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# IMPACT OF INDIVIDUAL HEALTH-ORIENTED PARENT EDUCATION ON EATING AND HYGIENIC HABITS, ORAL HYGIENE LEVEL, AND DENTITION CONDITION IN CHILDREN WITH HIGH RISK OF CARIES

## WPŁYW INDYWIDUALNEJ EDUKACJI PROZDROWOTNEJ RODZICÓW NA NAWYKI DIETETYCZNO-HIGIENICZNE I STAN HIGIENY JAMY USTNEJ I UZĘBIENIA U DZIECI Z WYSOKIM RYZYKIEM CHOROBY PRÓCHNICOWEJ

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### Abstract

**Aim:** To assess the impact of individual health-oriented parent education on eating and hygienic habits, oral hygiene level, and dentition condition in children with a high risk of caries.

**Material and methods:** Eating and hygienic practices, oral hygiene level (DI-S) and dentition condition were evaluated during one year, every three months, in 81 children aged 18-71 months. At each visit parents were provided with the information on caries causes, nutrition and hygiene tips, and were shown the brushing routine to follow and the necessary preventive care routine.

**Results:** The examination of the mean number of snack, juice/sweetened drink and sweets intake in a day, of the mean toothbrushing frequency and the clinical examination ensured a considerable improvement in eating and hygienic habits and in oral hygiene. The percentage of children having more than three snacks a day decreased from 40.7% to 16%, of children having sweets from 32.1% to 11.11%, and of children drinking juices/sweetened drinks more than three times a day from 48.1% to 25.9%. At the initial examination, 74.1% of children declared to be brushing their teeth twice a day, versus 91.4% at the final examination. The mean DI-S decreased from  $1.19 \pm 0.71$  to  $0.72 \pm 0.48$ . Caries intensity scored with the dmft index increased from  $5.14 \pm 4.25$  to  $6.99 \pm 4.68$ .

**Conclusions:** Individual health-oriented parent education has a positive influence on changing hygienic and eating habits and decreasing the mean DI-S index in children with high risk of caries.

**Key words:** cariogenic diet, oral hygiene, early childhood caries

### Streszczenie

**Cel pracy:** Ocena wpływu indywidualnej edukacji prozdrowotnej rodziców na nawyki dietetyczno-higieniczne i stan higieny jamy ustnej i uzębienia u dzieci z wysokim ryzykiem choroby próchnicowej.

**Material i metody:** U 81 dzieci w wieku 18-71 miesięcy z wysokim ryzykiem próchnicy co 3 miesiące w okresie 1 roku oceniano nawyki żywieniowe i higieniczne oraz stan higieny jamy ustnej (DI-S). Na każdej wizycie rodziców/opiekunów przekazywano informacje o przyczynach próchnicy, zalecenia dietetyczne i higieniczne, wykonywano instruktaż higieniczny oraz niezbędne zabiegi profilaktyczne (oczyszczano zęby, aplikowano lakier fluorkowy) i lecznicze.

**Wyniki:** Analiza średniej liczby przekąsek, soków/napojów słodzonych i słodczy spożywanych w ciągu dnia oraz stanu higieny jamy ustnej i częstości szczotkowania zębów potwierdziła poprawę nawyków dietetyczno-higienicznych i stanu higieny jamy ustnej. Odnotowane różnice między badaniem wstępnym a końcowym były istotne statystycznie. Odsetki dzieci spożywających więcej niż 3 przekąski w ciągu dnia zmniejszyły się z 40,7% do 16%, słodczy z 32,1% do 11,11%, a dzieci pijących >3 razy dziennie soki/napoje słodzone z 48,1% do 25,9%.

