ORIGINAL PAPERS

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Retrospective Evaluation of the Relationship Between the First Dental Visit and the Dental Condition of Six- and Seven-Year-Old Children

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;
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Abstract

Background. The delayed time of a child's first dental visit can influence a future dental condition.

Objectives. To assess the dental condition of children in relation to the age at which their first dental visit took place and the frequency of subsequent visits.

Material and Methods. The study involved 584 parents of 6–7-year-old children regarding the age and the reason for the first child's dental visit, the frequency of subsequent visits and caries preventive counseling obtained during the visits. The children's dental condition was assessed by dmft and DMFT values.

Results. Nine point five percent of the children first visited the dentist up to 1 year old, 44.0% over 3, and 38.7% have not yet had. The highest dmft and DMFT values were among children having their first dental visit at the age of $< 2 \leq 3$. The most frequent reason for the first visit was a check-up (54.3%) and a carious lesion (42.4%). Higher dmft and DMFT values were among children with a symptomatic first visit than with an asymptomatic one. Caries severity in the primary teeth was correlated with the reason for the first dental visit and the frequency of subsequent visits.

Conclusions. Caries severity in primary teeth may be predicted by the reason for the first dental visit and the frequency of subsequent visits (**Adv Clin Exp Med 2016, 25, 4, 767–773**).

Key words: dental caries, first dental visit, 6–7-year-olds.

According to the guidelines of many professional dental organizations around the world, the first dental visit of a child should take place within six months of the eruption of the first primary tooth, but not later than at the age of 12 months [1–5]. The same timing is recommended by Polish experts in pediatric dentistry [6]. During the first dental visit, home dental care should be established. This includes a teeth cleaning demonstration, the implementation of proper feeding practices with avoidance of frequent consumption of liquid and/or solid food containing sugar, and the minimization of saliva-sharing activities (e.g. sharing utensils, cleansing a pacifier orally) to reduce the transmission of cariogenic bacteria. Moreover, anticipatory guidance regarding dental and oral development, non-nutritive sucking habits, teething, and traumatic injury prevention should be provided. Moreover, intervals of further oral check-ups should be established (in most cases, 6 months). Systematic dental examinations are part of a comprehensive strategy to prevent early childhood caries (ECC), a type of tooth decay that affects children at the age of up to 71 months [1, 5, 6].

While authoritative bodies have formulated guidelines for the timing of a child's first dental visit, implementing it has been a different matter as, in the majority of children living in various countries, this guideline is not universally followed [7–13]. Although in recent years an increase in the knowledge of dental caries, concerning both its causes and prevention, has been observed, the implementation of preventive measures in this matter has not raised significantly [12–15]. Therefore, in most cases, a child's first contact with the dentist takes place if tooth decay has been noticed. For

this reason, more effective cooperation is expected of pediatricians, who have the possibility to see the child right after birth, and who should inform the parents about the necessity of scheduling a dental visit for the child by the age of one [16]. The aim of scheduling regular subsequent visits is the assessment of the dental condition, detection of early carious lesions and treatment, as well as carrying out preventive measures and facilitating the child's adaptation to dental treatment. The initial as well as the following dental visits ought to establish long-life preventive oral health measures. There is an opinion that education about the prevention of early childhood caries should be provided to pregnant women as during this period a woman tends to be more open to health-related information due to the special care for her unborn child [17, 18]. During such a visit, the mother becomes aware of the fact that the state of her oral cavity may have some influence not only on the child's development, but also on the childbirth date, and early childhood caries development. The mother receives information concerning caries infectivity, and she becomes aware of the fact that her oral cavity is the main source of transmitting cariogenic bacteria to the child's oral cavity (vertical transmission). She also becomes conscious of how the infection is transmitted, which enables her to implement appropriate preventive practices. Moreover, during this visit, the mother-to-be is provided with information about the necessity for implementing hygienic procedures in the child's toothless oral cavity, and their systematic continuation after teeth eruption. Consistent follow-through of these actions will ensure prevention of early childhood caries development, or at least will reduce its severity.

