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## Longitudinal study of symptoms associated with teething: Prevalence and mothers' practices



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## ABSTRACT

**Background:** The results of the study support the view that teething is not associated with severe general symptoms. They present factors influencing their perception by mothers and methods to solve teething problems. **Aim:** The aim was to identify the teething symptoms and factors influencing their prevalence and the mothers' perception of teething and ways of solving them. **Methods:** A study was conducted among children aged 5–36 months and their mothers in Warsaw. It included questionnaire data (socio-demographic data, those related to nursing care, the baby's general condition, teething symptoms) and children's clinical examination. **Results:** Of 630 children included in the study (the mean age:  $21.84 \pm 8.28$  months) teething problems were reported in 79.7% of the patients: excessive salivation, swollen and reddened gum, an increased temperature and nervousness, anorexia, diarrhoea, cold-like symptoms, insertion of fingers/objects into the mouth. Teething problems were mildly associated with socio-demographic factors, birth weight and season of birth. Mothers used teething rings (66.8%), topical gels (63.3%), gingival massage (45.7%), comforting bottles (2.7%). In 16.8% of patients tooth brushing was started since the eruption of the first tooth. The choice of methods was influenced by the type of observed symptoms, education and maternal smoking habits. Pediatricians were the main source of knowledge. **Conclusion:** The general teething symptoms are associated with gingival swelling. The results demonstrate an overuse local remedies and negative impact of maternal smoking and lower level of education upon the solution problems. The hygienic neglect and feeding with a bottle indicates the significance of education.

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## Introduction

Eruption of deciduous teeth is associated with the presence of a variety of local and general ailments [1–7]. However, there is still no strong scientific evidence of an association between tooth eruption and a majority of the symptoms [8]. A large number of studies assess the occurrence of teething symptoms without analysing potential determinants of teething-related disturbances. Neither is there a fully documented association between local and general teething symptoms; therefore there is no purpose to use different methods of local teething problems. However, parents opt for a definite use of different types of remedies. Problems associated with teething are sometimes solved in a dangerous way, i.e. wearing an amber neckless, a penny tied various spices, cold baths [9, 10]. Children are given vegetables or frozen bakery goods to chew and bottle feeding or nursing [12, 13]. Mothers believe that it is also useful to provide antibiotics [12]. Local anaesthetics containing benzocaine, lignocaine are also frequently used despite an associated risk of methaemoglobinaemia, choking by a child and intoxication or agents containing choline salicylate associated with a risk of chemical burns and Reye's syndrome [1, 8, 13–16].

Therefore, it is vital to identify symptoms associated with deciduous teeth eruption and factors influencing their prevalence and mothers' perception of teething problems and ways to solve them.

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## Material and methods

### Setting

The longitudinal study was conducted at the Department of Pediatric Dentistry, Warsaw Medical University, Poland.

### Participants

The parents and their children at the age of 5–36 months resident in Warsaw were invited to the study. The information about the access to the study was published in journals associated with children, distributed in nurseries, kindergartens and pediatric outpatient clinics.

Qualification to the study included children in a good general health condition with an erupted or erupting at least one deciduous tooth. The exclusion criteria were: a lack of a written consent by the parent, the natal teeth, oral or dental anomalies, systemic disease and present treatment, as well as a congenital physical or mental disability.

### Data collection

A two-year longitudinal study included eliciting a face-to-face history from the child's mother, conducted according to a questionnaire and a clinical examination of the child. Those were carried out by four pediatric dentists. The study was preceded by the course organized by the chief research worker on the methodology of eliciting history from

mothers and performing an oral examination as well as a pilot study in a group of 15 children.

The questionnaire contained questions concerning the child (sex, age, birth weight, the Apgar score, the season of birth, perinatal complications, general health, habits, local and systemic teething disturbances, oral hygienic procedures), mothers (age, level of education, habits, ways to solve teething problems). Oral examination was conducted in a dental surgery. The presence of erupted and erupting teeth (an erupting tooth was considered when the crown edge of the tooth had visibly emerged in the oral cavity and was no longer than 3 mm) [5], the gingival and mucosal membranes status, were noticed.

