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A survey on toothbrushing practices and dosing of fluoridated toothpaste among preschool children in the cantons of Basel-Stadt and Berne, Switzerland

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Désirée Céline Adé¹, Cornelia Filippi², Andreas Filippi^{1*}

¹ Department of Oral Surgery, University Center for Dental Medicine Basel UZB, University of Basel, Basel, Switzerland

² Department of General Pediatric and Adolescent Dentistry, University Center for Dental Medicine Basel UZB, University of Basel, Basel, Switzerland.

*Correspondence: Prof. Dr. med. dent. Andreas Filippi, Klinik für Oralchirurgie, Universitäres, Zentrum für Zahnmedizin Basel (UZB), Universität Basel, Mattenstrasse 40, CH-4058 Basel
Telephone number: +41 61 267 26 55
email: andreas.filippi@unibas.ch

Keywords

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Abstract

This study aimed to evaluate toothbrushing practices and toothpaste dosing among preschool children aged 0-6 years in Switzerland recruited from the Department of General Pediatric and Adolescent Dentistry, University Center for Dental Medicine Basel UZB, and in daycare centers or in private practices located in the canton of Berne. Three hundred parents of children were surveyed about socioeconomic characteristics, their children's toothbrushing behavior, the use of age-appropriate toothpaste, and whether they were instructed by an oral healthcare professional about appropriate toothbrushing practices and the amount of toothpaste to use. Additionally, the parents were asked to apply toothpaste to two different toothbrushes, one with a narrow and one with a wide brush head, as they usually would at home. The amount of toothpaste was weighed using a portable scale. Over 50% of the parents were not instructed by an oral health care professional on toothbrushing practices and toothpaste dosing. However, nearly all participants used age-appropriate toothpaste. Approximately 50% of the parents of 0- to 2-year-old children applied more than the recommended 0.25 g of fluoridated toothpaste (both brushes, mean \pm SD: 0.25 g \pm 0.14 g), while two-thirds of the parents of 2- to 3-year-olds (both brushes, mean \pm SD: 0.36 g \pm 0.23 g) and nearly 90% of the parents of 3- to 6-year-olds applied more than 0.25 g (both brushes, mean \pm SD: 0.43 g \pm 0.20 g). Overall, parents dispensed more toothpaste on the toothbrush with the wide brush head. The present study suggested that assuming toothpaste as the sole source of fluoride, the amounts generally used are not of concern. However, considering the substantial variation in the amounts of toothpaste applied, oral healthcare professionals should routinely provide instructions on toothbrushing practices and toothpaste dosing during children's dental examinations.

Introduction

Despite the reduction in dental caries prevalence in economically more developed countries over the last decades, dental caries remains a highly prevalent oral condition adversely affecting both adults' and children's quality of life (PERES ET AL. 2019; WATT ET AL. 2019).

Deciduous teeth are more susceptible to caries due to their anatomical features, such as thinner and more porous enamel, compared to permanent teeth (DE MENEZES OLIVEIRA ET AL. 2010). Consequently, decay has been shown to penetrate the dentin twice as fast as in permanent teeth (MEJÀRE & STENLUND 2000). In addition, due to the children's young age, the toothbrushing technique and motivation to clean the plaque can lead to deciduous teeth being more often affected by caries. Therefore, caregivers' attention and monitoring of toothbrushing behavior are of great importance.

The most significant preventive measure is brushing with fluoridated toothpaste to prevent caries in deciduous and permanent dentition, as shown by several meta-analyses with a high level of evidence (WALSH ET AL. 2019). The preventive effect of fluorides consists of reducing demineralization processes caused primarily by bacterial acids and enhancing calcium deposition during remineralization processes in the presence of minerals in the saliva (TEN CATE & BUZALAF 2019). However, overexposure to fluorides during enamel formation of the permanent teeth may lead to fluorosis of the teeth manifesting as white or brown structural abnormalities and, in severe cases, even accompanied by skeletal damage (ZHANG ET AL. 2023). The risk of excessive exposure to fluorides is aggravated in young children by the more significant proportion of ingested fluoridated toothpaste after brushing compared to adults, which may further be exacerbated by flavoring the dentifrice (OLIVEIRA ET AL. 2007; ULLAH ET AL. 2017). Studies have shown that the percentage of toothpaste swallowed by children aged 1.5 to 3.5 years and 4 to 6 years was almost 80% and 40%, respectively (COCHRAN ET AL. 2004; ZOHOORI ET AL. 2012). In addition, toothpaste ingestion during toothbrushing appears to be inversely proportional to the age of the children and directly proportional to the amount of toothpaste applied on the brush (KOBAYASHI ET AL. 2011), highlighting the importance of dispensing an appropriate amount of fluoridated dentifrice to provide caries-preventive benefit of topical fluoride against caries while minimizing the risk of excessive ingestion (WRIGHT ET AL. 2014). The appropriate amount of toothpaste per toothbrushing session is often described as a smear, rice grain size, or pea-sized amount of dentifrice. This terminology may lead to different interpretations by parents and guardians, negatively impacting the amount of dentifrice dispensed, leading either to a reduced preventive effect or enhanced ingestion of toothpaste. Various institutions have developed guidelines for using fluoridated toothpaste in children, which vary in detail. The guideline released by the European Academy of Pediatric Dentistry (EAPD), last updated in 2019, endorses twice daily brushing with a rice-grain-sized amount (0.125 g) of toothpaste containing 1000 ppm fluoride from the eruption of the first tooth until two years of age, and twice daily brushing with a pea-sized amount (0.25 g) of toothpaste containing 1000 ppm fluoride for children aged from 2 to 6 (TOUMBA ET AL. 2019). In Switzerland, the recommended dispensing strategy for children recently updated includes once or twice daily brushing with a smear of toothpaste containing 500 ppm fluoride from the eruption of the first tooth to 2 years and twice daily brushing with a pea-sized amount (0.25 g) of toothpaste containing 500 ppm fluoride for children aged 2 to 6. For children with an increased caries risk (existing carious dentin lesions or initial caries on deciduous teeth) a

