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***Frequency of tooth brushing and its impact on the oral health.  
A local study in West Pomeranian region***

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**Częstość szczotkowania zębów i jej wpływ na zdrowie jamy ustnej.  
Badanie pacjentów w województwie zachodniopomorskim**

Key words: DMF Index, oral health, oral hygiene, tooth brushing

Słowa kluczowe: wskaźnik PUW, zdrowie jamy ustnej, higiena jamy ustnej, szczotkowanie zębów

**INTRODUCTION**

The promotion of proper oral hygiene at the population level is one of the most important goals of WHO (World Health Organization) and the FDI (World Dental Federation) [6, 11, 25, 33]. Preventive care both at the individual and population level reduces the negative influence of oral diseases on the overall health status and wellbeing. Effective and efficient oral health practices and habits are crucial for

achieving good oral health [24, 25]. Removing plaque is essential for the prevention of the two most prevalent dental diseases – dental caries and periodontal diseases [25]. The most effective way of removing dental plaque is still regular tooth brushing using fluoride toothpaste, preferably after every meal. The use of dental floss is also recommended for complete removal of dental plaque, even from interdental spaces [6, 11].

Oral diseases have a very negative influence on people's lives [20] and are associated with chronic health conditions such as diabetes and cardiovascular diseases [13, 19]. Many studies have examined the associations between oral health and various socio-economic and demographical factors [2, 26, 28, 31] or stress [7, 8, 10, 27], both of which have been found to have an impact on the oral health outcomes.

Dental caries is defined as a multi-factorial infectious disease. When food enters the mouth, bacteria metabolize fermentable carbohydrates, producing acids, which diffuse into hard dental tissue, and demineralize tooth enamel [9]. In the absence of proper dental hygiene, this process has an increased likelihood of resulting in dental caries.

The DMFT is simple and the most widely applied caries index and is a sum of the number of teeth that are decayed – DT, missing (extracted) – MT, or have been filled – FT. The FT component gives a picture of a consequence of the disease as well as its treatment outcome. Many studies are assessing the relationship between caries, diet and hygiene habits while using DMFT as caries experience index. A widely supported expert- and evidence-based strategy for the treatment and prevention of dental caries involves collecting patient-specific caries risk information and using that information to guide individualized treatment decisions, with emphasis on minimally invasive and/or non-operative therapies, such as remineralizing or anti-bacterial agents, to manage caries as a disease process [4].

This study tries to assess the oral health status and dental health behaviors, especially the frequency of brushing teeth of patients from West Pomeranian region.

## **MATERIAL AND METHOD**

This was a cross-sectional study conducted in dental facilities in the city of Szczecin, on 301 randomly chosen patients attending dental treatment. The analysis included dental examination of teeth status, prevalence of caries and evaluation of oral hygiene. The survey contained questions related to patients' personal data, including gender, age, place of living, education and income per person in a household. Patients were divided into five age groups: 18-22, 23-34, 35-50, 51-65 and over 65 years old. Place of living was classified into three groups: the city of Szczecin, smaller cities and villages. Education was classified into four groups: primary,

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vocational, secondary and higher. Patients were divided into five income groups: up to 300 PLN, 301-500 PLN, 501-800 PLN, 801-1200 PLN and over 1200 PLN. Further questions were related to the utilization of dental services, dental attendance, reasons of attending and delaying visits, fear of the dentist, hygiene habits (frequency of brushing teeth and replacing toothbrush, use of dental products). Clinical examination was performed in the dental environment, in artificial light, with use of mirror and dental probe in accordance with the WHO recommendation. The dental examination was preceded with a short interview, to determine patients' evaluation of their health (cardiovascular diseases, metabolic disorder, blood diseases, infectious diseases). Dental caries experience was shown as a DMFT index. Number of remaining and healthy teeth (without caries or fillings) was determined.

The data collection took place from 2013 to 2014 and the dental examination was performed by 4 dental professionals. The research was approved by the Ethics Committee of the Regional Medical Council in Szczecin.

