STUDY OF ODONTAL LESIONS AND THEIR ASSOCIATION WITH FOOD DIET IN CHILDREN BETWEEN 7 AND 16 YEARS FROM DOLJ COUNTY, CRAIOVA

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ABSTRACT

The aim of this study was to assess the level of odontal lesions to permanent and temporary teeth in a group of school-aged children and to identify the determining factors of odontal lesions in relation to children's diet. **Material and method**. The study group included 200 children, 78 girls (representing 39% of the entire study group) and 122 boys (representing 61%), aged between 7 and 16 years old, with a mean age of 12.3 ± 3 years. The majority of participants were from urban areas (190 children, representing 95%), while the remaining 10 children (5%) were from rural areas. The data were statistically processed, and the results were considered significant, and important results for this study were centralized. **Results.** A total of 614 teeth with lesions were identified, 560 being permanent teeth and 54 being temporary teeth. For permanent teeth: 171 (30.54%) in the first quadrant (majority 1.6 and 1.7), 120 (21.43%) in the second quadrant (majority 2.6 and 2.7), 125 (22.32%) in the fourth quadrant (majority 4.7 and 4.6) and 144 (25.71%) in the third quadrant (majority 3.6 and 3.7). For temporary teeth: 14 (25.93%) in the first quadrant (5.5 and 5.4), 10 (18.52%) in the second quadrant (6.5 and 6.4), 16 (29.63%) in the fourth quadrant (8.5 and 8.4), 14 (25.93%) in the third quadrant (mostly 7.5). **Conclusions.** Dental caries was present for most children included in the study group. Statistically significant associations were found with the consumption of acidic drinks, pre-meal sweets, juices, and energy drinks. The number of teeth with class I caries increases with age.

Key words: odontal lesions, diet, school children, prevention

INTRODUCTION

Oral health is an integrated part of general health and, according to the resolution adopted in May 2021 by the General Assembly of the World Health Organization (World Health Assembly), it is a global priority issue (1).

According to recent studies, the majority of the population suffers from dental diseases in both permanent and temporary dentition. The most frequent dental diseases are tooth decay of the permanent teeth (2).

Tooth decay occurs when bacteria form biofilm-like bonds, and lead to a decrease in the pH of the plaque. The low pH, as a result of carbohydrate fermentation, becomes acidic. When the pH value of the tooth surface decreases, the surface dissolution of hydroxyapatite crystals occurs, a process

known as demineralization. Constant exposure to acidic pH causes demineralization lesions and the progress of those lesions forms the tooth decay (3).

The interdependent relationship between fermentable carbohydrates and caries was first documented in the literature around 1950.

An important aspect of sugar consumption, according to the Vipeholm study, is the frequency of sugar intake as well as the consistency of sugar-containing foods (4).

In most cases, we found several interacting risk factors for each child, such as bad oral hygiene combined with a cariogenic diet. Those risk factors lead to dental disease (5).

One of the most common chronic childhood diseases is dental caries. Both caries and its subsequent complications are the main reason for requiring dental treatment in children.

Dental carious lesions, dental pulp lesions and periapical lesions, dental trauma, developmental defects of enamel are the most common dental diseases in children that are strongly related to food diet (6).

Localized enamel defects (DEDs) can be quantitative (hypoplasia) or qualitative (hypomineralisation) and can affect both primary and permanent dentition (7).

Many local or general factors can influence the constant demineralization and remineralization of tooth enamel, including bacteria (especially *Streptococcus Mutans*), sugar, saliva, and fluoride. If the oral balance is disturbed, a demineralization lesion can develop into a carious lesion (8).

The increased incidence of caries in children is associated with vicious eating habits and poor oral hygiene, in addition to the anatomical characteristics of temporary and permanent teeth (6).

Frequent consumption of fizzy drinks, sweets and bakery is associated with an increased frequency of dental cavities. In this sense, a diet with foods and drinks with increased sugar content leads to dental caries as a consequence. Especially urban areas with fluoridated water may decrease the frequency of dental caries (9).