### Statistical analysis

In order to characterize the study groups, means and standard deviations of the study features as well as the number and the percentage of children with specific symptoms were calculated. The comparison between groups was performed by means of the chi-square test for categorized variables and the t-test for quantitative variables. Relationships between selected pairs of variables were described using Spearman's rank correlation coefficient. Moreover, for selected variables, logistic regression analysis was conducted, on the basis of which, quotients of chances of a relative risk were determined with confidence intervals (at the confidence level of 95%). The analyses were performed using the Statistica 12 programme and SPSS 22; the accepted significance level was 0.05.

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## Ethics approval

The research protocol was approved by The Bioethics Committees of the Medical University of Warsaw (KB/221/2009).

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## Results

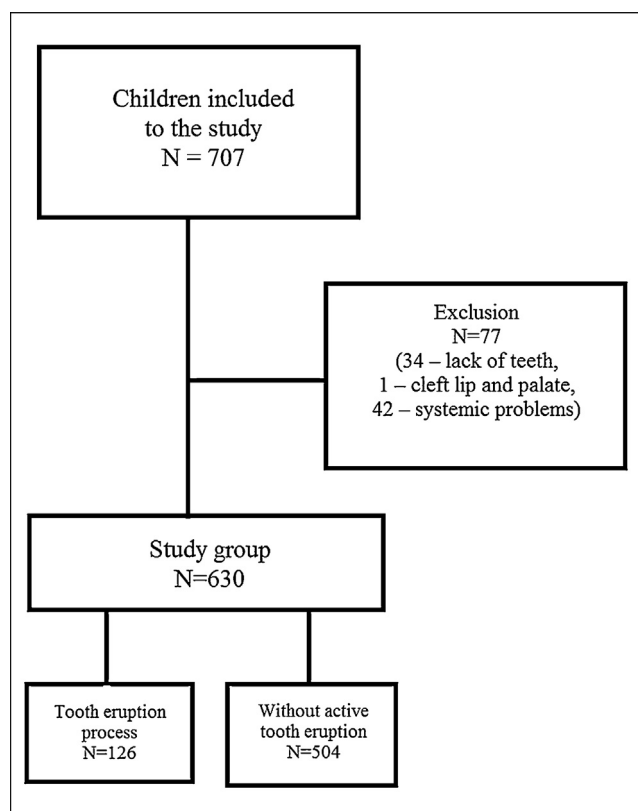
### Participants

The study group included 630 children (300 girls and 330 boys), and their mothers. One hundred twenty six children were diagnosed with an active eruption of at least one tooth (Fig. 1).

Characteristics of children and their mothers are included in Table I. The pregnancy time was 26–42 weeks (average  $38.9 \pm 2.1$ ). Forty-three babies were born alive before 37 weeks of pregnancy (<28 weeks – 3 babies, between 32 and 37 weeks – 40 babies). Three premature babies were born at low birth weight (<2500 g).

### Teething symptoms

Symptoms associated by mothers with teething are presented in Table II. No general or local symptom was noted in 128 (20.3%) children. At least one general symptom was noted by 451 mothers (71.6%), without any specific difference between the group of children without an active tooth



**Fig. 1 – Qualification for the study**

eruption (70.2%), and that at the eruption time (77.0%) ( $P = 0.132$ ). The changes were noted by 370 mothers (58.7%) with a similar rate in the groups (57.5% and 63.5% respectively;  $P = 0.225$ ). Three hundred twelve mothers (48.9%) associated the presence of the local lesions with general symptoms. In the group with active dental eruption, gingival lesions were noted by mothers in 80 children (63.5%), and by dental surgeons in 88 children (69.8%). A consistent recognition between mothers and dentists was: 54.6% – swelling, 62.1% – reddening, 96.5% – livedo. Spearman's analysis showed a similar association between gingival signs, noted by mothers, with an increased body temperature ( $r = 0.244$ ;  $P < 0.001$ ) and cold-like symptoms ( $r = 0.224$ ;  $P < 0.001$ ). No correlation, however, was confirmed between general symptoms reported by mothers with the presence of swelling and reddening in the gingival area on clinical examination. Nevertheless, there were statistically crucial correlations between an increased body temperature and cold-like symptoms: runny noses, coughing ( $r = 0.308$ ;  $P < 0.001$ ), diarrhoea ( $r = 0.297$ ;  $P < 0.001$ ), nervous excitability ( $r = 0.237$ ;  $P < 0.001$ ) and sleep disorders ( $r = 0.213$ ;  $P < 0.001$ ).