*W badaniu wstępnym szczotkowanie zębów 2 razy dziennie zadeklarowano u 74,1% dzieci, a w badaniu końcowym u 91,4,7%. Zmniejszeniu uległ odsetek dzieci myjących zęby 1 raz dziennie z 19,8% do 8,6%. Średnia wartość DI-S obniżona została z  $1,19 \pm 0,71$  do  $0,72 \pm 0,48$ .*

**Wnioski:** *Ograniczenie liczby spożywanych przekąsek słodczy i soków/słodkich napojów oraz wyrobienie nawyku szczotkowania zębów po posiłkach jest istotne dla kształtowania prawidłowych nawyków żywieniowych i higienicznych u dzieci w wieku wczesnego dzieciństwa. Wyniki badań wskazują na wciąż aktualną potrzebę edukacji rodziców.*

**Słowa kluczowe:** dieta próchnicotwórcza, higiena jamy ustnej dzieci, próchnica wczesnego dzieciństwa

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## INTRODUCTION

According to the World Health Organisation, tooth caries are a localized pathological process of external origin, leading to decalcification and proteolytic degradation of mineralized dental tissues (1). It is mainly caused by persisting metabolic bacterial biofilm activity on tooth surfaces, resulting from carbohydrates lingering in the mouth. Organic acids produced by bacteria lower the pH below the so-called critical for the enamel level (4.5-5.5) resulting in tooth demineralisation (2).

Upon assessment of study results published within the past decades, it was established that bad eating habits, especially more than three sweet snacks or juices/sweetened drinks a day and a persisting presence of dental plaque, resulting from inexistent or insufficient toothbrushing, are considerable risk factors of caries in deciduous teeth (3-7). These factors can be removed or modified by the mother/guardian of the child. In case of a high risk of caries in a child, the preventive care routine, including the dental health-oriented education of their parents/guardians, should be intensified. Following the doctor's guidelines regarding an appropriate diet and effective toothbrushing of the child's teeth is necessary for the preventive care routine to be efficient. Most authors working on early childhood caries emphasise the importance of conducting surveys and discussing the child's medical history with their parents/guardians to establish the causes of caries (3-7). This allows individualising guidelines and preventive care routines.

## AIM

To assess the impact of parent health-oriented education on eating and hygienic habits and oral hygiene and dentition condition in children with high risk of caries.

## MATERIALS AND METHODS

The Commission for Bioethics of Warsaw Medical University approved, opinion No KB/243/2010, the study project on 14 of December 2010. Children from the Department of Paediatric Dentistry of Warsaw Medical University were qualified for the study. Inclusion criteria

enclosed: age from 18 to 71 months; the presence of two or more active white carious lesion; a written consent form signed by parents for participation in the research study. Exclusion criteria included: age above 71 months; a planned geographical relocation within a year time; mental illnesses of parents.

The study consisted of discussing the medical history with parents and performing five dental examinations in children: initial and four control ones every three months. The study was conducted by two researchers (co-authors of this paper) after previous calibration. The conformity of researcher result after calibration amounted to 96.25%. The medical history discussion with parents followed the guidelines of the control list, including the child's eating and hygienic habits – number of snacks, frequency of juice/sweetened drink and sweets intake and the frequency of hygiene routines. The dental examination was performed with a mouth mirror and periodontal probe. Oral hygiene level and dentition condition were scored. The simplified oral debris index (DI-S), a component of Greene and Vermillion's simplified oral hygiene index (OHI-S) was used to score the oral hygiene level (8). Dental debris were stained with 3% erythrosine aqueous solution and the degree of coverage of buccal surfaces of teeth 55, 51, 65, 71 and of lingual surfaces of teeth 75 and 85 were scored as following: 0 – no dental debris; 1 – debris covering not more than 1/3 of tooth surface; 2 – debris covering more than 1/3 but not more than 2/3 of tooth surface; 3 – debris covering more than 2/3 of tooth surface. Caries intensity was scored with the dmft index. The index is expressed as the total number of teeth (t) that are decayed (d), missing because of caries (m) or filled (f). The preventive care and treatment routines were performed at every visit.

The results of the initial and the control examinations were entered in a computer database and analysed statistically. The changes in eating and hygiene habits, hygiene level and dentition condition between the initial and the final examination (after one year) were assessed. The chi-square test was used to compare the proportions between two independent samples; McNemar's test for comparison of binomial data for matched pairs; the Mann-Whitney U test (between independent samples) and the Wilcoxon signed-rank test (for paired samples) to compare the means of

quantitative variables. The analyses were performed using Statistica 10 software; the level of significance was set at 0.05 probability level.

