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DENTAL HEALTH STATUS IN CHILDREN WITH TYPE 1 DIABETES MELLITUS IN MONTENEGRO

DENTALNO ZDRAVLJE KOD DJECE SA DIJABETES MELLITUS-OM TIP I U CRNOJ GORI

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Abstract

Background/Aim. The number of children with diabetes is constantly increasing. The aim of this study was to evaluate oral health in children with type 1 diabetes mellitus compared to healthy children. Methods. The study included 177 patients aged 10-15 years, divided into two groups. Group T1DM, made up of children with type I diabetes mellitus. Control group was healthy children. The dental health was assessed using the DMFT index. The Plaque Index (PI) according to Silness-Löe and the Calculus Index (CI) by Green were used to determine oral hygiene. Salivary status involved determining the amount of secreted stimulated saliva and buffer capacity of the same patient. Results. In terms of average values of DMFT index of permanent teeth, there were no statistically significant differences in study groups. A significant difference in PI value in group T1DM (1.29 ± 0.56) and control group (1.01 ± 0.50) was observed (p =0.001). Also, a significant difference in CI value in group T1DM (0.09 ± 0.23) and in control group (0.03 ± 0.14) was observed (p=0.047). The average amount of secreted stimulated saliva for diabetic children was significantly lower (0.99 ± 0.14 ml/min), compared to healthy children (1.06 ± 0.20 ml/min; p=0.020).

Conclusion: Children with type 1 diabetes mellitus have no more diseased teeth; however, they have more dental plaque, dental calculus and lower saliva than children in the control group. Also, our results point to the absence of preventive measures and programs in Montenegro.

Key words: children; type 1 diabetes mellitus; caries, oral hygiene; saliva.

Apstrakt

Löe i Indeks zubnog kamenca po Green-u (CI). Salivarni status je podrazumevao određivanje količine izlučene stimulisane pljuvačke i puferski kapacitet iste pacijenata. **Rezultati.** U pogledu prosečnih vrednosti indeksa KEP stalnih zuba nije bilo statistički značajnih razlika između obolele i zdrave dece. Uočena je značajna razlika u vrednostima PI grupe T1DM (1,29±0,56) i kontrolne grupe (1,01±0,50; p=0,001). Takođe je uočena značajna razlika u vrednostima CI grupe T1DM (0,09±0,23) i kontrolne grupe (0,03±0,14; p=0,047). Prosečna količina izlučene stimulisane pljuvačke za obolele decu bila je značajno niža i iznosila je 0,99±0,14ml/ min, u odnosu na zdravu decu (1,06±0,20 ml/min; p=0,02). **Zaključak.** Deca obolela od dijabetes mellitus-a tip 1 u CG nemaju više obolelih zuba, ali imaju više dentalnog plaka, zubnog kamenca i manji protok pljuvačke u odnosu na decu iz kontrolne grupe. Takođe, naši rezultati upućuju na nepostojanje preventivnih mera i programa u Crnoj Gori.

**Ključne riječi:** deca; dijabetes mellitus tip 1; karijes; oralna higijena; pljuvačka.

**Introduction**

Diabetes mellitus (DM) is a metabolic disorder caused by an absolute or functional insulin deficiency. Type 1 diabetes mellitus (T1DM) is a common metabolic disease of childhood\(^1\,^2\). The main characteristic of childhood diabetes is unstability, variability, sudden changes in blood glucose levels from day to day, and changes that occur during growth and development.

The increase in the incidence of diabetes in childhood reaches a worrying situation, so that the 21\(^{st}\) century epidemic can rightfully be discussed. The occurrence of the incidence is greatest in the population up to 14 years old, equally among ill boys and girls. The incidence of Type 1 diabetes mellitus (T1DM) decreases from north to south Europe and is highest in children aged 0-14 years in the Scandinavian countries. Compared to other countries of the former Yugoslavia, Montenegro has the highest incidence of diabetes mellitus type 1 in the age group 0-14 years and is 18.6 per100000 \(^1\,^2\).