#### Factors influencing the maternal view of teething problems

Frequency of maternal reporting of symptoms associated with teething changed with the children's increasing age (Fig. 2). Statistically significant negative correlations were noted between maternal education and their view on increasing nervous excitability ( $r = -0.082$ ;  $P = 0.040$ ) as well as cigarette smoking and a child's excessive salivation

( $r = -0.104$ ;  $P = 0.009$ ). With a higher economic status, maternal attention to inserting fingers and other objects into the oral cavity by children was also increased ( $r = 0.106$ ;  $P = 0.008$ ). In all group Spearman's analysis did not show the correlations between the local and general symptoms reported by mothers and sex, preterm birth, birth weight, season of birth, or the Apgar score.

In group with active tooth eruption statistically significant correlations were noted between:

- sleep disorders and birth in the summer ( $r = 0.239$ ;  $P = 0.007$ ) and birth in the winter ( $r = -0.178$ ;  $P = 0.030$ ),
- loss of appetite and birth in the autumn ( $r = -0.194$ ;  $P = 0.030$ ),
- excessive salivation and birth in the autumn ( $r = -0.194$ ;  $P = 0.030$ ),
- swollen and reddened gum and birth in the spring ( $r = -0.236$ ;  $P = 0.008$ ), and birth in the autumn ( $r = -0.178$ ;  $P = 0.046$ ) and birth weight ( $r = -0.195$ ;  $P = 0.029$ ).

#### Solving problems associated with teething: maternal view

According to 527 (83.6%) mothers, tooth eruption has been accompanied by discomfort or pain. The frequent methods used by mothers during tooth eruption, and correlation with teething symptoms are included in Table III.

Twenty-five mothers only, using local pharmacological agents, were aware that the gel used contained lignocaine or bupivacaine. As many as 73 mothers (11.6%) used methods relieving symptoms associated with teething, without any symptoms, including 43 mothers (6.8%) prophylactically applying pharmacological remedies to gums. Merely 77 mothers (12.2%) provided only non-pharmacological methods (teething rings or/and gingival massage). A statistically significant negative correlation was noted between using those methods and an increased body temperature ( $r = -0.092$ ;  $P = 0.015$ ), sleep disorders ( $r = -0.115$ ;  $P = 0.004$ ), increased nervousness ( $r = -0.140$ ;  $P < 0.001$ ) and cold-like symptoms ( $r = -0.097$ ;  $P = 0.015$ ).

Out of 546 (86.7%) children, in whom hygienic procedures in the oral cavity are carried out, 502 (91.9%) subjects undergo tooth brushing, starting from 4 to 30 months (the average age  $10.59 \pm 4.5$  months). In 106 (16.8%) children tooth brushing was started with the eruption of the first tooth. Oral hygienic procedures, however, were not considered as a method to solve problems.

Spearman's correlation analysis showed the influence of maternal education and smoking upon the methods to solve teething problems. Application of merely non-pharmacological methods was associated with the mothers' level of education ( $r = 0.085$ ;  $P = 0.033$ ; OR = 2.04 (1.03–4.04)) and cigarette smoking ( $r = -0.083$ ;  $P = 0.037$ ; OR = 1.10 (1.07–1.12)).

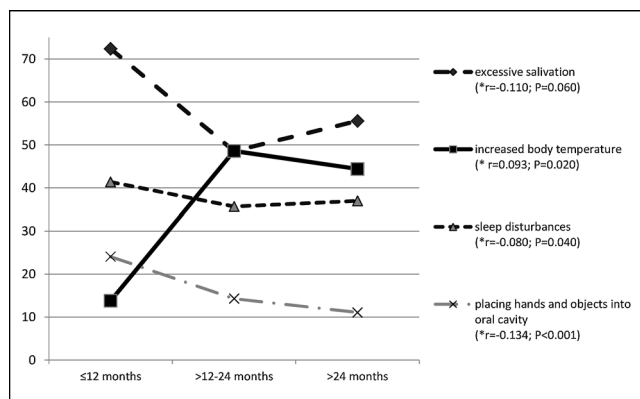
Three hundred forty three (54.4%) mothers received the information on teething from pediatricians, and only 170 (26.9%) from dentists.