toothpaste with 1000 ppm fluoride is recommended from the age of two (WEGEHAUPT ET AL. 2023).

In addition to the fluoride concentration in toothpaste and amounts to be used, parents' and guardian's knowledge about dental and oral health strongly influences their children's health behaviors (CASTILHO ET AL. 2013). Studies showed that parents and guardians seemed to have limited knowledge of children's dental and oral health, as reflected by the high amounts of toothpaste applied (ELKARMI ET AL. 2015; HUEBNER ET AL. 2013).

Based on the above, the present study aimed to investigate the amount of fluoridated toothpaste applied by the parent, potentially related factors, and tooth brushing practices among preschool children in the cantons of Basel-Stadt and Berne.

Materials and methods

For this survey, 300 children aged 0 to 6 years accompanied by at least one parent were recruited between August 2020 and February 2022, who either attended the Department of General Pediatric and Adolescent Dentistry, University Center for Dental Medicine Basel UZB, or were interviewed in daycare centers and in private practices located in the canton of Berne. The entire study was performed by one investigator (first author). Participants attending the UZB were asked in the waiting room to participate in the study and were interviewed before or after their consultation. In daycare nurseries, the parents were asked to partake at the pick-up gate, whereas, in private practices, the recruitment process involved asking to participate after their treatment, followed by a separate interview appointment with the child. In total, 124 participants were recruited from the UZB, 95 in daycare nurseries and 81 in private practices. Overall, four patients in private practices and two parents in daycare nurseries refused to participate. The participating children were divided into three age groups: 0-2 years (age group I), 2-3 years (age group II), and 3-6 years (age group III), each group comprising 100 children. All participants were verbally informed of the scope of the investigation and gave informed consent to use the data collected for the present study, which was approved by the local ethics committee (EKNZ Req-2020-00369). Participation was voluntary, and no identifiers were collected from the participants to ensure anonymity.

The study consisted of two parts, the first of which used a short questionnaire containing questions about the child's gender and age, the brand of toothpaste used at home, and questions about toothbrushing practices, such as who applies the toothpaste to the child's toothbrush and who brushes the child's teeth, and the duration of toothbrushing at home. The brand of toothpaste used at home was evaluated to provide information on the use of a toothpaste suitable for children in terms of fluoride concentration. In cases where the participant did not remember the brand of toothpaste used at home, he was shown a brochure with illustrations of different kinds of toothpaste for adults and children available in most supermarkets. Children who applied the toothpaste to the brush themselves were excluded from the study to obtain information about their parent's knowledge of the appropriate amount of toothpaste to use. Furthermore, children without an erupted tooth and accompanied by other than the mother or father on the day of the interview were excluded since all participants reported being supervised by the mother or father at home. Additionally, twelve participants were excluded, as the accompanying parent did generally not supervise the child's toothbrushing at home. The accompanying parent was shown a collection of different toothpastes