In recent years, the global increase of urbanization, the growth of trade and the ultra-processing food have contributed to the increase in sugar, fat and salt content of food (10).

In certain circumstances, dental lesions in the primary dentition are considered to lead to much more severe and extensive consequences compared to the permanent dentition (11).

Dental trauma injury is often encountered among young children, who are vulnerable during this period while learning to walk, or are prone to falls, bumps at playgrounds. Frontal impact with hard objects in most situations makes the teeth in the upper frontal area more prone to trauma while the mandibular primary teeth are less at risk. Fracture at the dental crown or root level, dislocation, avulsion are dental traumas frequently detected in primary teeth (12).

Erosive lesions are wear lesions caused by increased amounts of acids that gradually damage the tooth structure. The causes leading to their appearance can be endogenous (acid regurgitation) or exogenous (excess citrus fruits, carbonated drinks). They cover the dental surfaces of a group of teeth, surfaces which may be variably eroded depending on the type of aetiological factor (13).

The aim of this study was to assess the level of odontal lesions to permanent and temporary teeth in a group of school-aged children from Craiova, and also to identify the determining factors of odontal lesions and possible implication in relation to children's diet.

MATERIAL AND METHODS

This research study included 200 children, aged 7-16, from Craiova, Dolj county, Romania, a developed city in Romania,

enrolled at the "MATEI BASARAB" High School, based on the clinical examination.

This study aims to identify odontal lesions from the oral cavity in relation to children's diet.

The study was preceded by an initial convention to inform parents and children about the activity in which children will be involved. For this purpose, we obtained the informed consent of all subjects. Thus, the parents gave their written consent in order to carry out the statistical activity. For collecting all information, we used a questionnaire to facilitate the centralization of data. The evaluation of each participant in the study consisted in a clinical examination and also a questionnaire containing data related to food, hygiene, frequency of visits to the dentist. Clinical examination was realized by one dentist without any dental instrument inserted in children's oral cavity, but only by inspection with sterile gloves, under natural light.

For each participant, the following data were obtained: age, gender, diet (consumption of fizzy drinks, energy drinks, juices, sweets before/after the main weight, meat, bakery), individual tooth analysis, frequency of brushing, frequency of visits to the dentist, and professional hygiene session.

The results of the examination were entered into an Excel document and processed statistically. This document included odontograms for both types of dentitions. The odontal lesions targeted for identification were caries, developmental defects of hard dental structures (well-defined or diffuse), dyschromia, erosion, abrasion, attrition, and also dental trauma.

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS), version 20 (IBM Corp., New York, NY, USA). For the descriptive analysis, continuous variables were expressed in terms of mean ± standard deviation and they were tested using the Kendall's tau-b correlation, after normality check based on Shapiro–Wilk's test and Levene's test of equality of variances. Categorical parameters were defined as absolute and relative frequencies (%) and tested using the Chi-square test for association. The value *p* value lower than the threshold accepted at 0.05, was considered statistically significant in a confidence interval (CI) of 95%.

RESULTS AND DISCUSSIONS

1.1 Study group – description

The study group included 200 children, 78 females (representing 39% from the entire study group) and 122 males (representing 61%), with ages comprised between 7 years old and 16 years old, average age being 12.3 ± 3 years old (mean ± standard deviation).

Most participants were from urban areas (190 children, representing 95%), while the remaining 10 children (5%) were from rural areas.

1.2 Hypoplasia

Two children presented hypoplasia lesions (1 female, 13 years old, and 1 male, 10 years old). There were 6 lesions identified, teeth 1.2 and 1.1 for the female participant, and teeth 1.2, 1.1, 2.1 and 2.2 for the male participant. Both children reported proper hygiene habits (brushing their teeth twice a day, no acidic beverages, no sweets before meals, no energy drinks, no tooth pain during the nighttime).