## RESULTS

Eighty-one children – 34 girls (41.98%) and 47 boys (58.02%), with a mean age of  $3.78 \pm 1.30$  years, and their mothers took part in the study. All participants reported for subsequent control examinations. The assessment of the mean number of snack, juice/sweetened drink and sweets intake during a day confirmed an improvement of the eating habits. The differences between the initial and final examinations were statistically significant (tab. I).

At the initial examination (E0), 40.7% of children had more than three snacks a day. After one year (E4) that percentage decreased to 16% (tab. II).

The percentage of children drinking juices/sweetened drinks more than three times a day decreased from 48.1% to 25.9% (differences statistically significant) (tab. II). The frequency of sweets intake more than three times a day decreased three times from 32.1% of children and was statistically significant (tab. II). The percentage of children having too many snacks at initial examination decreased by 30.9%, of those drinking too much juices/

sweetened drinks by 27.2%, and of those eating too many sweets by 23.5%, and percentages were always higher in boys than in girls (respectively 36.2% vs. 23.5%, 29.8% vs. 23.5%, and 27.7% vs. 17.6%).

Parents of all the examined children were responsible for brushing the teeth of the latter with a fluoride toothpaste. Despite a four time deliverance of hygiene guidelines to the children and their parents and a four time explanation of the link between bacterial biofilm presence and the development of carious lesions, not everyone changed their hygiene practices. At the initial examination, 74.1% of children declared to be brushing their teeth twice a day (tab. III). At the final examination that percentage increased to 91.4% (differences statistically significant).

At the initial score, the mean DI-S index amounted to  $1.19 \pm 0.71$ . The DI-S index noticeably decreased after one year to  $0.81 \pm 0.64$  (tab. IV).

Caries intensity, measured with the dmft index increased from  $5.14 \pm 4.25$  to  $6.99 \pm 4.68$ , including to  $7.32 \pm 4.85$  in girls and  $6.74 \pm 4.59$  in boys, which was statistically significant. The number of decayed (d) teeth increased statistically insignificantly only in boys (tab. V).

Spearman's rank correlation coefficients did not display any correlation between the debris index and the toothbrushing frequency. A negative correlation observed after one year confirmed that the index increased

Table I. Average intake of snacks, juices/sweetened drinks and sweets during the day.

Tabela I. Średnie liczby przekąsek, soków/napojów słodzonych i słodyczy spożywanych w ciągu dnia.

Eating habits <i>Nawyki dietetyczne</i>	Examination (E) <i>Badanie (B)</i>	Mean ( $\pm$ SD) <i>Średnia <math>\pm</math>SD</i> Girls (G) <i>Dziewczęta (D)</i>	Mean ( $\pm$ SD) <i>Średnia <math>\pm</math>SD</i> Boys (B) <i>Chłopcy (Ch)</i>	P (G vs. B) P (D vs. Ch)	Mean $\pm$ SD <i>Średnia <math>\pm</math>SD</i> Total <i>Ogółem</i>
Snacks <i>Przekąski</i>	Initial (E0) <i>Wstępne (B0)</i>	2.71 $\pm$ 1.31	3.11 $\pm$ 1.07	0.226	2.94 $\pm$ 1.19
	Final (E4) <i>Końcowe (B4)</i>	2.50 $\pm$ 1.21	2.66 $\pm$ 0.84	0.589	2.59 $\pm$ 1.01
Mean $\pm$ SD (all exam. scores) <i>Średnia <math>\pm</math>SD (wszystkie badania)</i>		2.71 $\pm$ 1.21	2.78 $\pm$ 0.94	0.943	2.75 $\pm$ 1.06
P (E0. vs. E4.)/P(B0. vs. B4.)		0.330	<b>0.008*</b>		<b>0.008*</b>
Juices/sweetened drinks <i>Soki/napoje słodzone</i>	Initial (E0) <i>Wstępne (B0)</i>	1.94 $\pm$ 1.18	2.06 $\pm$ 1.05	0.712	2.01 $\pm$ 1.10
	Final (E4) <i>Końcowe (B4)</i>	1.56 $\pm$ 1.16	1.49 $\pm$ 1.14	0.800	1.52 $\pm$ 1.14
Mean $\pm$ SD (all exam. scores) <i>Średnia <math>\pm</math>SD (wszystkie badania)</i>		1.79 $\pm$ 1.11	1.68 $\pm$ 1.14	0.394	1.73 $\pm$ 1.12
P (E0. vs. E4.)/P(B0. vs. B4.)		0.133	<b>0.008*</b>		<b>0.003*</b>
Sweets <i>Słodycze</i>	Initial (E0) <i>Wstępne (B0)</i>	1.65 $\pm$ 1.07	1.74 $\pm$ 1.03	0.450	1.70 $\pm$ 1.04
	Final (E4) <i>Końcowe (B4)</i>	1.35 $\pm$ 1.01	1.15 $\pm$ 0.81	0.716	1.23 $\pm$ 0.90
Mean $\pm$ SD (all exam. scores) <i>Średnia <math>\pm</math>SD (wszystkie badania)</i>		1.55 $\pm$ 0.97	1.35 $\pm$ 0.91	<b>0.046*</b>	1.43 $\pm$ 0.94
P (E0. vs. E4.)/P(B0. vs. B4.)		0.173	<b>0.002*</b>		0.001*