A significant influence of this disease is on oral health, as has been shown by numerous studies \(^3\)-\(^6\). The most common complications in oral health in diabetes mellitus are changes in the tissues of periodontum (periodontitis and gingivitis) salivary dysfunction, xerostomia, changes in salivary composition, oral mucosal diseases, taste dysfunction, oral lichen planus, skin hyperpigmentation, infection by Candida albicans, dental caries,
odontogenic abscesses and tooth loss. In 1993, periodontal diseases were identified as the sixth complication of diabetes, and four years later it has been listed as one of the pathologic states diagnosed in these patients (Expert Commitment on the Diagnosis and Classification of Diabetes Mellitus).

The relationship between DM with dental caries has not yet been clarified. Dental caries can be defined as an infectious and easily transmissible disease caused by a specific bacterial infection. Saliva, with numerous exogenous and endogenous factors, is considered an important factor in the etiology of dental caries. Reduced salivary flow rate, and consequently reduced salivary clearance, can lead to dental caries development as well as various other disorders of mucosal lining of the oral cavity. Reducing the flow rate modifies the puffer's salivary effect resulting in reduced resistance to dental plaque microorganisms and can present favorable conditions for dental caries development in these patients. On the other hand, restricted sugar intake, can slow the development of dental caries in diabetics. Plaque control and fluoride use is very important in the prevention of dental caries and periodontal disease. Brushing teeth with fluoride paste is a professional recommendation at least twice a day. However, children usually, do not follow these recommendations.

Accordingly, we aimed to evaluate the dental health status in children with T1DM compared to healthy subjects in Montenegro.

Methods

The study was designed as an academic cross-sectional study and was carried out in the period from June 2014 to December 2015. The study was conducted in accordance with the Helsinki Declaration and principles of Good Clinical Practice. The study protocol was approved by the Ethical Committe of the Clinical Center of Montenegro in Podgorica (No. 03-5/23).

One dental team is qualified and calibrated for clinical measurements, regardless of experience. The reliability of the inspection criteria was measured by a pre-test performed on a group randomly selected 20 schoolchildren (10 children with T1DM and 10 healthy children) aged 10-15 years. Inter-rater agreement was measured by the Cohen kappa index. Kappa values evaluated after the study for inter-rater agreement amounted to 0.94.

Subjects
The study was conducted in 177 children including 87 children with type 1 diabetes mellitus (48 boys and 39 girls) aged 10–15 years, who were treated at the Institute of Child Diseases of the Clinical Center of Montenegro. All diabetic children were treated with insulin. Insulin was dosed according to individual patient needs (0.7-1.3 IU/kg/24h). These children constituted one group of the respondents. The parents of the affected children were fully acquainted with the research protocol. Only children whose parents have given their signature their consent were included in the study.

Children with type 1 diabetes mellitus were examined in the dental offices of the Faculty of Medicine-study program Dentistry in Podgorica; after regular control of endocrinologists in the presence of parents. From the medical documentation of patients, data on the value of glycosylated hemoglobin (HbA1c) were obtained not older than six days. The exclusion criteria for this group with type 1 diabetes were the presence of other systemic disorders unrelated to the complications of diabetes.

The control group aged 10–15 years included 90 healthy children (47 boys and 43 girls) with absence of active diseases and no history of drug therapy, selected by random sample method, from elementary schools in the municipality of Podgorica. The school principal, school staff and parents were informed with the research protocol. The realization of the study started after receiving the written consent of the principal and parents' signatures. These children were examined in school dental offices in the presence of parents, in a period that did not interfere with their regular teaching.

General exclusion criteria for all participants were: need for antibiotic prophylaxis and children who refused to cooperate. The patients and their families lived in the same geographic area.

Questionnaire

The parental questionnaire consisted of two parts. Part 1 included questions on socioeconomic data (municipality, school, grade, gender, date of birth, parents’ education and employment, parents marital status, number of children at home, family income). The second part was focused on children, including questions about their oral hygiene habits (the frequency of tooth brushing and the use of fluoride toothpaste). The questionnaire is in attachment 1.
Also the socioeconomic status estimate was implemented. Socioeconomic status is classification: low, moderate, or high, according to the household income, with nationally defined cutoffs according to Eurostat. After examining, every child was trained to properly brush his teeth.

