

Influence of nutritional and oral hygiene habits on oral health in Croatian island children of school age



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Abstract

Aim The aim of this cross-sectional (analytical) study was to investigate the influence of nutritional and hygienic habits on oral health in children.

Materials and methods There were 143 children aged six to thirteen years attending primary school Blato, Blato, Croatia who participated in this study. Children were divided into groups according to age in younger primary school children (6–9 years old, n=82) and older primary school children (10–13 years old, n=61): according to gender in males (n=53) and females (n=90). The study was conducted by using a questionnaire of nutritional and hygienic habits and clinical dental examination. Decayed-missed-filled tooth index (DMFT) and plaque index were calculated. DIAGNOdent pen was used to assess caries presence on the first permanent molars.

Results There are no statistically significant differences in the consumption of sugar and sweetened beverages among the tested groups. There were 124 (86.71%) children brushing their teeth one or more times a day. The DMFT index for older children (10–13 years, DMFT=2.66±2.45) was significantly higher ($p < 0.001$) than the DMFT index in younger children (6–9 years, DMFT=1.08±1.36). There is no statistically significant difference in the DMFT index between the sexes ($p = 0.405$). Results obtained by comparing the plaque index value among children of different ages and sexes show that there are no statistically significant differences among the comparable groups as well as the values obtained with the device KaVo DIAGNodent Pen in both groups (age and gender). Statistics: Statistical analysis was carried out using the MedCalc for Windows software version 11.5.1.0 (MedCalc software, Mariakerke, Belgium). For comparison of continuous variables, the Mann-Whitney U test was used, and a χ^2 -test was used to compare the category variables. The level of statistical significance was set at $p < 0.05$.

Conclusion Results of this study showed that DMFT index is higher in older children than in younger children although their nutritional and oral hygiene habits are similar. Oral health in children of different sexes was the same as well as their nutritional and oral hygiene habits.

Introduction

Dental caries is the most common childhood chronic illness [Benjamin, 2010] and there are many known opportunities for preventing it [Donahue et al., 2005]. Folayan [2016] cited research results conducted on children in Nigeria, which show that the use of fluoridated toothpaste and toothbrush twice daily reduces the likelihood of developing caries. The research on caries and related factors in Saudi Arabia in children aged 6 to 8 years in 2018 shows that children who eat sweetened foods, juices and fast food are more likely to have caries than those who do not have those nutritional habits [Alhabdan et al., 2018]. Similarly, Gustavsson's studies have proved that crucial factors for caries development are: frequency of food intake, snacks between meals that are rich in carbohydrates, and the time of keeping food in the mouth [Gustavsson et al., 1954].

For caries control nowadays, indices are being used which are a generally accepted and reliable system for its assessment. The World Health Organization (WHO) has accepted the number of decayed (D), missed (M), filled (F) tooth index (DMFT index) in oral national health research, which is recommended in oral health assessment forms, regardless of certain limitations to measure and compare the caries frequency in a given population [Abhishek, 2012]. The WHO has set the target for Western Europe for 2020, which states that the average DMFT index of twelve-year-olds children should be 1.5, and 80% of six-year-olds should be caries-free [Hobdell et al., 2003]. In Croatia, according to data from 2015, the DMFT index of six-year-olds was 4.14, for twelve-year-olds 4.18, and the DMFT index of citizens aged 18 to 65 was 12.5, which includes Croatia in countries with high prevalence of caries [Radić et al., 2015].

Blato is a municipality located on the island of Korčula, Croatia. Today there are about 3,600 inhabitants (data downloaded from online site of touristic board Blato). According to data from the Vela Luka - Blato Health Center, the municipality of Blato has two polyvalent teams of dental practitioners working in continuity for more than 50 years. In the 1990s, in the area of Blato and the neighboring town of Vela Luka, a specialist paedodontist team systematically carried out the prevention of dental caries and oral health care in children. Therefore, the aim of this study was to investigate the impact of nutritional and hygienic habits on oral health

KEYWORDS Schoolchildren; Nutrition; Oral hygiene; Oral health.

of school children aged six to thirteen years (primary school) from Blato on the island of Korčula in Croatia.