\* statistically significant ( $P \leq 0.05$ ; Wilcoxon test (comparing E0. with E4.) and the Mann-Whitney U test (comparing both sexes).

Table II. Percentage of children having snacks, juices/sweetened drinks and sweets more than 3 times a day.

Tabela II. Odsetki dzieci spożywających więcej niż 3 razy dziennie przekąski, soki/napoje słodzone i słodczyce.

Examination (E) Badanie(B)		Snacks Przekąski	Juices/sweetened drinks Soki/napoje słodzone	Sweets Słodczyce
		Number/percentage of answers n/% Liczba/odsetek n/%	Number/percentage of answers n/% Liczba/odsetek n/%	Number/percentage of answers n/% Liczba/odsetek n/%
Initial Examination (E0) Badanie wstępne (B0)	Girls (G) Dziewczęta (D)	11/32.4	16/47.1	10/29.4
	Boys (B) Chłopcy (Ch)	22/46.8	23/48.9	16/34
	P (G vs. B ) P (D vs.Ch)	0.191	0.868	0.660
	All/Ogółem	33/40.7	39/48.1	26/32.1
Final Examination (E4) Badanie końcowe (B4)	Girls (G) Dziewczęta (D)	6/17.6	9/26.5	6/17.6
	Boys (B) Chłopcy (Ch)	7/14.9	12/25.5	3/6.4
	P (G vs. B ) P (D vs.Ch)	0.739	0.924	0.111
	All/ Ogółem	13/16	21/25.9	9/11.1
<b>P (E0. vs. E4.)P(B0. vs. B4.)</b>	Girls (G) Dziewczęta (D)	0.228	<b>0.046*</b>	0.289
	Boys (B) Chłopcy (Ch)	<b>0.001*</b>	0.015*	0.001*
	All/ Ogółem	<b>0.001*</b>	<b>0.001*</b>	<b>0.001*</b>

\*significant difference on the basis of the chi-square test (comparing both sexes) and McNemar's test (comparing E0. with E4.) at 0.05 probability level

with a decrease in toothbrushing (tab. VI). It was also observed during the examination after one year that poor oral hygiene was associated with bad eating habits, i.e. a more frequent sweets and juice/sweetened drink intake. The assessment also emphasised the correlation between caries intensity (dmft index) and a frequent juice/sweet drink intake and hygienic negligence.

## DISCUSSION

At the initial examination and at every control examination, the co-authors of this paper explained to the parents and to the children, the eating and hygiene guidelines and demonstrated the preventive care routine. They also informed about the role played by cariogenic bacteria and the presence of carbohydrates in the onset of caries, the necessity of treating the lesions and applying a preventive fluoride treatment by using the so called positive motivation, which consists of presenting the benefits of good habits instead of exposing the negative aspects of caries (negative motivation). The bad eating and hygienic habits promulgated by the parents and reported at the initial examination were crucial when it came to preventive care, which confirms the data presented by other authors (4, 5, 7). The correlation between the frequency of snack intake in-between meals and a diet

rich in sugars and the onset of early childhood caries was proved by many researchers (3-5, 7). A frequent intake of sweetened drinks/juices in-between meals is also an important factor in early childhood caries. It is crucial for parents to be aware of the fact that sweetened drinks/ juices are a cariogenic sweet snack. Teaching small children healthy nutrition habits should involve the least frequent possible intake of highly cariogenic drinks and food. Eating and hygienic habits taught in the first year of life are maintained throughout the whole childhood. Discussing the eating habits serves to predict the incidence of caries.