**Dental Examination**

The dental caries status of permanent teeth was registered using the DMFT system (D-Decayed, M-Missing, F-Filled) according to WHO standards. Caries was diagnosed with an inspection with the use of standard dental diagnostic instruments. Clearly visible lesions with cavity formed on the surface of the tooth are registered as dental caries, while changes in transparency or initial demineralization of the eyes with an intact surface, without cavitation registered as healthy teeth. The oral hygiene was assessed using the Plaque Index (PI) according to Silness-Löe which determines the absence, or the presence, quantity and distribution of dental plaque and other soft deposits on teeth as well as the Calculus Index (CI) by Green which determines the absence, or the presence of dental calculus on the teeth.

**Saliva Collection**

The children involved in the study were healthy and did not undergo antibiotic therapy for at least 15 days until taking a saliva or any other therapy (other than anti-diabetic for patients suffering from the disease) and were not in the process of tooth repair during saliva sampling. Investigations were carried out on samples of total stimulated saliva taken at least two hours after the last meal (between 10-11 a.m.).

The Dentobuff Strip System (Orion Diagnostics, Espoo, Finland) was used to determine the amount of stimulated saliva and buffer capacity. Samples of saliva were collected by giving medical paraffin to children, who chewed them to induce stimulation and spontaneously spit in a graduated plastic bowl for a period of 5 minutes. The measurement did not include foam formed during shrinkage. After that, the readout value was divided by the number five, and thus the amount of stimulated secretion of saliva in one minute (ml/ min) is obtained. Then one drop of saliva was applied to the test strip. After five minutes, the test strip changed color and buffer capacity of saliva was recorded. The results of the saliva buffer capacity of diabetic children were compared with control group. The scoring, or the results of the buffer capacity of the saliva, was carried out as follows:
0-blue color; the test strip is currently turned into this color; indicates a very high buffering capacity (pH>6)
1-blue color; the test strip changed colors within 5 min; indicates a high buffering capacity (pH=6)
2-green color; represents a mean buffer capacity (pH=4.5-5.5).
3-yellow color; represents a low buffering capacity (pH=4, or less than 4)
The blue color; of the test strip, that is, the values 0 and 1, indicated a high buffering capacity °.

Statistical Analysis

Statistical data processing was done in SPSS v.11.5 for Windows (SPSS Inc., Chicago, IL, USA). Methods of descriptive and analytical statistics were used to describe the results. The descriptive statistical methods used were: mean value, standard deviation and percentages. Student's t-test and $\chi^2$ test were used to test statistical significance in the average values between two independent samples. P values of less than 0.05 were considered statistically significant.

Results

Subjects Characteristics

A total of 177 children (95 boys and 85 girls) aged 10-15 years participated in the research. The average age of children suffering from diabetes was 12.7±1.6, while the average age of children from the control group was 12.8±1.6. The disease lasted from 4.44±2.02 years from the moment of diagnosis. The mean glycosylated hemoglobin value in the diabetics was 9.9±1.7%, reflecting an inadequate control of their diabetes. Of those, seventy-five percent had glycosylated hemoglobin higher than 8%.

All the examined children brushed their teeth with fluoridated toothpaste. Only 33.3% of patients with T1DM and 31.1% of respondents from the control group brushing their teeth twice a day or more often ($\chi^2$ test, p>0.05). Socioeconomic family statuses were similar for both groups ($\chi^2$ test, p>0.05). Oral hygiene habits and socioeconomic status in the study groups is shown in Table 1.

Dental Examination

The percentage of children with all healthy teeth in the T1DM group was 4.6%, while the number of children affected by illness with permanent teeth was 83 (95.4%). In the control group, the percentage of children with diseased permanent teeth was slightly lower
compared to the group of children with diabetes mellitus (92.2%), and the number of children with all healthy teeth was 7 (7.8%). Testing the results did not show statistically significant differences in the values of this index (Student's t-test, p>0.05).

