: SCHOOLCHILDREN, STREPTOCOCCUS MUTANS, SOCIOECONOMIC STATUS.

Pointing out the risk factors for oral diseases enables the identification of their role in oral health. Knowledge about the population distribution of those factors is an essential step in developing preventive strategies and in planning preventive oral healthcare services.

Numerous studies have shown the correlation between parental social status and oral health status of children. In Romania, despite the fact that all children receive free dental services through the National Health Insurance, there are marked inequalities in oral health. Besides the social aspects, parents' oral health education level plays an important role.

The aim of the present study was to comparatively evaluate the dental and salivary level of Streptococcus Mutans (SM) among schoolchildren in Iasi town,
Relationship between levels of streptococcus mutans and socioeconomic status of schoolchildren in Iasi, Romania

depending on the socio-economic status (SES) of their families.

MATERIAL AND METHODS

The cross-sectional, clinical and microbiological study was conducted between May 2015 and September 2016. The following criteria were considered for the selection of the study sample: children aged 7 to 12 years; children attending schools in various districts of Iasi town; schools in which a dental office was available. The sample was selected using the probabilistic method and included 533 children (50.47% males and 49.53% females). Clinical examinations were performed in the dental offices of the selected schools.

The level of $SM$ on dental surfaces (mesial and occlusal surfaces of the molars 1.6 and 3.6) and in saliva was assessed using Dentocult® SM Strip mutans kits (Orion Diagnostica Oy), according to manufacturer’s instructions. For the assessment of dental $SM$ level, special tips were used to obtain bacterial plaque samples, which were subsequently spread on the four sites of the square-tipped strips. For salivary $SM$ evaluation, the patient was invited to chew a paraffin pellet for 1 minute, then the rough surface of the round-tipped strip was pressed against the saliva remaining on patient’s tongue. The two strips were then placed in the selective culture broth; the vials were incubated at 35-37°C for 48 h; after incubation, the density of the grown colonies was compared to the chart provided by the producer, according to the following scores: $0 = <10^4$ CFU (colony-forming unit)/ml; $1 = <10^5$ CFU/ml; $2 = 10^5 - 10^6$ CFU/ml; $3 = > 10^6$ CFU/ml.

Tests were performed at least 1 h after eating and toothbrushing, in a distinct dental visit and not during a treatment session; patients on antibiotic therapy during the last month before testing were excluded.

The socioeconomic status of the family (SES), established as low, medium or high, was assessed considering parents’ occupation, income and number of children in the family. A balanced distribution of the subjects belonging to the three socioeconomic levels was ensured in the study sample.

Children participation in the study was conditioned by parental written consent. Children also had the opportunity to accept or refuse participation.

Data privacy as well as the impossible identification of subjects in the case the results are published were guaranteed.

SPSS 17.0 was used for the statistical analysis of data. The statistical significance threshold $p$ was set at 0.05; chi-square test was used for data comparison and correlation analysis was performed using Spearman test.

RESULTS

Analysis of data obtained from the bacteriological tests for the evaluation of dental levels of $SM$ indicated that score 3, meaning a density of more than $10^6$ CFU/ml was predominant both on the mesial surfaces of 1.6 and 3.6 and on the occlusal surfaces of the same teeth.

Comparative evaluation depending on SES indicated significant differences in $SM$ number; on the dental surfaces, such differences were observed particularly on the mesial surfaces of first permanent molars (1.6) (tab. I). Score 0 was predominant in children of high SES (48.8%) and score 2 prevailed in children of medium SES (35.1% for upper teeth 1.6 and 36.8% for lower teeth 3.6) and score 3 - in the group of low SES (56.2% and 63.6%, respectively).
Chi-square statistical test showed that the differences were statistically significant at a threshold of 0.01, and the correlation between SM number on the mesial surfaces of first permanent molars (1.6) and SES was strongly inversely proportional (Spearman coefficient $r = -0.510$ and $r = -0.539$, respectively).

Such differences, but slightly reduced, were observed in the number of SM on the occlusal surfaces (tab. II): score 0 was predominant in children of high SES (47.1%), while score 3 prevailed in children of low and medium SES (58.5%, 56.2% and 44.3%, 35.7%, respectively).

Differences remained statistically significant ($p <0.01$) and the correlation between the number of SM on the occlusal surfaces of first permanent molars (1.6) and SES was still inversely proportional, but moderate ($r = -0.456$ and $r = -0.471$, respectively).

Among the most important differences in caries risk factors between children of different socioeconomic levels were those in the number of salivary SM (tab. III); nearly 50% of the subjects of high SES presented score 0, while in those of low SES scores 2 and 3 were predominant (29.5% and 54%, respectively).