Materials and methods

Subjects

This study was carried out with the approval of the Ethics Committee of the Faculty of Dental Medicine, University of Zagreb. Parents of the examinees were informed about the procedures and the purpose of the research and gave their written consent for the participation, and both examinees and their parents voluntarily decided to participate. Between 2016 and 2018, research was conducted on students aged 6 to 13 years from the Blato Primary School on the island of Korčula. All 206 students attending this school were asked to participate in the research. The only exclusion factors were health reasons (physical, mental illnesses) and inability to cooperate with the research dental practitioner. None of the students had any exclusionary factors for which they would not approach the research. The research was responded to by 143 of them. The reasons why the remaining 63 students did not respond to the research were the neglect of children who had forgotten to inform their parents about the research and the scheduled time, the fear of the dentist and the distrust of their parents towards the dental practitioner who performed the examinations.

Dental clinical examination of the 143 students, who agreed to participate in the study, was carried out at the dental medicine clinic in Blato on the island of Korčula.

Methods

The children were examined with a dental probe and mirror, facing the source of daylight, avoiding direct sunlight [World Health Organization, 1997]. The protocol used in the research was the following.

1. The DMFT index was used to measure the current status of oral health in the examined children. For each subject, the number of D (decayed), M (missed), F (filled) teeth was calculated and for the average DMFT of group the average DMFT of all subjects was summed and multiplied by the number of individuals in the group.
2. To determine the level of oral hygiene maintenance in children, the plaque index was measured. The plaque revealer (GC Tri Plaque ID GELTM, GC, Tokyo, Japan) was used. For each examinee, the sum of surfaces showing plaque (four surface tooth division) is divided by the total number of dental surfaces in the mouth of the examinee. This number was multiplied by hundred and the value displayed by percentage [O’Leary, 1972].
3. The first permanent molars were inspected by the device KaVo DIAGNOdent pen 2190 (KaVo, Biberach an der Riss, Germany) and classified according to the following criteria: D1 = numerical value (0 ± 13) - no caries, no procedure required, regular prophylaxis; D2 = numerical value (14-20) - caries of enamel, recommended preventive measures; D3 = numerical value (21-29) - dentine caries, preventive or operational measures are recommended, depending on the risk and responsibility of the patient; D4 = numerical value (> 30) advanced dentine caries, operating measures are recommended [Lussi et al., 2001]. This was done in order to assess the state of the first permanent molars.
4. The children, with the assistance of their parents, completed a questionnaire on nutritional and oral hygiene habits taken from the WHO [World Health Organization, 2013].

A questionnaire similar to that used in a previous research was used for the study (Table 1) [Peltzer et al., 2014; Beljan et al., 2016].

1.	How often do you eat sweets?
2.	How often do you eat cakes, cookies, biscuits?
3.	How often do you drink carbonated and sweet drinks?
4.	How often do you brush your teeth?
5.	Do you use fluoride-containing toothpaste?
6.	How many times have you visited dentist in the last 12 months?
7.	If you have visited dentist in the last 12 months, what was the reason for the visit?

TABLE 1 Questionnaire of nutritional and oral hygienic habits of school children from Blato on the island of Korčula

	6-9 years (n=82)	10-13 years (n=61)	p*
Plaque index (%)	36.11±24.40 31 (2-100)	27.74±17.25 27 (3-56)	0.119
DMFT	1.08±1.36 0 (0-4)	2.66±2.45 2 (0-10)	<0.001
Diagnodent			
16	21.16±17.25 15 (2-65)	21.92±17.25 15.5 (5-65)	0.709
26	18.15±16.90 11 (3-71)	22.55±21.39 11.5 (3-70)	0.902
36	21.31±16.13 16 (4-61)	31.72±22.47 34 (5-70)	0.135
46	18.67±15.57 13 (2-62)	26.25±20.70 18 (2-70)	0.257

The values are shown as mean ± standard deviation or as median and interquartile range. *Mann-Whitney U test; P<0,05.