The average value of DMFT was almost identical for both groups and its was 4.3. The average values of caries, extracted and filled teeth were very similar in both groups (p>0.05, Student's t-test).

The distribution of the DMFT index is shown in Table 2.

In the structure of DMFT, both groups dominated the filled teeth. The percentage of caries and extracted teeth was slightly higher in the control group (Table 3). There were no significant differences found in the values of the DMFT components (χ² test, p>0.05).

Oral hygiene

Children with diabetes had significantly more average values of the Plaque Index (p=0.001, Student's t-test) and Calculus Index (p=0.047, Student's t-test) compared to healthy children. These values are shown in Table 4.

Saliva

The mean value stimulated salivary flow for children with diabetes was significantly lower (0.99±0.14 ml/min) compared to children in the control group (1.06±0.2 ml/min; p=0.020, Student's t-test). The average buffer capacity of saliva value for diabetic children was somewhat higher than the control group, but there was no statistical significance (p=0.652, Student's t-test), (Table 4).

In the group patients with T1DM, the highest percentage of children examined (44.8%) had high buffering capacity of saliva (grade 1), and only 5.7% of subjects had low buffering capacity of saliva. The highest percentage of children (44.4%) in the control group had a high buffering capacity of the saliva. The difference between observed groups was not statistically significant (χ² test, p>0.05). Other values of saliva buffer capacity are shown in Table 5.

Discussion

This study examined the relationship between diabetes mellitus type 1 in schoolchildren and the condition of oral health. We believe that this is the first study dedicated to this topic in Montenegro.

Dental caries is the ultimate result of a complex, dynamic multifactorial effect. Some factors may increase the risk of developing dental caries in diabetes and others may reduce
Reduced salivation, accelerated accumulation of dental plaque and increased frequency of meals in diabetics are factors that could increase the risk of developing dental caries. On the other hand, reduced consume of fermentable carbohydrates and well-balanced diet are factors that could slow the development of dental caries. Bearing in mind these facts, it is logical that numerous studies devoted to the impact of diabetes on the appearance of dental caries have shown contradictory results. Findings of individual studies indicate an increased prevalence of dental caries, especially in patients with poorly controlled disease, while others find no differences between people suffering from diabetes mellitus and a healthy population. Studies conducted in Portugal, Brazil, Egypt, and Iran did not find the correlation between these two diseases. In contrast to their results, higher incidence of dental caries in children with DM has been determined by studies carried out in Kuwait, Bosnia, and India.

The results of this study indicate a high percentage of children with diseased permanent teeth in our control group (92.2%). In accordance with the WHO criteria, the average value of the DMFT control group is considered high. These results point to the absence of preventive measures and programs in Montenegro, so it is necessary to form a strategy for controlling dental caries.

In our study, the percentage of children with DM with all healthy teeth in the Montenegro was slightly lower than the control group, which was expected. Namely, in these children, we established a significantly worse condition of oral hygiene and significantly lower average values of the stimulated salivary secreted. The lower buffer capacity of saliva was observed in diseased children. The occurrence of salivary glycoside, the increase in its viscosity, the salivary gland dysfunction, and dry mouth in this disease favor a faster accumulation of dental plaque and the formation of calculus.

Accordingly, our respondents with DM had significantly more calculus deposits on the teeth compared to the subjects of the control group. The results of our research are generally in agreement with the results of studies conducted by Orbak in Turkey, Dakovic in Serbia, Del Vale in Puerto Rico. In patients with insulin-dependent diabetes, hyposalivation was confirmed. Reduced secretion of saliva reduces its bactericidal role. This creates a disposition for an oral infection. Increased saliva density increases the concentration of enzymes. This enhances fermentation and leads to acidosis. Increased acidity in the mouth causes changes in the biofilm structure and makes it easier to colonize streptococci and
lactobacilli, thereby increasing the risk of dental caries\textsuperscript{31,32}. In contrast, the results of our study did not find an association between the amount of salivation and dental caries prevalence. Similar observations were found previously\textsuperscript{20,33}. Namely, the average value of the DMFT index of 4.3 was almost identical for both of the investigated groups. The explanation of this statement lies in the etiology of dental caries that arises as a result of the interaction of three primary factors: host (tooth), causative agent (microorganism) and environment (nutrition, substrate) in function of time. Also, the use of fluoride, nutrition, social factors, habits and behavior of patients of great importance. In addition, the results of our research show that most children from both groups brush their teeth with fluoride paste at least once a day and they had very similar oral hygiene habits. Similar findings have also been found by Lai\textsuperscript{33}. Also, the participants of our research were very similar to socioeconomic status, which could explain the same values of the DMFT index.