1.3 Well-delimited demineralization lesions

Thirty-nine children from the entire study lot (18.57%), 14 females (17.9% from all females) and 25 males (20.5% from all males), presented well-delimited demineralization lesions. Chi-square tests for association were conducted between the presence of teeth with well-delimited demineralization lesions and all nominal anamnestic data. Statistically significant associations were identified with: the consumption of acidic beverages (moderate association, $\varphi = 0.143$, $p = 0.043$),

consumption of fruits before meals (moderate association, φ = 0.204, p = 0.004), consumption of fruits after meals (moderate association, φ = 0.197, p = 0.005), consumption of products with flour (moderate association, φ = 0.200, p = 0.024).

A total of 210 teeth with lesions were identified, 208 being permanent teeth: 79 (37.98%) in the first quadrant (mostly 1.1 and 1.2), 86 (41.35%) in the second quadrant (mostly 2.1 and 2.2), 22 (10.58%) in the fourth quadrant (mostly 4.1, 4.2 and 4.3) and 21 (10.10%) in the third quadrant (mostly 3.1, 3.2 and 3.3).

1.4 Diffuse demineralization lesions

Thirty children from the entire study lot (15.00%), 15 females (19.2% from all females) and 15 males (12.3% from all males), presented diffuse demineralization lesions. Chi-square tests for association were conducted between the presence of teeth with diffuse demineralization lesions and all nominal anamnestic data, but no statistically significant associations were identified ($p > 0.05$).

A total of 115 teeth with lesions were identified, all permanent teeth: 42 (36.52%) in the first quadrant (mostly 1.1 and 1.2), 43 (37.39%) in the second quadrant (mostly 2.1 and 2.2), 14 (12.17%) in the fourth quadrant (4.1 and 4.2) and 16 (13.91%) in the third quadrant (3.1 and 3.2). A Kendall's tau-b correlation was run to determine the relationship between the number of teeth with lesions and children's age. There was a moderate, negative association between these parameters, which was statistically significant, $\tau_b = -0.139$, $p = 0.019$. As presented in Figure 1, the number of teeth with diffuse demineralization lesions decreases as the age increases.

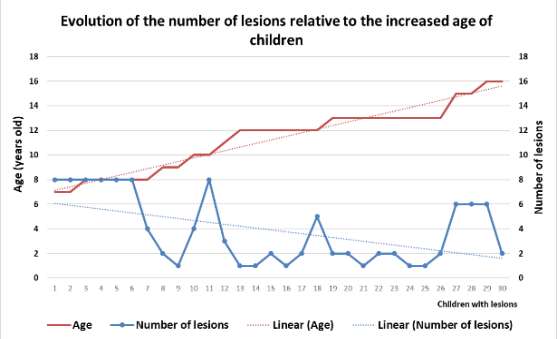

Fig. 1. Evolution of diffuse demineralization

1.5 1st class tooth decay

Tooth decay was present for the majority of children included in the study group. A number of 169 children presented 1st class dental caries (84.50% of the entire study lot), 65 females (83.3% of all females) and 104 males (85.2% of all males). Out of 52 children who have never been to the dentist before, 49 (94.2%) had 1st class dental caries.

Chi-square tests for association were conducted between the presence of teeth with 1st class dental caries and all nominal anamnestic data. Statistically significant associations were identified with: the consumption of acidic beverages (moderate association, φ = 0.225, p = 0.001), consumption of sweets before meals (moderate association, φ = 0.228, p = 0.001), consumption of juice (moderate association, φ = 0.214, p = 0.002), consumption of energy drinks (moderate association, φ = 0.235, p = 0.001), consumption of seeds (moderate association, φ = 0.173, p = 0.014).

A total of 614 teeth with lesions were identified, 560 being permanent teeth, and 54 being temporary teeth.

For the permanent teeth: 171(30.54%) in the first quadrant (mostly 1.6 and 1.7), 120 (21.43%) in the second quadrant (mostly 2.6 and 2.7), 125 (22.32%) in the fourth quadrant (mostly 4.7 and 4.6) and 144 (25.71%) in the third quadrant (mostly 3.6 and 3.7).

For the temporary teeth: 14 (25.93%) in the first quadrant (5.5 and 5.4), 10 (18.52%) in the second quadrant (6.5 and 6.4), 16 (29.63%) in the fourth quadrant (8.5 and 8.4), 14 (25.93%) in the third quadrant (mostly 7.5).