TABLE 2 Comparison of the DMFT index, plaque index and measurement with the DIAGNOdent Pen device on the first permanent molars between younger and older children

Statistical analysis

Statistical analysis was carried out using the software for drafting statistics MedCalc for Windows version 11.5.1.0 (MedCalc software, Mariakerke, Belgium). The values of the continuous variables are presented with mean value and standard deviation or median and interquartile range, and the category variables are represented as an integer and a percentage. For comparison of continuous variables (KEP values index, index plaque and Diagnodent measurement) between younger and older children, and between boys and girls, the Mann-Whitney U test was used, and for comparison of categorical variables (nutritional and hygienic habits of children) χ^2 -test was used. The level of statistical significance is set at P < 0.05.

Results

The study included 143 school children aged 6 to 13 (average age 9.31 ± 2.23 years), of which 90 were girls (62.9%) and

	Girls (n=90)	Boys (n=53)	P*
Plaque index (%)	31.98±20.44 28.5 (2-89)	33.54±22.70 28 (3-100)	0.843
DMFT	1.70±2.07 1 (0-8)	1.87±2.01 2 (0-10)	0.405
Diagnodent			
16	23.02±17.48 18 (3-65)	19.76±16.98 12.5 (2-62)	0.289
26	18.30±18.84 11 (3-71)	21.45±18.16 13,5 (3-71)	0.325
36	25.66±19.5 17 (4-70)	22.76±17.65 16 (4-70)	0.460
46	20.64±17.67 15 (2-62)	20.56±16.81 14.5 (4-70)	0.824

The values are shown as mean ± standard deviation or as median and interquartile range.

*Mann-Whitney U test; P<0,05.

TABLE 3 Comparison of the DMFT index, plaque index and measurement with the DIAGNodent Pen device on the first permanent molars between girls and boys.

53 boys (37.1%). For the purpose of statistical analysis of nutritional and hygienic habits and oral health assessments the respondents were divided into two age groups, a group of lower grade school students (6–9 years, n = 82) and higher grade school students (10–13 years, n = 61.)

The examinees of the lower grade (6–9 years) have a statistically significantly lower DMFT index (1.08 ± 1.36) compared to the examinees of the higher grade school students (10–13 years, 2.66 ± 2.45) (p<0.001) (Table 2). There are no statistically significant differences in measured plaque index values among lower grade school children (6–9 years) compared to the older ones (10–13 years), as well as in Diagnodent measurement on the first permanent molars (Table 2).

Table 3 shows the comparison of the DMFT index value, plaque index and Diagnodent measurement on the first permanent molars between girls and boys.

The analysis of the obtained data from the questionnaire shows no statistically significant differences in the consumption of candies, cakes, biscuits by male and female subjects (Table 5), and compared to the older (10–13 years) and younger (6–9 years) age groups (Table 4). Percentage of children who consume sweets, cakes and cookies a few times a week or even every day is high (sweets: 70.7% children 6–9 years, 70.4% children 10–13 years, 69.9% girls, 71, 6% boys).

Concerning the consumption of carbonated and sweetened beverages, we found no statistically significant difference between the examined groups (Table 4, 5).

Carbonated and sweetened beverages are usually consumed once a week (34.1% 6–9 years, 40.9% 10–13 years, 41.1 girls, 31.1 boys). Analyzing part of the survey related to the oral hygiene habits of the examinees, it was found that 45.1% of children aged 6 to 9 years and 49.1% of children aged 10 to 13 brush their teeth two or more times a day (Table 6). The lowest proportion of children between 6 and 9 years of age brushes their teeth only once a week (2.24%), while the smallest proportion of children aged 10–13 years brush their teeth once a week (1.6%), or sometimes a few times a month, 2–3 times (1.6%).