Material and Methods

The study was comprised of 548 6–7-year-old children of both genders, out of which 262 were boys, as well as their mothers. The subjects involved in this study were the participants of a program entitled "Caries prevention of erupting first molars in children" (PL 0395), supported by Norway Grants – EEA Grants. The inclusive criterion for the children was having at least 2 erupting first permanent molars, and the exclusive one – 4 erupted molars. The mean age of the children was 6.5 ± 0.8. The dental condition of the children was assessed with the use of the "decayed, missing and filled" primary and permanent teeth scores (dmft and DMFT, respectively), according to World Health Organization criteria. The mothers of the children (n = 548) were involved

in a questionnaire study regarding the time and the reason for the child's first dental visit, the frequency of subsequent dental visits and their opinion on the caries preventive counseling received at their child's dental visits. The data obtained was analyzed statistically with the use of the Kruskal-Wallis H test and Dunn's test at a significance level $p < 0.05$. Moreover, a caries severity predictive linear model based on four variables (i.e. the time and the reasons for the child's first dental visit, the frequency of subsequent visits and caries preventive counseling) was calculated using stepwise regression analysis (F-test, $p < 0.05$). The statistical analysis was performed using the STATISTICA 6.0 software package (StatSoft Inc., Tulsa, USA).

This study was approved by the Ethics Committee of Wroclaw Medical University (protocol No KB-114/2009). A written consent for participation in the study was obtained from each child's mother.

Results

The children participating in the study had an average of 15.5 ± 3.3 primary teeth, out of which 4.5 ± 3.8 were affected by the carious process. Most of the decay (82.0%) had not been treated. The average number of erupted permanent teeth was 7.9 ± 3.5, including 0.5 ± 1.0 of caries affected teeth (Table 1).

The largest percentage of the children (38.7%) had their first dental visit when they were over three years of age, then 22.5% at the age of three, 21.5% between two and three, and only 9.5% by the age of one. The rest (5.8%) had not visited the dentist before, i.e. until they were included in the program. While analyzing the relationship between the time of the first dental visit and the dental condition, it was observed that the children with the lowest experience of caries had not visited the dentist so far, and the children with the highest experience of the disease (6.41 ± 3.94 dmft) had had their first visit at the age over one and under two (Table 2).

The most frequently reported reason for the first visit was dental check-up (54.3%), the second was a visible carious lesion without pain (33.3%), and then tooth decay associated with toothache (9.1%), and other lesions (2.5%).

The reason for the first visit was reflected in the dmft and DMFT values. Significantly higher dmft and DMFT values were observed among children visiting the dentist due to noticeable painful decay (8.09 ± 3.88 and 0.96 ± 1.33, respectively), and with a visible painless carious lesion (7.62 ± 4.10 and 0.67 ± 1.20, respectively) in compari-

Table 1. Dental condition

Primary teeth								
Number of teeth	dmft	dt	mt	ft	dmfs	ds	ms	fs
	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD
15.5 ± 3.3	5.75 ± 4.00	4.54 ± 3.80	0.04 ± 0.54	1.17 ± 1.78	11.68 ± 11.56	9.57 ± 11.21	0.01 ± 0.97	2.00 ± 3.13
Permanent teeth								
Number of teeth	DMFT	DT	MT	FT	DMFS	DS	MS	FS
7.9 ± 3.5	0.55 ± 1.10	0.50 ± 1.03	0.01 ± 0.22	0.03 ± 0.25	0.77 ± 1.92	0.68 ± 1.61	0.04 ± 0.74	0.05 ± 0.49

Table 2. Time of the first dental visit and the dental condition

Time of the first dental visit (years)	Nº examined		Primary teeth				Permanent teeth			
			dmft	dt	mt	ft	DMFT	DT	MT	FT
	n	%	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD
No visit before	32	5.8	4.22 ± 3.63	3.59 ± 3.25	0	0.63 ± 1.58	0.22 ± 0.55	0.19 ± 0.47	0	0.03 ± 0.17
2 ≤ 1	52	9.5	6.13 ± 4.79	4.75 ± 4.37	0.31 ± 1.70	1.08 ± 1.58	0.31 ± 0.67	0.29 ± 0.63	0	0.02 ± 0.13
1 ≥ 2	118	21.5	6.41 ± 3.94	4.79 ± 3.82	0.02 ± 0.12	1.60 ± 2.09	0.58 ± 1.16	0.55 ± 1.16	0.01 ± 0.09	0.02 ± 0.12
2 ≥ 3	123	22.5	5.60 ± 4.10	4.21 ± 3.69	0.01 ± 0.09	1.41 ± 1.76	0.46 ± 1.23	0.41 ± 1.03	0.01 ± 0.14	0.04 ± 0.11
3+	212	38.7	5.62 ± 3.75	4.59 ± 3.64	0.01 ± 0.08	0.97 ± 1.64	0.66 ± 1.09	0.59 ± 1.10	0.03 ± 0.09	0.04 ± 0.23
Not reported	11	2.0	0.31 ± 5.41	0.10 ± 5.53	0.01 ± 0.09	0.20 ± 0.41	0.80 ± 1.08	0.80 ± 1.08	0	0
Kruskal–Wallis test			H = 10.4 p < 0.04			H = 15.6 p < 0.004				
Post-hoc test = Dunn's test p < 0.05			significant differences between a–c, a–e c–e			significant differences between a–b, a–c a–d, a–e c–e, d–e				

son to the children whose dental visit was aimed at a dental check-up (4.34 ± 3.30 and 0.42 ± 0.98, respectively) (Table 3).