All calculations were performed with the use of StatSoft Inc. statistical software STATISTICA, version 12.0. and Excel 2010 calculation sheet. Quantitative variables were expressed by: mean, standard deviation, median, minimal and maximal value (range) and 95% CI (Confidence Interval). The qualitative variables were expressed by numerical values. The W Shapiro-Wilk test was used to check if the quantitative variable came from normally distributed population. The Levene's (Brown-Forsythe) test was used to check the hypothesis on equal variances. The difference significance between two groups (independent variables model) was tested using significance differences test: t-Student or U Mann-Whitney test. Significant differences between more than two groups were tested with F (ANOVA) or Kruskal-Wallis test (in case of not complying with ANOVA test requirements). The strength and direction of correlation between variables was tested using correlation analysis calculating Pearson and/or Spearman correlation coefficients. The statistical significance level was set at  $p=0.05$ .

**Tab. I. Socio-demographic and personal data of examined patients**

	N (%)
Total	301 (100.0)
Gender	
women	174 (57.8)
men	127 (42.2)
Age	
18-22	24 (8.0)
23-34	88 (29.2)
35-50	67 (22.3)
51-65	77 (25.6)
over 65	45 (14.9)
Place of living	
big city	251 (83.4)
smaller cities	25 (8.3)
villages	25 (8.3)

	N (%)
Education	
primary	12 (4.0)
vocational	68 (22.6)
secondary	124 (41.2)
higher	97 (32.2)
Income	
up to 300 PLN	11 (3.7)
301-500 PLN	31 (10.3)
501-800 PLN	59 (19.6)
801-1200 PLN	72 (23.9)
over 1200 PLN	128 (42.5)

## RESULTS

**Tab. II. The frequency of brushing teeth in relation to the socio-demographic data of examined patients**

	How often do you brush your teeth?				
	after every meal	twice a day	once a day	less often than once a day	sporadically
	N (%)	N (%)	N (%)	N (%)	N (%)
Total	61 (20.27)	188 (62.46)	41 (13.62)	9 (2.99)	2 (0.66)
Gender					
women	41 (23.56)	112 (64.37)	16 (9.20)	4 (2.30)	1 (0.57)
men	20 (15.75)	76 (59.84)	25 (19.69)	5 (3.94)	1 (0.79)
Age					
18-22	6 (25.00)	14 (58.33)	3 (12.50)	0 (0.00)	1 (4.17)
23-34	18 (20.45)	56 (63.64)	11 (12.50)	3 (3.41)	0 (0.00)
35-50	11 (16.42)	51 (76.12)	5 (7.46)	0 (0.00)	0 (0.00)
51-65	12 (15.58)	52 (67.53)	10 (12.99)	3 (3.90)	0 (0.00)
over 65	14 (31.11)	15 (33.33)	12 (26.67)	3 (6.67)	1 (2.22)
Place of living					
big city	53 (21.12)	153 (60.96)	35 (13.94)	8 (3.19)	2 (0.80)
smaller cities	2 (8.00)	19 (76.00)	3 (12.00)	1 (4.00)	0 (0.00)
villages	6 (24.00)	16 (64.00)	3 (12.00)	0 (0.00)	0 (0.00)
Education					
primary	3 (25.00)	4 (33.33)	4 (33.33)	1 (8.33)	0 (0.00)
vocational	13 (19.12)	34 (50.00)	16 (23.53)	5 (7.35)	0 (0.00)
secondary	24 (19.35)	77 (62.10)	19 (15.32)	2 (1.61)	2 (1.61)
higher	21 (21.65)	73 (75.26)	2 (2.06)	1 (1.03)	0 (0.00)
Income					
up to 300 PLN	4 (36.36)	4 (36.36)	2 (18.18)	1 (9.09)	0 (0.00)
301-500 PLN	5 (16.13)	16 (51.61)	7 (22.58)	1 (3.23)	2 (6.45)
501-800 PLN	9 (15.25)	40 (67.80)	8 (13.56)	2 (3.39)	0 (0.00)
801-1200 PLN	16 (22.22)	42 (58.33)	11 (15.28)	3 (4.17)	0 (0.00)
over 1200 PLN	27 (21.09)	86 (67.19)	13 (10.16)	2 (1.56)	0 (0.00)

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The vast majority of patients reported that they brush teeth twice a day. Every fifth patient brushed teeth after every meal. Gender and education had visible influence on the frequency of brushing teeth. Women, patients with higher education and with income of over 1200 PLN brushed teeth more frequently than other patients. Patients with low income and with primary education brush teeth least often.