## Discussion

The majority of mothers associate the tooth eruption with the presence of general or/and local symptoms. According

**Table I – Characteristics of children and their mothers**

Characteristics – children	All group (N = 630) N (%)	No active phase of the tooth eruption (n = 504) N (%)	Active phase of the tooth eruption (n = 126) N (%)
<b>Biological characteristics</b>			
<i>Age (months)</i>			
5–12	101/630 (16.0%)	72/504 (14.3%)	29/126 (23.0%)
12–24	256/630 (40.6%)	186/504 (36.9%)	70/126 (55.6%)
24–36	273/630 (43.3%)	246/504 (48.8%)	27/126 (21.4%)
Mean ± SD	21.84 ± 8.28	22.65 ± 8.39	18.22 ± 7.22
<i>Sex</i>			
Girls	300/630 (47.6%)	239/504 (47.4%)	61/126 (48.4%)
Boys	330/630 (52.4%)	265/504 (52.6%)	65/126 (51.6%)
<i>Preterm birth</i>			
Before 37 completed weeks of gestation	43/630 (6.8%)	35/504 (6.9%)	8/126 (6.3%)
<i>Birth weight (in g)</i>			
<2500 g	28/630 (4.4%)	22/504 (4.4%)	6/126 (4.8%)
>4000 g	54/630 (8.6%)	45/504 (8.9%)	9/126 (7.1%)
Mean ± SD	3400 ± 568	3416 ± 573	3339 ± 546
<i>Season of birth</i>			
Spring	158/630 (25.1%)	123/504 (24.4%)	35/126 (27.8%)
Summer	169/630 (26.8%)	133/504 (26.4%)	36/126 (28.6%)
Autumn	148/630 (23.5%)	118/504 (23.4%)	30/126 (23.8%)
Winter	155/630 (24.6%)	139/504 (25.8%)	25/126 (19.8%)
<b>Socio-demographic factors – mothers</b>			
<i>Age (yrs)</i>			
≤25	62/630 (9.8%)	52/504 (10.3%)	10/126 (7.9%)
26–30	210/630 (33.3%)	171/504 (33.9%)	39/126 (31.0%)
31–35	241/630 (38.3%)	191/504 (37.9%)	50/126 (39.7%)
36–40	100/630 (15.9%)	77/504 (15.3%)	23/126 (18.3%)
>40	17/630 (2.7%)	13/504 (2.6%)	4/126 (3.2%)
<i>Education</i>			
Basic	41/630 (6.5%)	34/504 (6.7%)	7/126 (5.6%)
Middle	225/630 (35.7%)	174/504 (34.5%)	51/126 (40.5%)
High	364/630 (57.8%)	296/504 (58.7%)	68/126 (54.0%)
<i>Smoking cigarettes</i>			
	52/630 (8.3%)	43/504 (8.5%)	9/126 (7.1%)
<b>Socio-demographic factors – family</b>			
<i>Socioeconomic status</i>			
Low	8/630 (1.3%)	8/504 (1.6%)	0/126 (–)
Average	279/630 (44.3%)	222/504 (44.0%)	57/126 (45.2%)
High	343/630 (54.4%)	274/504 (54.4%)	69/126 (54.8%)
<i>Number of children</i>			
1	307/630 (48.6%)	250/504 (49.6%)	57/126 (45.2%)
2	256/630 (40.2%)	201/504 (39.8%)	55/126 (44.3%)
≥3	67/630 (10.9%)	53/504 (10.5%)	14/126 (10.5%)

**Fig. 2 – Statistically significant changes in the frequency of symptoms associated with teething**

to the maternal opinion of 450 children aged from 6 to 60 months the teething symptoms afflict 80.9% of children [17]. In our study group the frequency of teething problems was similar (79.9%). In the study performed on a Australian group of parents of 92 babies (the mean age: 9.9 months), only one parent did not observe any symptoms [8]. A similarly high frequency was reported by Memarpour et al. [18] (99.2% of children aged 8–36 months) and Azevedo et al. [19] (91.93% of children aged 12–23 months), a lower frequency was reported by Feldens et al. [20] (73.0%). Different numbers of the study groups and the age of children qualified for the study make it difficult to compare its results since the frequency of particular symptoms may change with age and is associated with a particular type of erupting teeth [7, 8, 17]. The most frequently reported teething symptoms include increased suction (75.56%) [20], salivation (57.78, 77%, 67.7%) [8, 18, 21], biting (78%) [8], red cheeks (75%) [8], irritability (40.5%, 82%, 84.44%, 65.2%) [8,