Overall, one-third of the parents (33.4%) declared that their children had dental check-ups and dental treatment appointments three or more times a year. About one-fourth of them reported that such appointments took place once a year (24.8%) or twice a year (24.3%). Seven point nine percent of the children received dental care less frequently than once a year, and a similar percentage had never visited the dentist before (7.3%). While analyzing the parents' responses concerning the frequency of dental care utilities by their children, it was observed that the significantly high-est caries severity in primary teeth (7.58 ± 4.07) was noticed among those children who visited the dental office the most frequently, i.e. three or more times a year. By comparison, the children visiting the dentist once a year had significantly fewer primary teeth affected by caries (4.92 ± 3.52). This could suggest that the frequency of visits was related to the need for treatment rather than for checkup, which was also reflected in the number of filled teeth (2.08 ± 2.17 vs. 0.27 ± 0.77). This is also confirmed by the low dmft value (2.90 ± 2.87) among the children who did not have regular dental check-ups (Table 4).

Most of the parents stated that during the visit, they were provided with sufficient and compre-

Table 3. The relationship between the reason for the first dental visit and dental condition

Reason for the first dental visit	Nº examined		Primary teeth				Permanent teeth			
			dmft	dt	mt	ft	DMFT	DT	MT	FT
	n	%	x ± SD	x ± SD	x ± SD	x ± SD	x± SD	x ± SD	x ± SD	x ± SD
Examination	280	54.3	4.34 ± 3.30	3.28 ± 2.91	0	1.06 ± 1.66	0.42 ± 0.98	0.38 ± 0.88	0	0.4 ± 0.91
b. Decay without pain	172	33.3	7.62 ± 4.10	6.13 ± 4.16	0.02 ± 0.24	1.47 ± 1.95	0.67 ± 1.20	0.62 ± 1.16	0	0.05 ± 1.26
c. Decay with pain	47	9.1	8.09 ± 3.88	6.66 ± 4.2	0.30 ± 1.75	1.13 ± 2.03	0.96 ± 1.33	0.88 ± 1.29	0.06 ± 0.44	0.02 ± 0.14
d. Other lesions	13 2.5		3.50 ± 2.45	2.40 ± 1.07	0.10 ± 0.27	1.00 ± 1.53	0.38 ± 0.90	0.38 ± 0.90	0	0
e. Not reported	4	0.8	5.60 ± 6.32	5.60 ± 6.31	0	0	0.55 ± 1.09	0.55 ± 0.93	0	0
Kruskal––Wallis test			H = 88.4 p < 0.0001	H = 73.3 p < 0.0001	H = 14.5 p < 0.006		H = 14.5 p < 0.006	H = 15.4 p < 0.004		H = 12.2 p < 0.02
Post-hoc test = Dunn's test p < 0.05			significant differences between a–b, a–c b–d, b–e c–d, c–e	significant differences between a–b, a–c, a–e b–c, b–d c–d, c–e d–e		significant differences between a–b	significant differences between a–b, a–c c–e d–e	significant differences between a–b, a–c c–d, c–e		significant differences between a–d, b–d