In the present study almost half of the children drank juices or sweetened drinks more than three times a day, had more than three snacks in-between meals, and 32.10% had sweets more than three times a day. The assessment of the mean intake of snacks, juices/sweetened drinks and sweets after a year confirmed better eating habits. Tkaczuk et al. noted sweets were the most frequently consumed snack (53.5% of children) (7). Sweet snacks are served to 73% of children a couple of times in-between meals. However, Pietraszewska et al. noted that all children at the age of two had sweets in-between meals (9). According to surveys, 60% of children aged 4-5 years, 62.38% of children aged 5, and 70.03% of children aged 6 years had sweets at least once a day, and 27 and 32% a couple of

Table III. Toothbrushing frequency before receiving guidelines and after having received them 4 times.

Tabela III. Częstość szczotkowania zębów przed udzieleniem wskazówek higienicznych oraz po 4-krotnym przekazaniu instrukcji higienicznych.

Examination <i>Badanie</i>		Occasionally <i>Sporadycznie</i>	Once day <i>1 x dziennie</i>	Twice a day/ <i>2 x dziennie</i>
		Number/percentage of answers n/% <i>Liczba/odsetek n/%</i>	Number/percentage of answers n/% <i>Liczba/odsetek n/%</i>	Number/percentage of answers n/% <i>Liczba/odsetek n/%</i>
Initial Examination (E0) <i>Badanie wstępne (B0)</i>	Girls (G) <i>Dziewczęta (D)</i>	1/2.9	9/26.5	24/70.6
	Boys (B) <i>Chłopcy (Ch)</i>	4/8.5	7/14.9	36/76.6
	P (G vs. B ) <i>P (D vs.Ch)</i>	0.304	0.197	0.543
	All/ <i>Ogółem</i>	5/6.2	16/19.8	60/74.1
Final Examination (E4) <i>Badanie końcowe (B4)</i>	Girls (G) <i>Dziewczęta (D)</i>	0/0	5/14.7	29/85.3
	Boys (B) <i>Chłopcy (Ch)</i>	0/0	2/4.3	45/95.7
	P (G vs. B ) <i>P (D vs.Ch)</i>	1.00	0.099	0.099
	All/ <i>Ogółem</i>	0/0	7/8.6	74/91.4
P (E0. vs. E4.) <i>P(B0. vs. B4.)</i>	Girls (G) <i>Dziewczęta (D)</i>	0.314	0.230	0.144
	Boys (B) <i>Chłopcy (Ch)</i>	<b>0.041*</b>	0.080	<b>0.007*</b>
	All/ <i>Ogółem</i>	<b>0.023*</b>	<b>0.043*</b>	<b>0.004*</b>

\*significant difference according to the chi-square test at a probability value of 0.05

Table IV. Mean simplified oral hygiene DI-S score.

Tabela IV. Średnie wartości wskaźnika higieny jamy ustnej DI-S.

	DI-S Initial Examination (E0) <i>Badanie wstępne (B0)</i>	DI-S Final Examination (E4) <i>Badanie końcowe (B4)</i>	P (E0 vs. E4) <i>P (B0 vs. B4)</i>
Girls (G) <i>Dziewczęta (D)</i>	1.15±0.67	0.72±0.48	<b>&lt;0.001*</b>
Boys (B) <i>Chłopcy (Ch)</i>	1.23±0.74	0.87±0.74	<b>0.006*</b>
P (G vs. B ) <i>P (D vs.Ch)</i>	0.727	0.518	
All <i>Ogółem</i>	1.19±0.71	0.81±0.64	<b>&lt;0.001*</b>

\*significant difference (Comparison of girls and boys using the Mann-Whitney U test and comparison of E0. vs. E4. using Wilcoxon signed-rank test)

Table V. Average values for dmft d-component.

Tabela V. Średnie wartości składowej d wskaźnika dmft.