Regarding the frequency of tooth brushing between the

	6-9 years (n=82)	10-13 years (n=61)	P*
Comparison of the frequency of consuming sweets (chocolate, candy) between younger and older children			
Few times a day	12 (14,6)	8 (13,1)	0,796
Once a day	32 (39,0)	15 (24,5)	0,070
Few times a week	26 (31,7)	28 (45,9)	0,135
Once a week	9 (10,9)	5 (8,1)	0,582
Once a month	1 (1,2)	4 (6,5)	0,742
Never	2 (2,4)	1 (1,6)	0,742
Comparison of the frequency of consuming cakes, biscuits, between younger and older children			
Few times a day	13 (15,8)	4 (6,5)	0,091
Once a day	33 (40,2)	28 (45,9)	0,500
Few times a week	23 (28,0)	20 (32,7)	0,543
Once a week	11 (13,4)	1 (1,6)	0,012
Once a month	1 (1,2)	8 (13,1)	0,004
Never	1 (1,2)	0 (0)	0,388
Comparison of frequency of consumption of carbonated and sweetened drinks between younger and older children			
Few times a day	1 (1,2)	2 (3,2)	0,397
Once a day	6 (7,3)	4 (6,5)	0,861
Few times a week	16 (19,5)	10 (16,3)	0,634
Once a week	28 (34,1)	25 (40,9)	0,404
Once a month	20 (24,3)	16 (26,2)	0, 803
Never	11 (13,4)	4 (6,5)	0,187

The values are shown as mean ± standard deviation or as median and interquartile range.

*Mann-Whitney U test; P<0,05.

TABLE 4 Comparison of nutritional habits between younger and older children

sexes we found similar results, since 53.3% of girls and 49.1% of boys brushed their teeth two or more times a day (Table 7).

Only 1.6% of boys and 2.24% of girls brush their teeth only once a week. There was no statistically significant difference in the frequency of teeth brushing among the examined groups. From the examined children 51.2% of the younger age group and 44.2% of the older age group were using fluoride-containing toothpaste while the rest of the children (23.1% of younger children and 27.8% of older children) did not know if they were using fluoridated toothpaste (Table 6). Fluoridated toothpaste was used by 50.0% of girls and 45.2% of boys (Table 7). Questionnaire data showed that there was no statistically significant difference in the frequency of visits to a dentist in the last 12 months between male and female examinees. The highest percentage of girls 33.3% and boys 35.8% have visited the dentist twice in the last 12 months (Table 9). Table 9 shows that the highest proportion of examined children, 58.48% of boys and 47.77% of girls, went to the dentist because of toothache or gingival pain,

	Girls (n=90)	Boys (n=53)	P*
Comparison of the frequency of consuming sweets (chocolate, candy) between girls and boys:			
Few times a day	13 (14,4)	7 (13,2)	0.837
Once a day	28 (31,1)	19 (35,8)	0.562
Few times a week	35 (38,8)	19 (35,8)	0.718
Once a week	11 (12,2)	3 (5,6)	0.203
Never	2 (2,1)	1 (1,8)	0.893
Comparison of the frequency of consuming cakes, biscuits, between girls and boys:			
Few times a day	10 (11,1)	7 (13,2)	0.709
Once a day	36 (40,0)	25 (47,1)	0.404
Few times a week	30 (33,3)	13(24,5)	0.269
Once a week	13 (14,4)	6 (11,3)	0.569
Once a month	0 (0)	2 (3,7)	0.064
Never	1 (1,1)	0 (0)	0,443
Comparison of frequency of consumption of carbonated and sweetened drinks between girls and boys:			
Few times a day	2 (2,1)	1 (1,8)	0.893
Once a day	6 (6,6)	4 (7,5)	0.843
Few times a week	15 (16,6)	11 (20,7)	0.542
Once a week	37 (41,1)	16 (31,1)	0.193
Once a month	21 (23,3)	15 (28,3)	0.510
Never	9 (10,0)	6 (11,3)	0.804

The values are shown as an integer and a percentage. * X2-test; P <0.05

TABLE 5 Comparison of nutritional habits between boys and girls

tooth repair or some other treatment (Table 9); 10.18% of boys and 43.33% of girls visited a dental practitioner in the last 12 months (p <0.0001) for regular examination/recall. The analysis of data from the survey about the reasons for going to a dentist in the last 12 months showed that 54.87% 6–9 years-olds and 47.53% of children aged 10–13 years visited the dentist because of toothache, gingival pain or tooth repair or some other treatment: 39% of children aged 6–9 years and 36.06% of children aged 10–13 years went to a dentist in the last 12 months for a regular examination/recall (Table 8). Differences in the reasons for visiting a dentist between the two age groups are not statistically significant.