Table 4. The frequency of dental visits and dental condition

Frequency of dental visits	Nº examined		Primary teeth				Permanent teeth			
			dmft	dt	mt	ft	DMFT	DT	MT	FT
	n	%	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD
No visits	40	7.3	2.90 ± 2.87	2.73 ±2.83	0	0.17 ± 0.95	0.23 ± 0.57	0.20 ± 0.51	0	0.03 ± 0.15
Less frequently than once a year	41	7.9	5.24 ± 3.85	4.95 ± 3.74	0.02 ± 0.15	0.27 ± 0.77	0.93 ± 1.40	0.93 ± 1.40	0	0
Once a year	136	24.8	4.92 ± 3.52	4.21 ± 3.43	0	0.71 ± 1.34	0.63 ± 1.16	0.58 ± 1.13	0.02 ± 0.25	0.01 ± 0.12
Twice a year	133	24.3	5.00 ± 3.61	4.0 ± 3.63	0	1.0 ± 1.52	0.41 ± 0.87	0.41 ± 0.95	0	0
Three and more times a year	183	33.4	7.58 ± 4.07	5.41 ± 4.09	0.09 ± 0.91	2.08 ± 2.17	0.56 ± 1.19	0.47 ± 1.04	0.02 ± 0.29	0.07 ± 0.34
Not reported	15	2.7	6.31 ± 4.63	5.70 ± 4.67	0.12 ± 0.31	0.49 ± 1.11	0.49 ± 1.08	0.49 ± 1.08	0	0
Kruskal––Wallis test			H = 70.2 p < 0.0001	H = 23.7 p < 0.0001		H = 91.9 p < 0.0001				
Post-hoc test = Dunn's test p < 0.05			significant differences between a–b, a–c, a–e c–e d–e	significant differences between a–c, a–d, a–e b–c, b–d, b–e c–d, c–e d–e		significant differences between a–b, a–c, a–d, a–e b–e c–e d–e	significant differences between a–b	significant differences between a–b		

Table 5. Mothers' opinion about caries preventive counseling received during their children's dental visits

Counseling	Nº examined		Primary teeth				Permanent teeth			
			dmft	dt	mt	ft	DMFT	DT	MT	FT
	n	%	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD	x ± SD
a. No advice	108	20.9	5.13 ± 3.76	4.44 ± 3.61	0.01 ± 0.08	0.68 ± 1.44	0.55 ± 1.05	0.51 ± 1.00	0.02 ± 0.25	0.02 ± 0.18
b. Incomprehensible	13	2.5	7.00 ± 3.29	5.92 ± 3.06	0 ± 0	1.08 ± 1.75	0.77 ± 1.69	0.77 ± 1.69	0	0
c. Insufficient	54	10.5	5.95 ± 3.78	4.65 ± 3.69	0 ± 0	1.30 ± 1.80	0.69 ± 1.30	0.63 ± 1.20	0	0.06 ± 0.30
d. Comprehensible and sufficient	319	61.8	5.83 ± 4.13	4.41 ± 3.91	0.06 ± 0.67	1.36 ± 1.86	0.52 ± 1.1	0.47 ± 0.98	0.01 ± 0.22	0.04 ± 0.26
Not reported	22	4.3	6.10 ± 4.00	5.59 ± 4.51	0 ± 0	0.51 ± 0.91	0.5 ± 1.05	5.0 ± 1.00	0	0
Kruskal–Wallis test						H = 24.8 p < 0.0001				
Post-hoc test = Dunn's test p < 0.05						significant differences between a–c, a–d				

hensible caries preventive counseling by the dentist (61.8%). However, for 10.5% of the parents, the advice was insufficient, and for 2.5% of them – incomprehensible. Twenty point nine percent of the parents did not receive any counseling regarding caries prevention in children from the dentist. The highest caries severity was observed among the children whose parents were provided with incomprehensible preventive counsel (Table 5).

Stepwise regression analysis showed that a caries predictive model could be created only for caries in primary teeth because the model for caries in permanent teeth was not reliable due to the F test values (F test = 2). Among the four variables considered, two of them were uncorrelated and had to be rejected. The other variables were significantly correlated with caries experience (i.e. the reason for the child's first dental visit and the frequency of subsequent visits), and they were used to create a predictive model as follows: X = 0.2 . P1 + 0.32 . P2 + 2.23, where X – dmft, P1 – the reason for the child's first dental visit, P2 – frequency of subsequent dental visits. The quality of the model was defined with the following values: R – 0.38, R2 – 0.14, R2 corrected – 0.14, p < 0.000001, F test = 43, which specified its high value. It is also worth mentioning that the initial model including four variables, with F test = 21, was the worst model (Table 6).

Discussion

The age at which the child's first dental visit takes place may impact to some extent the future oral health condition because during this visit preventive measures to be implemented at home are determined. Savage et al. [9] found that the age of the first dental visit had an impact on the frequency of subsequent dental visits, as well as a significant positive effect on dental related expenditures. However, only a relatively small percentage of children have the first dental appointment in the recommended time, i.e. by the age of one. A study conducted in the USA indicated that only 11.9% of children first visited a dental office at that time. In Bulgaria, the percentage of children was even lower (1.73%) [7]. Our data showed that 9.5% of children had their first dental visit by the age of one, 21.5% over one and under two and 22.5% at age over two and under 3. Therty eight point seven percent of the children first visited the dentist at the age over three, and 5.8% of 6–7-year-olds had not visited the dentist yet. The data is consistent with a national study conducted in Poland in which it was found that 46.6% of 3-year-old children [14], 19.4% of 6-year-old children [15] and 8.7% of 7-year-old children had not visited the dentist yet [13]. Nevertheless, it was expected that our study would indicate a higher percentage of children having their first dental visit earlier due to the fact that they were residents of a big city in which the availability of dental care is much higher than indicated in the national study, which included children living in areas with varied dental care availability (small towns, rural areas). Leroy et al. [19] demonstrated that in Belgium 62% of 3-year-old children and 21% of 5-year-old children had not visited the dentist yet. They also