A Kendall's tau-b correlation was run to determine the relationship between the number of teeth with 1st class caries and children's age. There was a moderately strong, positive association between these parameters, which was statistically significant, $\tau_b = 0.317$, $p < 0.0005$. As presented in Figure 2, the number of teeth with 1st class caries increases as the age increases.

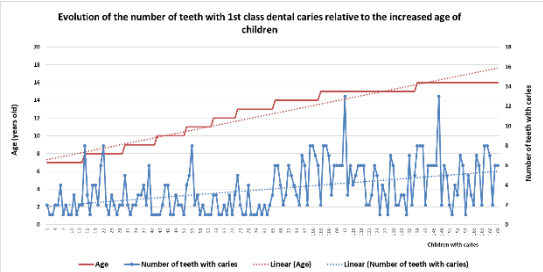

Fig. 2. Evolution of 1st class tooth decay

1.6 Discussions

Although technology has evolved a lot, the highlighting and evaluation of caries continues to be based mainly on visual and tactile techniques. Although the prevalence and severity of dental caries in the primary and permanent dentition have been reduced today in an important number of countries, the prevalence and severity of dental caries remain too high worldwide. Dental caries is a disease that can be prevented, and it must be understood that it is directly related to lifestyle (14).

Thus, a study conducted in 2019 on 605 adolescents showed a caries prevalence of 94.0%, and the DMFT was 5.75 ± 3.74. Higher values and DMFT values more than 7 were associated with less than twice-daily tooth brushing, frequent snacking, and absence of sealants (15).

Another important study carried out on almost 400 subjects between the ages of 5 and 17 consistently associated the frequency and severity of dental caries with a lower level of education, a lower consumption of natural juice, a lower frequency of brushing and with the female sex (16).

For the occurrence of caries, it suggests that the intake of sugar in quantities of more than 60 g/person/day for teenagers and adults is important. For preschool children and young children, intakes should be proportional to those for teenagers; about 30 g/person/day for preschool children (17).

Tooth erosion and tooth decay have common etiological factors such as unhealthy eating habits and reduced salivary flow, hence foods and drinks with high acid and sugar content. They can produce both types of injuries. Moreover, the association between erosion and acid attack by gastric juice implies the need to refer to a specialist for treatment (18).

Most studies reveal the negative role of added sugars in food or drinks, or naturally present in fruit juices, honey, or unsweetened syrups. They do not refer to the natural sugar found in vegetables, fruits, and milk (19).

Sugar-sweetened beverages are known to be cariogenic, but the association of consumption with age showed that intake significantly increases the frequency and severity of caries in 10-year-olds, but the effects are mitigated in 15-year-olds (20).

The deposits on the teeth can differ in color and degree of cariogenicity, and the correlation between the formation of colored dental plaque and the associated diseases, the characteristics of the diet, the intensity of the carious process can help the dentist in his current activity (21).

CONCLUSIONS

1. Despite the prevention methods and the currently available information related to prophylaxis, dental lesions are still quite common among children and adolescents in our area.
2. Demineralization lesions were encountered relatively frequently, to over

30% of the subjects, but only well-delimitated ones were correlated with the consumption of acidic beverages, fruits and products with floury foods. The number of teeth with diffuse demineralization lesions decreases as the age increases.

3. Tooth decay was present for the majority of children included in the study group, the 1st class dental cavities being observed at to over 80% of the subjects. Statistically significant associations were identified with the consumption of acidic beverages, sweets before meals, juice and energy drinks. The number of teeth with 1st class caries increases as the age increases.
4. It is particularly important that school children to benefit from awareness programmes of oral hygiene. In this way dentists can teach children the correct brushing techniques so that they would be able to brush properly themselves. They should also must be informed about the available auxiliary hygiene to improve the oral status of children.
5. It is very important that parent's children provide control of the aetiological factors of dental lesions, especially those related to diet, to reduce or eliminate the factors risk of odontal lesions.
6. Constant information and awareness measures are needed for children and also adolescents in relation to the occurrence, prevention and early treatment of dental lesions.

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