**Tab. III. Mean values of DT in relation to the frequency of brushing teeth and socio-demographic data of examined patients**

	DT (mean values)					
	How often do you brush your teeth?					
	after every meal	twice a day	once a day	less often than once a day	sporadically	p=
Total	2.49	3.52	3.22	2.56	3.00	p=0.2077
<b>Gender</b>						
women	2.54	3.99	2.00	1.50	6.00	p>0.05
men	2.40	2.82	4.00	3.40	0.00	p=0.6369
<b>Age</b>						
18-22	2.17	3.14	5.67	-	6.00	p=0.3559
23-34	3.72	4.96	6.64	3.67	-	p=0.5205
35-50	3.64	4.35	4.20	-	-	p=0.7661
51-65	1.67	1.87	1.40	3.00	-	p=0.7984
over 65	0.86	1.33	0.58	1.00	0.00	p=0.5710
<b>Place of living</b>						
big city	2.70	3.28	3.00	2.13	3.00	p=0.4673
smaller cities	2.00	4.84	3.67	6.00	-	p=0.7096
villages	0.83	4.19	5.33	-	-	p>0.05
<b>Education</b>						
primary	0.00	5.25	8.00	0.00	-	p=0.1063
vocational	1.54	2.71	2.19	1.80	-	p=0.3564
secondary	2.17	3.57	3.05	7.00	3.00	p=0.3008
higher	3.81	3.74	3.50	0.00	-	p=0.6477
<b>Income</b>						
up to 300 PLN	1.00	4.00	5.50	0.00	-	p=0.3043
301-500 PLN	3.20	3.63	2.14	0.00	3.00	p=0.3565
501-800 PLN	5.44	4.73	1.75	1.50	-	p=0.1672
801-1200 PLN	2.63	3.31	2.45	3.67	-	p=0.6279
over 1200 PLN	1.52	3.01	5.00	4.50	-	p=0.0785

Patients who brush their teeth after every meal have the lowest mean number of DT (2.49). Considering age groups, patients with the age of over 65 years have the lowest number of DT. Patients from villages who brush their teeth after every meal have

lower number of DT (0.83) than patients living in Szczecin (2.70) and smaller cities (2.00). Patients with higher education had more DT, even when brushing always after every meal or twice a day, than other patients. It was noticeable that patients with the highest income (over 1200 PLN) had the lowest number of DT.

**Tab. IV. Mean values of MT in relation to the frequency of brushing teeth and socio-demographic data of examined patients**

	MT (mean values)					
	How often do you brush your teeth?					
	after every meal	twice a day	once a day	less often than once a day	sporadically	p=
Total	11.75	8.32 <sup>a</sup>	16.66 <sup>a</sup>	20.22	16.00	<sup>a</sup> p=0.0018
Gender						
women	12.51	7.32 <sup>a</sup>	18.88 <sup>a</sup>	15.25	4.00	<sup>a</sup> p=0.0018
men	10.20	9.80	15.24	24.20	28.00	p>0.05
Age						
18-22	0.00	1.43	1.33	-	4.00	p=0.1673
23-34	1.67	1.75	2.64	6.33	-	p=0.4540
35-50	4.09 <sup>a</sup>	5.29 <sup>b</sup>	16.20 <sup>a,b</sup>	-	-	<sup>a,b</sup> p<0.05
51-65	20.67	16.50	24.10	23.67	-	p=0.0725
over 65	28.14	21.27	27.33	30.67	28.00	p>0.05
Place of living						
big city	13.08	8.90 <sup>a</sup>	17.94 <sup>a</sup>	22.63	16.00	<sup>a</sup> p=0.0025
smaller cities	0.00	5.68	11.67	1.00	-	p=0.4538
villages	4.00	5.94	6.67	-	-	p=0.4945
Education						
primary	18.00	10.50	12.75	28.00	-	p=0.7914
vocational	21.08	16.38	18.50	22.60	-	p=0.3853
secondary	12.25	8.14	17.05	20.50	16.00	p=0.0827
higher	4.52	4.64	6.00	0.00	-	p=0.3246
Income						
up to 300 PLN	18.00	14.50	2.00	32.00	-	p=0.3318
301-500 PLN	19.40	7.13 <sup>a</sup>	27.00 <sup>a</sup>	31.00	16.00	<sup>a</sup> p=0.0095
501-800 PLN	6.22 <sup>a</sup>	10.20	23.50 <sup>a</sup>	24.50	-	<sup>a</sup> p=0.0416
801-1200 PLN	14.13	10.24	17.91	15.67	-	p=0.2636
over 1200 PLN	9.85	6.45	8.08	11.50	-	p=0.9583

Patients who brush their teeth twice a day have the lowest mean number of MT (8.32). There are statistically significant differences between the mean values of MT in women, patients aged 35-50, from a big city, with income of 301-500 and 501-800 PLN.