Discussion

The DMFT index in the examined higher grade school children (10–13 years) was 2.66 ± 2.45 and statistically significantly higher (p <0.001) than the DMFT index in lower grade school children 1.08 ± 1.36 (6–9 years). As far as gender, no statistically significant differences were found (p = 0.405). Previous studies have shown the correlation of high prevalence of caries and high DMFT index with sugar consumption [Valentak et al., 1995]. In the research of Sitana et al. [2016] it has been shown that in pre-school children the increasing of DMFT index with age is associated with sugar consumption in the same children. The results of this study have shown that all surveyed children eat similar high-sugar foods (chocolate, candy, cakes, biscuits) most often once a day, then several times a week, and the smallest percentage of children do not eat high-sugar food at all. Also, the answers from the survey showed that examinees drink sweetened and carbonated beverages almost in the same percentage, most often once a week or once a month. A high percentage

	6-9 years (n=82)	10-13 years (n=61)	P*
Comparison of the frequency of tooth brushing between younger and older children			
Never	0 (0)	0 (0)	NA
Few times a month (2-3 times)	0 (0)	1 (1,6)	0.246
Once a week	2 (2,24)	1 (1,6)	0.742
Few times a week (2-6 times)	6 (7,3)	9 (14,7)	0.153
Once a day	37 (45,1)	20 (32,7)	0.138
Two or more times a day	37 (45,1)	30 (49,1)	0.632
Comparison of the use of tooth past containing fluorides between younger and older children			
Yes	42 (51,2)	27 (44,2)	0,412
No	21 (25,6)	17 (27,8)	0,763
I don't know	19 (23,1)	17 (27,8)	0,524

The values are shown as an integer and a percentage. * X2-test; P <0.05

TABLE 6 Comparison of oral-hygiene habits between younger and older children

	Girls (n=90)	Boys (n=53)	P*
Comparison of the frequency of tooth brushing between girls and boys			
Never	0 (0)	0 (0)	NA
Few times a month (2-W3 times)	1 (1,2)	0 (0)	0.443
Once a week	1 (1,2)	2 (3,7)	0.285
Few times a week (2-6)	8 (8,8)	7 (13,2)	0.417
Once a day	32 (35,5)	19 (35,8)	0.972
Two or more times a day	48 (53,3)	25 (47,1)	0.478
Comparison of the use of tooth past containing fluorides between girls and boys			
Yes	45 (50,0)	24 (45,2)	0.587
No	22 (24,4)	16 (45,2)	0.454
I don't know	23 (25,5)	13 (24,5)	0.892

The values are shown as an integer and a percentage. * X2-test; P <0.05

TABLE 7 Comparison of oral-hygiene habits between girls and boys

of children do not consume sweetened and carbonated beverages ever (13.4% of 6–9 year-olds, 6.5% of 10–13 year-olds, or 10% girls, 11.3% boys). It has also been noted that regardless of gender or age, more than 80% of children were brushing their teeth 1–2 times or more a day, which suits the recommendation of the American Dental Association (ADA) [1996] of cleaning the teeth at least twice a day. Sitana et al. [2016] in their research, did not demonstrate the correlation between the DMFT index value in children with the frequency of toothbrushing, while Alhabdan et al. [2018] in research

	6-9 years (n=82)	10-13 years (n=61)	P*
Comparison of frequency of visiting dental practitioner in the last 12 months between the older and the younger children			
Once	25 (30,4)	13 (21,3)	0,221
Twice	30 (36,5)	19 (31,1)	0,499
Three times	12 (19,6)	6 (9,8)	0,394
Four times	5 (6,0)	4 (6,5)	0,911
More than four times	7 (8,5)	8 (13,1)	0,379
Not once in the last 12 months	3 (3,6)	10 (16,3)	0,009
I have never been to dentist	0 (0)	0 (0)	0,079
I don't remember/I don't know	0 (0)	1 (1,6)	0,246
Comparison of reasons of visiting dental practitioner in the last 12 months between the older and younger children			
Tooth ache, gingival pain or pain in mouth	12 (14,63)	7(11,47)	0,583
Tooth repairing or some other procedure in mouth	33 (40,24)	22 (36,06)	0,612
Recall	32 (39,0)	22(36,06)	0,720
I don't know /remember	1 (1,21)	0 (0)	0,390
They didn't visit dentist in last 12 months	4(4,87)	10 (16,39)	0,022