**Table II – General and local symptoms associated with teething**

Symptoms	All group (N = 630)	No active phase of the tooth eruption (n = 504)	Active phase of the tooth eruption (n = 126)
The average number of symptoms observed by the mother	2.56 ± 1.90 T test P = 0.016*	2.47 ± 1.85	2.93 ± 2.04
<i>General symptoms associated with teething</i>			
Excessive salivation	303/630 (48.1%)	233/504 (46.2%) P = 0.061	70/126 (55.6%)
Increased body temperature	231/630 (36.7%)	181/504 (35.9%) P = 0.432	50/504 (39.7%)
Sleep disorders	199/630 (31.6%)	152/504 (30.2%) P = 0.123	47/126 (37.3%)
Increased nervousness	177/630 (28.1%)	134/504 (26.6%) P = 0.092	43/126 (34.1%)
Loss of appetite	81/630 (12.9%)	60/504 (11.9%) P = 0.153	21/126 (16.7%)
Diarrhoea	77/630 (12.2%)	60/504 (11.9%) P = 0.627	17/126 (13.5%)
Cold-like symptoms	80/630 (12.7%)	54/504 (10.7%) P = 0.003*	26/126 (20.6%)
Inserting hands/objects into mouth	67/630 (10.6%)	47/504 (9.3%) P = 0.033*	20/126 (15.9%)
Constipation	15/630 (2.4%)	12/504 (2.4%) P = 1.000	3/126 (2.4%)
Vomiting	10/630 (1.6%)	6/504 (1.2%) P = 0.111	4/126 (3.2%)
Convulsions	3/630 (0.5%)	3/504 (0.6%) P = 0.385	0/126 (-)
Rash	2/630 (0.3%)	0/504 (-) P = 0.005*	2/126 (1.6%)
<i>Local symptoms associated with teething</i>			
Tumescence	291/630 (46.2%)	227/504 (45.0%) P = 0.247	64/126 (mother) (50.8%)
Reddening	223/630 (35.4%)	172/504 (34.1%) P = 0.183	55/126 (dentist) 43.7%
			51/126 (mother) 40.5%
Bruising above the tooth	16/630 (2.5%)	12 (2.4%) P = 0.613	59/126 (dentist) (46.8%)
			4/126 (mother) (3.2%)
			6/126 (dentist) (4.8%)

\* statistical significant

18–20], fever (16%, 38.9%, 44%, 62.22%, 70%) [7, 8, 18–20], disturbed sleep (31.7%, 53.33%, 78%) [8, 18, 20], infections (48%) [8], diarrhoea (36.0%, 42.22%) [8, 19, 20] itching (33.6%) [19], feeding problems (42%) [8], 34.2% [8], nasal discharge (4.4%, 41%) [8, 21]. In our presented group the most frequently noted symptoms also included excessive salivation (48.8%), increased body temperature (36.7%), sleep disturbances (31.6%) and irritability (28.1%); loss of appetite, diarrhoeas and cold-like symptoms were slightly less frequent.

The study by Macknin et al. [5] and Ramos Jorge et al. [2] confirm an association between teething and increased salivation, irritability, sleep disturbance, and loss of appetite, significant correlation, diarrhoea, rash, sleep disturbance and a rise in body temperature. The authors also concluded that the fever over 38.5°C and other general symptoms are not associated with teething. A mild rise in the body temperature was noted by Memarpour et al. [18] and Wake et al. [8]. However, they point to a lack of evidence for a scientific connection and emphasize a strong

belief of parents about the presence of such a connection. Shapira et al. [22] showed an association between gingivitis around an erupting tooth and the presence of other symptoms. Gingivitis is accompanied by increased inflammatory cytokine levels in the gingival crevicular fluid. A high level of interleukin 1  $\beta$  (IL-1  $\beta$ ) and interleukin-8 (IL-8) was associated with a possible occurrence of diarrhoea, IL-1  $\beta$  with a loss of appetite and body mass, but increased levels of IL-1  $\beta$  and tumour necrosis factor- fever and sleep disorders [22]. Oedema around the tooth was present in 46.67% of cases, bulging of mucosa in 37.78% of subjects, eruption haematoma in 2.22% of children, eruption cysts in 2.22% of cases [22]. On clinical examination of the group presented by us, gingival reddening, swelling eruption haematoma were observed.