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**Tab. V. Mean values of FT in relation to the frequency of brushing teeth and socio-demographic data of examined patients**

	FT (mean values)					
	How often do you brush your teeth?					
	after every meal	twice a day	once a day	less often than once a day	sporadically	p-value
Total	5.87	7.24 <sup>a</sup>	3.73 <sup>a</sup>	2.89	5.00	<sup>a</sup> p=0.0003
Gender						
women	4.98	7.22 <sup>a</sup>	2.69 <sup>a</sup>	5.25	6.00	<sup>a</sup> p=0.0027
men	7.70	7.26 <sup>a</sup>	4.40	1.00 <sup>a</sup>	4.00	<sup>a</sup> p=0.0326
Age						
18-22	4.83	7.29	8.33	-	6.00	p=0.5196
23-34	6.83	6.30	6.09	5.67	-	p=0.9863
35-50	9.91	9.02	4.20	-	-	p=0.1196
51-65	5.83	6.94	2.60	2.67	-	p=0.0686
over 65	1.93	5.67	1.17	0.33	4.00	p=0.0617
Place of living						
big city	5.68	7.50 <sup>a,b</sup>	3.46 <sup>a</sup>	2.50 <sup>b</sup>	5.00	<sup>a,b</sup> p<0.05
smaller cities	6.50	5.00	5.33	6.00	-	p=0.9455
villages	7.33	7.44	5.33	-	-	p=0.9305
Education						
primary	2.67	5.00	4.50	4.00	-	p=0.8352
vocational	4.00	4.79	3.69	2.20	-	p=0.6756
secondary	5.83	7.58 <sup>a</sup>	3.11 <sup>a</sup>	0.00	5.00	<sup>a</sup> p=0.0042
higher	7.52	8.14	8.50	11.00	-	p=0.6449
Income						
up to 300 PLN	2.75	2.25	3.00	0.00	-	p=0.7039
301-500 PLN	1.00	6.75 <sup>a</sup>	1.86 <sup>a</sup>	1.00	5.00	<sup>a</sup> p=0.0160
501-800 PLN	6.22	7.13 <sup>a</sup>	1.50 <sup>a</sup>	2.00	-	<sup>a</sup> p=0.0356
801-1200 PLN	6.25	6.55	3.36	3.33	-	p=0.1387
over 1200 PLN	6.89	7.95	6.54	5.50	-	p=0.3529

Patients, who brush their teeth twice a day or more often, have the highest number of FT. There are statistically significant differences between the mean values of FT in women, men, patients from a big city, with secondary education, with income of 301-500 and 501-800 PLN compared to those who brush their teeth less often.

**Tab. VI. Mean values of DMFT index in relation to the frequency of brushing teeth and socio-demographic data of examined patients**

	DMFT (mean values)					
	How often do you brush your teeth?					
	after every meal	twice a day	once a day	less often than once a day	sporadically	p-value
Total	20.11	19.08 <sup>a</sup>	23.61 <sup>a</sup>	25.67	24.00	<sup>a</sup> p=0.0265
<b>Gender</b>						
women	20.02	18.54	23.56	22.00	16.00	p=0.2837
men	20.30	19.88	23.64	28.60	32.00	p=0.0601
<b>Age</b>						
18-22	7.00	11.86	15.33	-	16.00	p=0.1769
23-34	12.22	13.02	15.36	15.67	-	p=0.2302
35-50	17.64	18.67	24.60	-	-	p=0.1592
51-65	28.17	25.31	28.10	29.33	-	p=0.2845
over 65	30.93	28.27	29.08	32.00	32.00	p=0.2521
<b>Place of living</b>						
big city	21.45	19.68	24.40	27.25	24.00	p>0.05
smaller cities	8.50	15.53	20.67	13.00	-	p=0.3180
villages	12.17	17.56	17.33	-	-	p=0.2220
<b>Education</b>						
primary	20.67	20.75	25.25	32.00	-	p=0.6182
vocational	26.62	23.88	24.38	26.60	-	p=0.5643
secondary	20.25	19.30	23.21	27.50	24.00	p=0.3716
higher	15.86	16.52	18.00	11.00	-	p=0.7055
<b>Income</b>						
up to 300 PLN	21.75	20.75	10.50	32.00	-	p=0.4476
301-500 PLN	23.60	17.50 <sup>a</sup>	31.00 <sup>a</sup>	32.00	24.00	<sup>a</sup> p=0.0253
501-800 PLN	17.89	22.05	26.75	28.00	-	p=0.1324
801-1200 PLN	23.00	20.10	23.73	22.67	-	p=0.5554
over 1200 PLN	18.26	17.42	19.62	21.50	-	p=0.6804