	<b>d-component/Składowa d Initial Examination (E0) Badanie wstępne (B0)</b>	<b>d-component/Składowa d Final Examination (E4) Badanie końcowe (B4)</b>	<b>P (E0 vs. E4) P (B0 vs. B4)</b>
Girls (G) <i>Dziewczęta (D)</i>	2.65±3.39	2.65±3.08	0.910
Boys (B) <i>Chłopcy (Ch)</i>	2.32±3.14	2.66±2.43	0.074
P (G vs. B) P (D vs. Ch)	0.811	0.488	
All <i>Ogółem</i>	2.46±3.23	2.65±2.70	0.147

\*statistically significant ( $P \leq 0.05$ ; Wilcoxon test (comparing E0 with E4) and Mann-Whitney U test (comparing both sexes)

Table VI. Spearman's rank correlation coefficients (E0 – initial examination, E4 – final examination).

Tabela VI. Współczynniki korelacji rang Spearmana (B0 – badanie wstępne, B4 – badanie końcowe).

	<b>DI-S (E0)/(B0)</b>	<b>DI-S (E4)/(B4)</b>	<b>dmft (E0)/(B0)</b>	<b>dmft (E4)/(B4)</b>
DI-S (E0)/(B0)			0.201	
DI-S (E4)/(B4)				<b>0.380*</b>
Toothbrushing frequency (E0) <i>Częstość mycia zębów (B0)</i>	-0.123		0.173	
Toothbrushing frequency (E4) <i>Częstość mycia zębów (B4)</i>		<b>-0.219*</b>		-0.187
Number of snacks (E0) <i>Liczba przekąsek (B0)</i>	0.151		-0.010	
Number of snacks (E4) <i>Liczba przekąsek (B0)</i>		0.071		-0.070
Number of juices/sweetened drinks (E0) <i>Liczba soków/napojów słodzonych (B0)</i>	<b>0.225*</b>		-0.141	
Number of juices/sweetened drinks (E4) <i>Liczba soków/napojów słodzonych (B4)</i>		<b>0.391*</b>		<b>0.230*</b>
Number of sweets (E0) <i>Liczba słodyczy (B0)</i>	<b>0.310*</b>		-0.098	
Number of sweets (E4) <i>Liczba słodyczy (B4)</i>		<b>0.277*</b>		0.191

\*coefficients pinpointing at statistically significant correlations

times a day, and 27% of children aged 6 years had sweets a couple of times a day, and 78% in-between meals (10). Almost 2/3 of children most often has highly cariogenic drinks during the day.

A high carbohydrate consumption indicates a correlation with irregular hygienic routines and the presence of dental plaque, posing a caries factor, in children. In the present study, DI-S decreased after one year from  $1.20 \pm 0.71$  to  $0.81 \pm 0.64$ , confirming the benefits of regularly providing health-oriented education. Jarzabek et al. reached similar conclusions (11). Researchers assessed children, aged 3 years and taking part in the preventive care health- and training-oriented programme, presented a better level

of oral hygiene compared to the control group (OHI-S = 1.2 vs. 1.5). In the majority of examined children, oral hygiene was assessed to be good (43 vs. 24%). In 3-7 year old children living in Warsaw only 30% of children presented a good level of oral hygiene (12).

Regular preventive care routines, including proper removal of bacterial dental plaque from tooth surfaces, is considered to be one of the main caries preventive factors. According to the medical history questionnaires, which the co-authors of the present study completed with the parents/guardians, the latter assured preventive care routines were performed in the oral cavity of their child. Daszkowska et al. states that the percentage of

children supervised by their parents when brushing their teeth varies between 25 and 86.6% (13). According to *Topolska*, this percentage is higher and amounts to 93.2%. In other studies, almost all parents with young children (95.8%) and almost three thirds of parents with older children (72.7%) help them to brush their teeth (14). *Bruzda-Zwiech* et al. had different results – most of 5-6 year olds brush their teeth without parental supervision, and only 42% of 4-5 year olds brush their teeth under parental supervision (15). Parents are usually happy that their kids manage to brush their teeth on their own, as they see it as a sign of their independence and of proper childhood development (6). They are not aware of the fact that the skill of washing alone requires motoric and mental maturity. Skipping the hygienic oral practices or imprecisely removing food debris from the teeth before going to bed, especially after the evening meal, are the main causes of early childhood caries. Only half of the mothers of children aged 5 years helped them with their hygiene practices (6), and in other studies only 28% washed their child's teeth, whereas 55% of children were supervised during that process (16). According to *Rajab* et al., only 19% of parents of children aged 6-7 years help them to brush their teeth (17). Also *Stańczak-Sionek* et al. states that only 13.86% of children aged 5 years and 6.66% of children aged 6 years are supervised by their parents when toothbrushing (18).