After analyzing the individual components of DMFT, no significant differences were found between the comparing groups. The filled teeth dominated both of the observed groups, but the ratio of dental caries and tooth fillings was a bit better in the group of diabetics. A slightly better structure of DMFT in diabetic children in Montenegro can be explained by the relatively good cooperation between pediatricians and dentists.

Similar oral hygiene habits in both study groups indicate the necessity of implementing oral health education with children and their parents. Effective removal of dental plaque is very important for good oral health. It is therefore necessary to apply this knowledge to the promotion of oral health at the individual and social level\textsuperscript{34,35}.

The relationship between diabetes mellitus and oral disease is not only at the level of clinical signs of illness, but at the level of inflammatory mediators, especially those occurring in autoimmune processes\textsuperscript{3,4,27}. Regular dental appointments for guidance, dental plaque control, fluor prophylaxis, fissure sealing, well-balanced diet, glycemic control, will certainly contribute to improving both oral and overall health\textsuperscript{35}.

Although our study has some limiting factors, such as a small number of subjects, a small number of diabetics with good glycemic control in order to relate this variable to the patient's oral health; it provides significant data on the condition of oral health of children with T1DM in Montenegro. Also, the study points to the importance of additional salivary analysis in assessing the state of oral health.
Conclusion

The results of these studies indicate that children with type 1 diabetes mellitus have no more diseased teeth; however, they have more dental plaque, dental calculus and lower saliva rate than children in the control group. The high average value of DMFT for both groups points to the absence of preventive measures and curative-oriented dental policy in Montenegro. It is highly necessary to propose a plan of preventive activities aimed at educating diseased children and the application of prophylactic measures at the individual level in dental offices.

REFERENCES


Table 1. **Oral hygiene habits and socioeconomic status in the study groups**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T1DM (%)</th>
<th>Control group (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D group</td>
<td>K group</td>
<td></td>
</tr>
<tr>
<td>Daily brushing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 daily</td>
<td>66.7</td>
<td>68.9</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>≥2 daily</td>
<td>33.3</td>
<td>31.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Using fluoridated toothpaste</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>22.9</td>
<td>21.1</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Medium/High</td>
<td>77.1</td>
<td>78.9</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

T1DM – a group of children with type I diabetes mellitus; Control group - a group of healthy children.

No statistical significance χ² test, p>0.05
Table 2. The arithmetic mean and standard deviation (SD), the values of DMFT components and DMFT index in the observed groups

<table>
<thead>
<tr>
<th>Index</th>
<th>T1DM (mean±SD)</th>
<th>min-max</th>
<th>Control group (mean±SD)</th>
<th>min-max</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>1.66±1.58</td>
<td>0-6</td>
<td>1.96±1.47</td>
<td>0-6</td>
<td>0.190</td>
</tr>
<tr>
<td>M</td>
<td>0.20±0.48</td>
<td>0-2</td>
<td>0.26±0.49</td>
<td>0-2</td>
<td>0.427</td>
</tr>
<tr>
<td>F</td>
<td>2.45±1.59</td>
<td>0-7</td>
<td>2.11±1.52</td>
<td>0-8</td>
<td>0.148</td>
</tr>
<tr>
<td>DMFT</td>
<td>4.30±1.79</td>
<td>0-8</td>
<td>4.33±1.99</td>
<td>0-9</td>
<td>0.866</td>
</tr>
</tbody>
</table>