Patients who brush their teeth twice a day have the lowest DMFT score (20.10). Patients who brush their teeth after each meal or twice a day have much lower DMFT scores than other patients. There are statistically significant differences between the mean values of DMFT in patients with income of 301-500 PLN and in entire group of patients who brush teeth twice a day compared to those who brush their teeth only once a day.

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**Tab. VII. Mean numbers of remaining teeth in relation to the frequency of brushing teeth and socio-demographic data of examined patients**

	Remaining teeth (mean numbers)					
	How often do you brush your teeth?					
	after every meal	twice a day	once a day	less often than once a day	sporadically	p-value
Total	20.07	23.68 <sup>a</sup>	15.07 <sup>a</sup>	11.89	16.00	<sup>a</sup> p=0.0004
Gender						
women	19.49	24.63 <sup>a</sup>	12.88 <sup>a</sup>	16.75	28.00	<sup>a</sup> p=0.0018
men	21.25	22.29	16.48	8.00	4.00	p>0.05
Age						
18-22	32.00	30.43	30.67	-	28.00	p=0.1848
23-34	29.72	30.21	28.73	25.67	-	p=0.2623
35-50	27.91 <sup>a</sup>	26.57 <sup>b</sup>	15.80 <sup>a,b</sup>	-	-	<sup>a,b</sup> p<0.05
51-65	11.33	15.79	7.90	8.67	-	p=0.0683
over 65	3.86	10.53	4.33	1.33	4.00	p>0.05
Place of living						
big city	18.72	23.14 <sup>a</sup>	13.74 <sup>a</sup>	9.50	16.00	<sup>a</sup> p=0.0005
smaller cities	32.00	26.32	20.33	31.00	-	p=0.4538
villages	28.00	25.75	25.33	-	-	p=0.5620
Education						
primary	14.00	21.50	18.50	4.00	-	p=0.7752
vocational	10.92	15.38	13.50	9.60	-	p=0.4357
secondary	19.29	23.79	14.53	11.50	16.00	p>0.05
higher	27.48	27.55	26.00	32.00	-	p=0.3632
Income						
up to 300 PLN	14.00	17.50	30.00	0.00	-	p=0.3318
301-500 PLN	12.60	24.56 <sup>a</sup>	5.00 <sup>a</sup>	1.00	16.00	<sup>a</sup> p=0.0109
501-800 PLN	25.78 <sup>a</sup>	21.73	8.50 <sup>a</sup>	8.00	-	<sup>a</sup> p=0.0402
801-1200 PLN	17.88	21.62	13.73	16.33	-	p=0.2712
over 1200 PLN	21.74	25.72	23.38	20.50	-	p=0.5888

Patients who brush their teeth twice a day have the highest mean number of remaining teeth (23.68). Patients who brushed their teeth after every meal and twice a day had more remaining teeth than other patients. There are statistically significant differences between the mean numbers of remaining teeth in women, patients aged 35-50, from a big city, with income of 301-500 and 501-800 PLN compared to those who brush their teeth once a day.