According to the data collected from other studies, 45-82.3% of children brush their teeth twice a day (10, 12-15). Among the mothers surveyed by *Rajab* et al., 57.7% declared that they cleaned their children's teeth twice and more a day, 29.1% once a day, and 13.3% occasionally or not at all (17). The control study revealed that 37.1% of children aged 3 years brushed their teeth at least twice a day, 38.1% once a day, and 10% not at all (10). In the present study, 74.1% of children brushed their teeth twice a day, and 91.4% did so after one year. The results of the present study are similar to those of *Daszkowska* et al. (13). They indicated that an absolute majority of children brushed their teeth twice a day. In the *Bruzda-Zwiech* et al. study, the percentage of 5 year olds brushing their teeth twice a day increased from 45.5% to 75.77% within a couple of years (15). According to the *Topolska* study, 55.7% of children brush their teeth twice a day (14). The toothbrushing frequency of a child does not always correlate with the OHI-S index. *Kaczmarek* et al. observed the DI-S index decreased in children with a decrease in the frequency of oral practices (19). This most probably results from the fact that parents/guardians didn't deliver true information or that the oral practices were not carried out diligently by the child. The oral hygiene, scored with an appropriate index, seems to be a more reliable parameter among all the analysed caries factors, related to eating habits and oral hygiene, to assess the risk of caries (19).

Regular toothbrushing is considered crucial in caries preventive care. However, it is hard to find a study proving a correlation between toothbrushing frequency and caries. *Rajab* et al. noted lower caries indexes in children brushing their teeth regularly (17). The *Stańczak-Sionek* et al. study proved 5 year old children brushing their teeth twice a day

present considerably lower dmft and OHI-S indexes, compared to children brushing their teeth once a day or a couple of times a week (18). Other studies did not confirm any direct correlation between toothbrushing frequency and oral hygiene and the prevalence of early childhood caries (20-22). The *Stańczak-Sionek* et al. study did not present any correlation between the mother performing oral practices in the child's mouth and the development of caries in children not older than 3 years (18). The eating and hygienic habits improved and the mean DI-S index decreased in some children during the one year study. *Key* and *Locker* state that the efficiency of parents' education at a dental practice is much higher than that of any other method (23). Children taking part in the study had the opportunity to have their teeth treated at the Department of Paediatric Dentistry. Unfortunately, parents did not always take advantage of that possibility, often not showing up for the scheduled visits where carious lesions were to be treated. There are countries where untreated caries in children are viewed as a form of negligence (24). According to the definition by the AAPD, dental negligence is a 'parent or guardian deliberate mistake (omission) to seek and have recourse to treatment necessary to have a healthy oral cavity, indispensable for a healthy functioning without pain and infections' (25). According to control studies on children aged 3 years, half of the mothers takes no interest in the teeth of their children and had never taken them to a dentist's (10). As stated in the *Wierzbicka* et al. study, over 60% of children who turned 3 and started their 4th year of life had never been to the dentist (26). The American Academy of Paediatrics (AAP) recommends paediatricians and family practitioners to get involved in promoting oral health, not only by ways of education and prevention, but also of treatment (such as fluoride varnish application) (27).

## CONCLUSIONS

The results of the present study pinpoint towards a beneficial impact of individual health-oriented parent education on hygienic and eating habits and a decrease in mean DI-S in children with a high risk of caries. Bad hygienic and eating habits observed at the initial examination reflected insufficient parents' knowledge and indicated the necessity of individual education in dental practices. Controlling the frequency of cariogenic food intake, toothbrushing including oral hygiene, dentition condition, repetitive guidelines for hygienic routines and eating advice proved to be an efficient way of educating the parents.

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