Statistic correlation was observed between teething symptoms and gingival lesions reported by mothers, confirming the hypothesis by Shapiro et al. [22]. Nevertheless, on the other hand, symptoms observed by mothers may be caused by viral infections accompanied by gingival lesions.

**Table III – Methods used by mothers during tooth eruption, and correlation with teething symptoms**

Methods use to solve teething problems	Gum massage N (%)	Objects to chew N (%)	Teething gel N (%)
Teething symptoms	288/630 45.7%	421/630 66.8%	399/630 63.3%
Excessive salivation	0.182 <sup>*</sup> P < 0.001	0.188 <sup>*</sup> P < 0.001	0.172 <sup>*</sup> P < 0.001
Increased body temperature	0.194 <sup>*</sup> P < 0.001	0.071 P = 0.075	0.169 <sup>*</sup> P < 0.001
Sleep disorders	0.137 <sup>*</sup> P < 0.001	0.113 <sup>*</sup> P = 0.005	0.276 <sup>*</sup> P < 0.001
Increased nervousness	0.164 <sup>*</sup> P < 0.001	0.160 <sup>*</sup> P < 0.001	0.263 <sup>*</sup> P < 0.001
Loss of appetite	0.057 P = 0.153	0.089 <sup>*</sup> P = 0.025	0.086 <sup>*</sup> P = 0.031
Diarrhoea	0.105 <sup>*</sup> P = 0.008	0.025 P = 0.531	0.113 <sup>*</sup> P = 0.005
Cold-like symptoms	0.023 P = 0.564	0.025 P = 0.531	0.162 <sup>*</sup> P < 0.001
Inserting hands/objects into mouth	0.128 <sup>*</sup> P = 0.001	0.089 <sup>*</sup> P = 0.025	0.006 P = 0.880
Gingival lesions	0.245 <sup>*</sup> P < 0.001	0.227 <sup>*</sup> P < 0.001	0.259 <sup>*</sup> P < 0.001
Number of symptoms	0.287 <sup>*</sup> P < 0.001	0.215 <sup>*</sup> P < 0.001	0.381 <sup>*</sup> P < 0.001

<sup>\*</sup> Statistical significant.  
Spearman's correlation coefficient was used.

Correlations reported by us between a body temperature and other symptoms and an increased frequency in body temperature on reaching by the child the age of 12 months with an immature immune system, seem to confirm this hypothesis. Additionally, in a group of children with erupting teeth, gingival lesions noted by doctors were not associated with general symptoms.

Correlation between the child's discomfort and eruptive gingivitis may be explained by stimulation of nociceptive receptors and a feeling of discomfort. Diarrhoea, despite a suggested connection with interleukins, may also be caused by swallowing large amounts of saliva [1, 7]. In our study group observation showed a decreased frequency of excessive salivation with age.

A potential limitation of the current study is, first of all, to rely upon the information provided by the mothers. They might have not fully remembered the symptoms during the teething and insufficient knowledge. Isolation of the group at the time of teething, clinical estimation of the condition of the gingiva also by a doctor and analysis of the impact of socio-medical aspects upon the maternal view of teething symptoms decreased the risk of error, however, it did not eliminate it completely. It is interesting that in all group we did not show any correlations between teething symptoms reported by mothers and the factors such as sex, preterm birth, birth weight, season of birth, the Apgar score. The correlation, however, was confirmed between some systemic and local teething symptoms, the season of birth and birth weight. It is known that there is an influence of environmental factors, especially birth weight on the time of teething, however so far the correlation between them and the teething symptoms has not been established [23-25]. Memarpour et al. noticed that teething symptoms,

diarrhoeas, irritability, sleep disorders appear more often in children with the low birth weight than with the normal one [18]. The season of birth is also emphasized in further development of the child, which may be related to seasonal differences in the exposure of pregnant women to environmental factors such as insolation, diet or physical activity. The correlation between the level of hydroxyvitamin D in mothers of infants and their sun exposure has been proved [26]. In infants born in the summer the levels of hydroxyvitamin D<sub>3</sub> are nearly twice as high as in infants born in winter [27]. When we take into consideration the time of teething, it has been observed to begin earlier in children born in spring than in the autumn-winter season [28]. In children born in the autumn-winter season we observed less frequent loss of appetite, sleep disorders and local symptoms of teething, which may be connected with slower growth process. The results we gained indicate the necessity of further research in a bigger group of children and the analysis of the correlation between the teething symptoms and the time of first tooth eruption.