**Tab. VIII. Mean numbers of healthy teeth in relation to the frequency of brushing teeth and socio-demographic data of examined patients**

	Healthy teeth (mean numbers)					
	How often do you brush your teeth?					
	after every meal	twice a day	once a day	less often than once a day	sporadically	p=
Total	10.72	11.78	7.51	5.56	9.50	p>0.05
<b>Gender</b>						
women	11.22	12.33	7.13	9.25	16.00	p=0.2472
men	9.70	10.96	7.76	2.60	3.00	p=0.1585
<b>Age</b>						
18-22	23.67	18.36	15.67	-	16.00	p=0.2551
23-34	18.50	17.45	15.18	14.67	-	p=0.2062
35-50	12.00	11.88	7.40	-	-	p=0.3847
51-65	3.33	6.17	3.30	2.00	-	p=0.3205
over 65	0.50	3.53	2.00	0.00	3.00	p=0.1907
<b>Place of living</b>						
big city	9.28	11.10	6.66	4.13	9.50	p>0.05
smaller cities	21.50	15.63	10.33	17.00	-	p=0.2537
villages	19.83	13.63	14.67	-	-	p=0.2196
<b>Education</b>						
primary	11.33	11.50	6.00	0.00	-	p=0.6197
vocational	5.08	7.32	7.00	4.60	-	p=0.6057
secondary	10.13	11.61	7.63	3.50	9.50	p=0.3412
higher	14.81	14.04	13.50	20.00	-	p=0.8085
<b>Income</b>						
up to 300 PLN	9.25	11.25	21.50	0.00	-	p=0.4476
301-500 PLN	7.60	13.38 <sup>a</sup>	1.00 <sup>a</sup>	0.00	9.50	<sup>a</sup> p=0.0230
501-800 PLN	12.78	8.83	4.75	3.00	-	p=0.1545
801-1200 PLN	7.81	10.71	6.18	8.00	-	p=0.3150
over 1200 PLN	12.56	13.40	11.69	10.00	-	p=0.8664

Patients who brush their teeth twice a day have the highest mean number of healthy teeth (11.78). In all socio-economic groups, the majority of patients who brushed their teeth after every meal or twice a day had higher number of healthy teeth than patients who brushed their teeth less often. There is a statistically significant difference between the mean numbers of healthy teeth only in patients with income of 301-500 PLN who brush teeth twice a day compared to those who brush teeth once a day.

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**Tab. IX. Mean values of oral health indices in relation to the frequency of brushing teeth**

How often do you brush your teeth?	DT	MT	FT	DMFT	Remaining teeth	Healthy teeth
after every meal	2.49	11.75	5.87	20.11	20.07	10.72
twice a day	3.52	8.32	7.24	19.08	23.68	11.78
once a day	3.22	16.66	3.73	23.61	15.07	7.51
less often than once a day	2.56	20.22	2.89	25.67	11.89	5.56
sporadically	3.00	16.00	5.00	24.00	16.00	9.50
Total	3.24	10.56	6.34	20.14	21.37	10.78
p=	p=0.2077	p=0.0006	p=0.0001	p=0.0113	p=0.0002	p>0.05

Patients who brush their teeth after each meal have the lowest mean number of DT (2.49). Patients who brush their teeth twice a day have the lowest mean number of MT (8.32) and the highest mean number of FT (7.24). They also have the lowest score of the DMFT index (19.08), and highest mean number of remaining (23.68) and healthy teeth (11.78). There are statistically significant correlations between the frequency of brushing teeth and the mean values of MT, FT and DMFT indices and also between the frequency of brushing teeth and the mean numbers of remaining teeth.

## DISCUSSION

Oral health is influenced by many factors like accessibility to dental services, dental attitude and oral hygiene habits. According to Gaszyńska et al. favourable dental health behaviour consists of 4 basic elements: effective removal of dental plaque by brushing teeth at least twice a day and flossing once a day, regular visits to a dentist (in adults at least once a year), providing a reasonable amounts of fluoride, restricted consumption of cariogenic food [12]. Reduction of plaque accumulation is an important factor for prevention of periodontal disease and dental caries. Therefore, twice a day tooth brushing is recommended as a good dental self-care procedure [5, 32, 34].

Gaszyńska et al. claimed that the frequency of brushing teeth by the Poles in 2010 was similar to the results obtained in 1988 in the studies conducted on Norwegian people [12]. At that time more than 63% of adult Norwegians brushed their teeth at least twice a day [29]. In New Zealand and West Germany as many as 85% of people claimed that they brushed their teeth at least twice a day [3, 17]. The study of other authors, who investigated the frequency of tooth brushing in the group of patients aged 35-44 years between 1988 and 2009 in New Zealand, showed that the percentage of patients who brushed their teeth at least twice a day was significantly lower and it was 65% [15].