### TABLE I

Children distribution (%) depending on *Streptococcus Mutans* scores on mesial surfaces of the teeth and socioeconomic status

<table>
<thead>
<tr>
<th>Score</th>
<th>Situs Mesial surface 1.6</th>
<th>Situs Mesial surface 3.6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low SES</td>
<td>Medium SES</td>
</tr>
<tr>
<td>0</td>
<td>10.8</td>
<td>21.1</td>
</tr>
<tr>
<td>1</td>
<td>4.5</td>
<td>12.4</td>
</tr>
<tr>
<td>2</td>
<td>28.4</td>
<td>35.1</td>
</tr>
<tr>
<td>3</td>
<td>56.2</td>
<td>31.4</td>
</tr>
</tbody>
</table>

### TABLE II

Children distribution (%) depending on *Streptococcus Mutans* scores on occlusal surfaces and socioeconomic status

<table>
<thead>
<tr>
<th>Score</th>
<th>Situs Occlusal surface 1.6</th>
<th>Situs Occlusal surface 3.6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low SES</td>
<td>Medium SES</td>
</tr>
<tr>
<td>0</td>
<td>10.8</td>
<td>21.1</td>
</tr>
<tr>
<td>1</td>
<td>1.7</td>
<td>15.1</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>19.5</td>
</tr>
<tr>
<td>3</td>
<td>58.5</td>
<td>44.3</td>
</tr>
</tbody>
</table>

### TABLE III

Children distribution (%) depending on *Streptococcus Mutans* salivary scores and socioeconomic status

<table>
<thead>
<tr>
<th>Score</th>
<th>Low SES</th>
<th>Medium SES</th>
<th>High SES</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10.8</td>
<td>21.1</td>
<td>48.8</td>
</tr>
<tr>
<td>1</td>
<td>5.7</td>
<td>15.1</td>
<td>24.4</td>
</tr>
<tr>
<td>2</td>
<td>29.5</td>
<td>38.9</td>
<td>23.8</td>
</tr>
<tr>
<td>3</td>
<td>54</td>
<td>24.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>
Chi-square analysis indicated statistically significant differences (p <0.01). Spearman correlation coefficient showed an inverse, strong correlation: \( SM \) salivary level increases as SES decreases (\( r = -0.521 \)).

**DISCUSSION**

One of the greatest challenges of public health systems in the XXI century is represented by detecting and reducing inequalities in oral health status of the population (1, 2). Reasons for disparities in oral health are complex. There are differences caused by biological factors (e.g. gender, age), their existence being normal and unavoidable in a balanced society.

However, there are avoidable inequalities that are unacceptable in modern society, caused mainly by socioeconomic differences (3). Studies have shown that, over the last decade, differences in health between individuals of high and low socioeconomic level have increased (4).

Given these considerations, the present study analyzed the influence of the family socioeconomic level on the salivary and dental level of \( SM \). Comparative assessment and use of statistical correlation tests showed that there were statistically significant inequalities in terms of \( SM \) density caused by SES. Among high SES children, score 0 of \( SM \) density was predominant both in saliva and on the mesial and occlusal surfaces of first permanent molars (1.6). Scores 2 and 3 were predominant in medium SES children, while score 3 of dental and salivary \( SM \) prevailed among low SES subjects.

Of the four major categories of factors that influence oral health (environmental factors, biological factors, behavioral factors and dental care system), social environmental factors have the greatest impact (5). The results of the present study confirm it by the evident differences in \( SM \) levels according to the socioeconomic level.

The most plausible explanation for these discrepancies is the behavioral differences related to oral hygiene habits and healthy diet. Although behaviors towards oral health, including various types of behavior, cannot be influenced by the same social and economic variables, two of the most important behaviors in terms of etiology of dental caries, i.e. brushing and sugar consumption are directly correlated with income level, educational level and occupational status (6). High SES individuals usually have a higher level of oral health knowledge and good oral health behaviors, mainly due to the improved access to information means (7). In addition, their income allows them to access more expensive hygiene products and healthy foods.

Results consistent with those obtained in this study were highlighted by other studies in the literature. In a study that assessed oral colonization of small children with \( SM \) it was found that mothers of children infected with this microorganism showed increased levels of salivary \( SM \), poor oral hygiene and a low socioeconomic level (8, 9).

Parental educational level plays an important role in oral hygiene status of their children and, thus, in the level of cariogenic microorganisms. Studies conducted in this regard have shown higher \( SM \) levels among adolescents from families with low education level (7).

The impact of SES on the level of cariogenic microorganisms is further reflected in the level of dental caries. Numerous studies showed that lower-class children experience more caries. Children of highly educated, professional and high income parents are at lower risk for dental caries (10).
Socioeconomic level impacts on many of the healthy oral behaviors. The more likely they visited a dentist for routine checkup, the higher the SES, the less frequently they had sweets, and the lower the SM level, the more likely they were caries-free and the less likely they were to have a high DMFT (11).

Contamination with SM increases the risk of caries development. However, this risk can be partially offset by other factors, with protective role, including good oral hygiene and non-cariogenic diet. On their turn, these factors can counterbalance each other, meaning that cariogenic diet does not necessarily lead to the emergence of caries, provided that rigorous oral hygiene is ensured (12).

CONCLUSIONS
Children from low SES families have a higher prevalence of increased Streptococcus Mutans levels, as compared to children from high SES families, underlining the need for complex prevention programs that should reduce inequalities in children oral health status caused by socioeconomic factors.

REFERENCES