Table 6. Prediction agents in dental caries of primary teeth

Variables			Variables	
Time of the first dental visit	R = 0.38 R2 = 0.14 corrected R2 = 0.14 F = 21' p = 0.1	stepwise → regression	causative of the first dental visit	R = 0.38 R2 = 0.14 corrected R2 = 0.14 F = 43' p = 0.0000001
Causative relationship of the first dental visit				
Frequency of dental checkups			frequency of dental checkups	
Counseling in caries prevention				

revealed that the children who were not first-born children and whose mothers were better educated had their first dental visit at a younger age. Malik-Kotru et al. [20] found that the mean age for the first dental visit among children living in a socio-economically deprived area was four. A study conducted in Southern Brazil demonstrated that over 60% of 5-year-old children had not visited the dentist yet [21]. A retrospective study conducted in India indicated that the majority of children (59.08%) first visited the dentist at the age of 6–12 [22].

Our data showed that the reason of the child's first dental visit for over half the subjects (54.3%) was dental check-up, one-third a decay noticed by a parent, and for the remaining ones caries-related pain (9.1%) and other lesions (2.5%). However, Mileva and Kondeva [7] found that caries and its complications were the most common cause of a dental visit (59.86%), and then check-up appointments (26.99%). Another study [22] also pointed to caries-related pain (42.04%) and a visible carious lesion (28.49%) as the most common reasons for making an appointment at a dental office [22].

In our study, most of the parents (61.8%) were satisfied with the caries preventive counseling provided during the dental visit, however 2.5% did not understand the counseling received, and 10.5% stated that the information was insufficient. Moreover, 20.9% of the parents did not receive any counseling in this matter. In comparison, in Brazil 54.9% of parents of 5-year-old children did not receive counseling regarding caries prevention during their children's dental visits [20]. Primary caries prevention combined with early diagnosis of carious lesions during regular dental visits will probably cause a considerable reduction in dental caries severity.

Our data did not reveal any significant correlation between the time of the first dental visit and caries experience. Beil et al. [23], retrospectively comparing children who had had their first dental visit by the age of 18 months to children who had had it at the age between 18 and 42 months, concerning the subsequent dental treatment and expenditures, concluded that for children at the highest risk, the dental visit before the age of 18 months

was beneficial, but for children at a low risk, the visit could be delayed up to the age of 3 with no negative outcome. However, their conclusion seems to be controversial [24]. Their findings are similar to our observation, as the children with the initial dental visit up to 1 year of age had a higher mean dmft value compared to the children with the visit between 2 and 3 and over 3 years of age.

The data from the literature has revealed that the first dental visit usually takes place when a child is several years old and it is usually related to visible carious lesions [8, 20, 25–27]. However, the first visit does not only involve an oral examination of the child, but its crucial element should also be educating the parents regarding diet, oral hygiene and oral health in general [18]. It is also essential to raise the mother's awareness of the transmission of cariogenic bacteria and the key determinants of their colonization and proliferation. Systematic subsequent dental visits are a key factor in caries prevention; according to Polish recommendations, the visits should take place every 6 months. In our study, 24.3% of the parents reported receiving dental care for their children twice a year. Camargo et al. [21] found that 41.9% of the mothers in Brazil declared that their children regularly attended dental visits.

In order to improve oral health among children, it is essential that oral-health-related education and motivating the parents of small children is provided during every dental visit. This also concerns pregnant women, who have been found to be more willing to follow all types of counsel during this period. Cooperation in early childhood caries prevention is also expected of non-dental medical staff (including pediatricians, general practitioners and nurses). They should motivate their patients to schedule the first dental visit for the child within six months of the eruption of the first primary tooth, as well as to make sure subsequent visits take place regularly.

Within the limitations of the study, we can conclude that the reasons for the first dental visit and the frequency of follow-up visits can influence caries experience in primary dentition.

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