In this study the percentage of patients who brushed teeth twice a day or more often, was about 83%. Every fifth patient brushed teeth after every meal. Gender,

education and income had significant influence on the frequency of brushing teeth. Women, patients with higher education and with income of over 1200 PLN brushed teeth more frequently than other patients.

The relationship between oral hygiene and dental caries is well described in the literature [1, 14, 21]. Mamai-Homata et al. [22] showed in their study that there was a very strong correlation between tooth brushing frequency and oral hygiene status, whereas in other studies tooth brushing frequency was only weakly associated with oral hygiene [16, 18, 23].

This study showed that the frequency of tooth brushing is statistically correlated with the oral health. Patients who reported more frequent tooth brushing had significantly better values of common oral health indices, such as DMFT and also the mean number of remaining teeth.

The study by Tseveenjav et al. showed that mean number of remaining teeth was 24.2, and the mean numbers of DT, FT and healthy teeth were 0.5, 13.8 and 9.6 for women and 1.1, 12.1 and 10.8 for men, respectively [29].

In this study the corresponding indices had following mean values: remaining teeth – 21.4, DT – 3.2, FT – 6.3, healthy teeth – 10.8. Women had more healthy teeth compared to men and lower number of FT was also observed in women.

Study conducted by Tsitaishvili [30] determined that the DMFT value is mainly determined by DT and MT variables, not by FT. The results were not only influenced by the oral hygiene habits but also by dental attendance. In that study Tsitaishvili showed that majority of patients brushed their teeth twice a day.

In our study the vast majority of patients brushed their teeth after every meal or twice a day. Higher numbers of remaining and healthy teeth was observed in this group compared to patients who brush their teeth less often.

### CONCLUSIONS

1. The vast majority of patients reported that they brush teeth twice a day. Women, patients with higher education and with income of over 1200 PLN brushed teeth more frequently than other patients.
2. Patients from villages who brush their teeth after every meal have a lower number of DT than patients living in Szczecin and smaller cities.
3. The group with highest number of FT are patients who brush their teeth twice a day or more frequently.
4. Patients who brush their teeth after each meal or twice a day have the lowest mean values of MT and DMFT indices.
5. In all socio-economic groups, the majority of patients who brushed their teeth after every meal or twice a day had higher numbers of remaining and healthy teeth compared to other patients.
6. There are statistically significant correlations between the frequency of brushing teeth and the mean values of DMFT, MT, FT and also between the frequency of brushing teeth and the mean numbers of remaining teeth.

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#### **ABSTRACT**

The aim of the study was to evaluate dental health status and dental behavior, especially the frequency of tooth brushing. The study was conducted from 2013 to 2014 among 301 randomly chosen adult patients of both sexes, living in Szczecin, smaller cities or villages. The analysis included dental examination of teeth status, prevalence of caries and evaluation of oral hygiene. The survey contained questions about using dental treatment and oral hygiene. The lowest average number of DT was observed on patients who brushed their teeth after every meal. The lowest average number of MT and the highest average number of FT was observed on patients who brushed their teeth twice a day. The lowest DMFT index and the highest average number of remaining and healthy teeth were noted in this group.

#### **STRESZCZENIE**

Celem badań była ocena stanu zdrowia jamy ustnej i stomatologicznych zachowań zdrowotnych, w szczególności częstości szczotkowania zębów. Badanie było prowadzone w latach 2013-2014 wśród 301 losowo wybranych dorosłych pacjentów, obu płci, zamieszkałych w Szczecinie, mniejszych miastach lub na wsi. Pacjentów poddano badaniu stomatologicznemu w celu ustalenia stanu zdrowia jamy ustnej i poziomu higieny. Badanie ankietowe zawierało pytania dotyczące korzystania ze stomatologicznych świadczeń zdrowotnych i przestrzegania higieny jamy ustnej. Najniższą średnią liczbę zębów z próchnicą zaobserwowano u pacjentów, którzy szczotkowali zęby po każdym posiłku. U pacjentów, którzy szczotkowali zęby dwa razy dziennie stwierdzono najniższą średnią liczbę brakujących zębów oraz najwyższą średnią liczbę zębów wypełnionych. Stwierdzono u nich najniższy wskaźnik PUW i najwyższą średnią liczbę zachowanych i zdrowych zębów.

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