The values are shown as an integer and a percentage.
* X2-test; P <0.05

TABLE 8 Comparison of frequency and reasons of visiting dental practitioner in the last 12 months between the older and younger children

	Girls (n=90)	Boys (n=53)	P*
Comparison of frequency of visiting dental practitioner in the last 12 months between the girls and boys			
Once	27 (30,0)	11 (20,7)	0.228
Twice	30 (33,3)	19 (35,8)	0.760
Three times	10 (11,1)	8 (15,0)	0.489
Four times	8 (8,8)	1 (1,8)	0.118
More than four times	8 (8,8)	7 (13,2)	0.417
Not once in the last 12 months	7 (7,7)	6 (11,3)	0.478
I have never been to dentist.	0 (0)	0 (0)	0.002 NA
I don't know / remember	0 (0)	1 (1,8)	0.193
Comparison of reasons of visiting dental practitioner in the last 12 months between girls and boys			
Tooth ache, gingival pain or pain in mouth	9 (10,0)	10 (18,86)	0.133
Tooth repairing or some other procedure in mouth	34 (37,77)	21 (39,62)	0.826
Recall/ regular examination	39 (43,33)	16 (10,18)	<0.0001
I don't know / remember	1 (1,11)	0 (0)	0.443
They didn't visit dentist in last 12 months	7 (7,77)	6 (11,32)	0.477

The values are shown as an integer and a percentage.
* X2-test; P <0.05

TABLE 9 Comparison of frequency and reasons of visiting dental practitioner in the last 12 months between the girls and boys

on children 6–8 year-olds came to the conclusion that late adoption of the habit of toothbrushing and eating sweets is associated with the onset of caries. A research by Rugg-Gunn [2013] points out that consumption of sweet food and sugary beverages increases the risk of developing caries.

Comparison of the DMFT index with nutritional and oral hygiene habits in examined children suggests that considering that children have equal nutritional (regarding sugar intake) (Tables 4, 5) and hygiene habits (Tables 6, 7), oral health in children is related to their aging. So, over time, caring for oral health for older school children should be improved in order to preserve the health of the teeth. Similar conclusions are also made in previous studies [Sistani et al., 2012; Soumya et al., 2017].

Tadakamadla et al. [2012] point out that the incidence of caries is affected by the frequency of brushing and the frequency of visits to a dentist.

The plaque index assessed with a plaque revealer is the indicator of the oral hygiene of an individual or group. The values presented in Tables 2 and 3 show no significant differences in the plaque appearance on children's teeth with respect to age groups (p = 0.119) and gender distribution (p = 0.843), indicating that all examined children take care of their oral health equally. The results obtained by comparing the plaque index value among children of different ages and sexes indicate that the mean plaque index value in all subjects is 32.18 ± 20.92. (mean ± standard deviation).

It can be concluded that frequent brushing in the examined children resulted in low plaque index values indicating a good oral hygiene. The same data is confirmed by earlier researches [Marshman et al. 2016; Lang et al. 1973]. The analysis of the values obtained with the KaVo DIAGNOdent Pen device, in both groups (age and gender), does not show statistically significant differences. The obtained results are mostly within the D1 and D2 classifications that indicate the absence of caries or caries of the enamel [Lussi et al., 2001]. This also confirms that oral health and oral hygiene are very good in the examined children. The low plaque index, the low KEP index, and the low value of the DIAGNOdent Pen in the study can be explained by moderate consumption of food and beverages rich in sugar and brushing teeth at least once or twice a day, suggesting that with good oral hygiene, consumption of sweetened foods and beverages in moderate amounts do not significantly impair oral health.