T1DM – a group of children with type I diabetes mellitus; Control group - a group of healthy children  
DMFT – (Decay, Missing, Filled Teeth)

Table 3. Structure of DMFT expressed in percent in the study groups

<table>
<thead>
<tr>
<th>Index</th>
<th>Parameters of DMFT</th>
<th>T1DM (%)</th>
<th>Control group (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>38.5</td>
<td>45.4</td>
<td></td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>DMFT</td>
<td>M</td>
<td>4.8</td>
<td>5.9</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>56.7</td>
<td>48.7</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
T1DM – a group of children with type I diabetes mellitus; Control group - a group of healthy children; DMFT – (Decay, Missing, Filled Teeth);

No statistical significance $\chi^2$ test; $p>0.05$.

Table 4. The arithmetic mean and standard deviation (SD), the values of Plaque Index (PI), Calculus Index (CI), stimulated salivary flow and buffer capacity saliva in the study groups

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T1DM (mean±SD)</th>
<th>Control group (mean±SD)</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min-max</td>
<td>min-max</td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>1.29±0.56*</td>
<td>1.01±0.50*</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>0.12-2.63</td>
<td>0.11-2.12</td>
<td></td>
</tr>
<tr>
<td>CI</td>
<td>0.09±0.23*</td>
<td>0.03±0.14*</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>0.00-1.16</td>
<td>0.00-1.16</td>
<td></td>
</tr>
<tr>
<td>Salivary flow ml/min</td>
<td>0.99±0.14*</td>
<td>1.06±0.20*</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>0.70-1.60</td>
<td>0.70-1.70</td>
<td></td>
</tr>
<tr>
<td>Buffer capacity saliva</td>
<td>1.35±0.77</td>
<td>1.29±0.85</td>
<td>0.652</td>
</tr>
<tr>
<td></td>
<td>0-3</td>
<td>0-3</td>
<td></td>
</tr>
</tbody>
</table>

T1DM – a group of children with type I diabetes mellitus; Control group - a group of healthy children; Salivary flow ml/min - the amount of stimulated secretion of saliva in 1 minute (ml/min)

*statistical significance Student's t-test

Table 5. Buffer capacity of the saliva expressed in percent in the study groups

<table>
<thead>
<tr>
<th>Buffer capacity saliva</th>
<th>T1DM (%)</th>
<th>Control group(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>12.7</td>
<td>16.7</td>
</tr>
<tr>
<td>1</td>
<td>44.8</td>
<td>44.4</td>
</tr>
<tr>
<td>2</td>
<td>36.8</td>
<td>31.1</td>
</tr>
<tr>
<td>3</td>
<td>5.7</td>
<td>7.8</td>
</tr>
</tbody>
</table>
No statistical significance $\chi^2$ test; $p > 0.05$.

T1DM – a group of children with type I diabetes mellitus; Control group - a group of healthy children;
0- indicates a very high buffering capacity (pH> 6)
1- indicates a high buffering capacity (pH= 6)
2- represents a mean buffer capacity (pH= 4.5-5.5).
3- represents a low buffering capacity (pH= 4, or less than 4)

Attachment 1

Questionnaire

Answer the questions by filling out the number of answers or enter the 'X'.

General data

Name and surname of the child

Day, month, year and place of birth

Gender

School

Grade

Adress

Municipality
Part 1

1. Paternal education
   a) No education
   b) Elementary school
   c) Secondary school
   d) College
   e) University

2. Maternal education
   a) No education
   b) Elementary school
   c) Secondary school
   d) College
   e) University

3. Paternal employment
   a) Employed
   b) Unemployed

4. Maternal employed
   a) Employed
   b) Unemployed

5. Family income in the last month

6. Number of siblings

7. Number of family members

8. Child living with
   a) Both parents
   b) Mother
   c) Father
   d) Custody

Part II
9. The child brushes the teeth
   a) Only in the morning
   b) Only in the evening
   c) In the morning and in the evening
   d) After each meal
   e) Not brushing every day
10. The child brushes his teeth with fluoride paste
   a) Yes
   b) No