Maternal view of teething symptoms and methods to solve problems may depend upon sociodemographic aspects. In a few scarce studies no substantial significance of a majority of aspects was demonstrated [7, 19, 20, 29, 30]. It was, however, noted that teething symptoms were more frequently noticed by higher schooling mothers and mothers with a higher socioeconomic status [12, 29, 31]. Ige and Olubukola [30] however, stated that a low economic status and a younger maternal age favour frequent reporting of teething symptoms. Our study also shows the value of maternal education and status. Mothers with a higher education level rarely noted irritability, those with a higher social status paid more attention to what the child puts into

the mouth. The higher maternal educational level the more frequent use of non-pharmacological methods– gum massage or/and teething rings. A vital issue seems to be smoking. Mothers smoking cigarettes paid less attention to salivation and rarely used non-pharmacological treatment. The connection has been proved between maternal smoking and presence of caries in children [32, 33]. It is considered that tobacco smoke at home is an indicator of poor oral hygiene among children and may affect oral health.

Non-pharmacological methods have been exclusively used [17]. Mothers, however, frequently considered to introduce local remedies. According to literature the mothers frequently use topical analgesics (6.66%, 45.6%, 51%, 65.6%) [8, 12, 21, 34], objects to chew (33.8%, 65%, 50%, 88%) [8, 11, 12, 27], gum massage (24%) [8], fluids to prevent dehydration (60.9%, 87.6%) [11, 12].

Mothers frequently used gels for teething, even prophylactically. There was no correlation found between the number of symptoms and oral hygienic procedures. The assessment of the gingival status by mothers and dentists differed and there was no correlation found between general symptoms reported by mothers and noted on dental examination. However, performing oral hygienic procedures was a rare and delayed method. There were also mothers who believed that it is helpful to offer a bottle of milk or juice. In Saudi Arabia and India 40% of mothers allow bottle feeding or nursing at night [10, 12].

It is worth emphasizing that in case of teething issues mothers more frequently ask for advice pediatricians than dentists. According to the study by Prado et al. [21] 20% of parents visits pediatricians, 15.56%, dentists. In our study the difference was much higher.

## Conclusions

The results presented are not conclusive as to which symptoms reported by mothers are actually related to the eruption of the deciduous teeth. Nevertheless, they show that severe symptoms are generally associated with gingival swelling accompanying physiological tooth eruption and they suggest the correlation between some symptoms of teething and the season of birth and birth weight. They also demonstrate a negative impact of maternal smoking and their lower level of education upon the choice of methods to solve teething problems. The maternal view that general symptoms are associated with the gingival lesions at the site of an erupting tooth is conducive to overuse local pharmacological remedies. Hygienic neglect and feeding the child with a bottle of milk or juice are also disadvantaged. Therefore, parental education should be a crucial point on a visit to the pediatric surgery, and should include education of parents concerning proper hygienic habits, teething issues, and safety for the child when solving teething problems.

## Authors' contributions/ Wkład autorów

DO-K – study design, data collection and interpretation, statistical analysis, acceptance of final manuscript version,

literature search. AT-S – study design, data collection and interpretation, acceptance of final manuscript version, literature search. DG – data collection, statistical analysis, acceptance of final manuscript version. HB-G and EK-S – study design, data collection, acceptance of final manuscript version. PS, AJ – data interpretation, acceptance of final manuscript version. JT – data interpretation, statistical analysis, acceptance of final manuscript version, literature search.

## Conflict of interest/ Konflikt interesu

None declared.

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None declared.

## Ethics/ Etyka

The work described in this article have been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; EU Directive 2010/63/EU for animal experiments; Uniform Requirements for manuscripts submitted to Biomedical journals.

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