A study from 2018 about the long-lasting effects of hypo-cariogenic diet and oral care shows that eating hypo-cariogenic foods as: apple, vegetables, low-sugar yogurt, breadsticks, crackers, rustic crusty bread, milk, water, grapes, cereals, rice, pasta, cheeses with low fats, sugar-free tea, sugar-free coffee, chicken, fish, fresh fruit, boiled eggs, lemon juice, orange juice, tomatoes, potatoes, decrease the cariogenic bacterial load [Barone et al., 2018]. Blato is a rural community whose inhabitants are still largely relying on the production and consumption of Mediterranean type food (fish, vegetables, fruits, eggs, rice, olive oil, cereals etc.), which we assume have a positive effect on the maintenance of oral health in children and adults.

The total DMFT index among the examinees was compared with the DMFT index in the Republic of Croatia. According to data from CEZIH (Central Health Information System of the Republic of Croatia) in Croatia, from 2013 to 2015, DMFT index for children aged 12 years was 4.18 [Radic et al., 2015; Beljan et al., 2016]. In the examined group of students of primary school of Blato, on the island of Korčula, which has 143 children aged 6 to 13, the average DMFT index is 1.75. In children of lower grades (6–9 years) DMFT is 1.08, and children in higher grades (10–12 years) the DMFT index is 2.66. These data compared to Radić et al. [2015] indicate an above-average good oral health status with respect to the

Republic of Croatia. These results are also close to the goals set by the WHO for Western Europe for 2020 (Average DMFT index of 12 year-olds: 1.5, and 80% of six-year-olds without caries [Hobdell et al., 2003]).

Responses to the questions from the survey on how often and for what reason children visited their dentist during the past year show that a higher percentage of higher grade school children (16.3%) compared to lower grade school children (3.6%), did not visit their dentist at all in the 12 months prior to submission of the questionnaire. This fact about the lower frequency of dental visits and thus reduced oral health care can be associated with a higher DMFT index in the older age group compared to the children of lower age group. The reason why younger children visit dentist more often can be sought in the higher authority of parents of younger children. This is explained by the fact that over time, as children grow up, parents lose their parental authority and thus going to the dentist is conditioned by the child's personal will and responsibility, which is obviously less than that of parental care.

Both the examined age groups of children mostly visited their dentists for repair and/or pain in the teeth and gums.

The percentage of female children who had undergone checkups in the last 12 months (43.33%) was considerably higher than the percentage of male children who had gone to checkups in the last 12 months (10.18%). This data cannot be related to oral health because no statistically significant differences were found in the DMFT index, plaque index, and values of the DIAGNodent device measured on the first permanent molars between sexes.

Regardless of the results that showed that children in Blato Primary School on the island of Korčula have good oral hygiene habits and satisfactory oral health, we believe that further preventive measures should be taken to improve oral health. We consider that there are limiting factors in this research, which is primarily a questionnaire for which it is not possible to prove the accuracy of the above responses. The study was conducted on a relatively small number of examinees, and the number of examinees needed to be extended for confirmation of the results. Prevention in children should be implemented in their early years. Preventive procedures that should be applied to children are: education on nutrition and oral hygiene, frequent examinations, fluoride treatments of the teeth and preventive sealing [Jurić, 2013; Bedos and Brodeur, 2000]. It is very important that preventive procedures are performed systematically year after year to keep the children under control and have them learn the importance of maintaining oral hygiene at home. Only by frequent repetition of all preventative procedures it is possible to shape the awareness of children about the importance of maintaining the health of the oral cavity [Samuel et al., 2015].

Conclusion

The picture of oral health in our children sample from Blato on the island of Korčula suggests that respondents with their DMFT index (1.75) reached the targets set by WHO for 2020 [Hobdell et al., 2003]. Based on the results we can conclude that with good oral hygiene habits (according to the ADA recommendation) [American Dental Association, Division of Communications; 1996], the moderate intake of sweetened foods and beverages does not significantly affect the incidence of caries in the mouth. From the obtained results we conclude that the oral health status of the children is significantly related to their age. The older the children, the higher the DMFT index, i.e. the worse the oral health.

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