(Elmex, Colgate, Oral B, Emoform, Candida, each as “Kids” and “Junior”) and then asked to select a toothpaste that seemed appropriate for their child’s age. Following, the parent was invited to apply the amount usually used at home to two age-appropriate toothbrushes provided and selected by the investigator, depending on the child’s age. The two toothbrushes provided differed in terms of the head shape; one had a narrow and the other one had a wide brush head and were the following: age group I; narrow (Colgate Smiles Baby) and wide (Oral B Baby Stage 1), age group II; narrow (Trisa Baby) and wide (Elmex Kids), age group III; narrow: (Colgate Smiles) and wide (Candida Kids). The amount of toothpaste applied was determined using a portable scale (Dipse TP-500, 500 g/0.01 g, Germany) by weighing the narrow- and wide-headed toothbrushes before and after toothpaste application. Following, the parent was asked to brush the child’s teeth, thereby observing the dispensing technique (central, transversal, axial), the brushing technique (occlusal surfaces (C), occlusal surfaces /outer surfaces (CO), occlusal surfaces/ outer surfaces/ inner surfaces (COI), and measuring the duration of toothbrushing. The transversal dispensing technique was defined as applying toothpaste perpendicular to the longitudinal axis of the brush and perpendicular to the axes of the bristles. In contrast, axial dispensing was defined as the application in the longitudinal direction. The central dispensing technique consisted of the application of toothpaste centrally on the toothbrush head. The data was collected in a room equipped with a sink and a shelf, resembling a bathroom.

The second part comprised a questionnaire with questions on sociodemographic characteristics, such as gender and age of the participating parent and educational background (Table 1). Furthermore, the questionnaire involved questions about toothbrushing practices, such as frequency and duration of toothbrushing at home and whether the parents were instructed by an oral healthcare professional about the appropriate amount of toothpaste (Table 2).

The data collected were entered into a Microsoft Excel spreadsheet (Microsoft Corporation, Version 16.74, Redmond, WA, USA) and further analyzed using the statistical program R version 4.1.3 (R CORE TEAM 2022). Descriptive statistics were performed using means and standard deviations for continuous variables and frequencies and proportions for categorical variables. Differences in applied toothpaste were indicated as medians (IQR) due to the skewed distribution. Consequently, the non-parametric Wilcoxon rank-sum or Kruskal-Wallis test were performed to detect significant differences between groups. For multiple comparisons, the Tukey test was performed. A p-value < 0.05 was considered significant (two-sided).

Table 1. Sociodemographic characteristics

Baseline characteristics	Age group I (0-2 years)	Age group II (2-3years)	Age group III (3-6 years)	Total
Participants, <i>n</i>	100	100	100	300
Gender, <i>n</i> (%)				
Female	52 (52)	49 (49)	51 (51)	152 (50.67)
Male	48 (48)	51 (51)	49 (49)	148 (49.33)
Parent supervising toothbrushing, <i>n</i> (%)				
Mother	85 (85)	81 (81)	92 (92)	258 (86)
Age (y), <i>n</i> (%)				
< 19	0 (0)	0 (0)	0 (0)	0 (0)
20-29	28 (32.94)	16 (19.75)	10 (10.87)	54 (20.93)
30-39	53 (62.35)	56 (69.14)	50 (54.35)	159 (61.63)
40-49	4 (4.71)	9 (11.11)	30 (32.61)	43 (16.67)
> 50	0 (0)	0 (0)	2 (2.2)	2 (0.78)
Education, <i>n</i> (%)				
No school graduation	0 (0)	2 (2.47)	4 (4.35)	6 (2.33)
School graduation without vocational educa-	3 (3.53)	9 (11.11)	15 (16.3)	27 (10.47)
Vocational school graduation (or currently at-	48 (56.47)	49 (60.49)	41 (44.57)	138 (53.49)
Advanced education (University or University	34 (40)	21 (25.93)	32 (34.78)	87 (33.72)
of Applied Sciences)				
Father	15 (15)	19 (19)	8 (8)	42 (14)
Age				
< 19	0 (0)	0 (0)	0 (0)	0 (0)
20-29	0 (0)	2 (10.53)	0 (0)	2 (4.76)
30-39	13 (86.67)	12 (63.16)	7 (87.5)	32 (76.19)
40-49	2 (13.33)	4 (21.05)	1 (12.5)	7 (16.67)
> 50	0 (0)	1 (5.26)	0 (0)	1 (2.38)
Education, <i>n</i> (%)				
No school graduation	0 (0)	1 (5.26)	0 (0)	1 (2.38)
School graduation without vocational educa-	0 (0)	5 (26.32)	0 (0)	5 (11.9)
Vocational school graduation (or currently at-	8 (53.33)	10 (52.63)	4 (50)	22 (52.38)
Advanced education (University or University of	7 (46.67)	3 (15.79)	4 (50)	14 (33.33)
Applied Sciences)				

n, number

Table 2. Toothbrushing practices

	Age group I (0-2 years)	Age group II (2-3years)	Age group III (3-6 years)	Total
Who brushes the child's teeth? <i>n</i> (%)				
Mother	83 (83)	81 (81)	32 (32)	196 (65.33)
Father	14 (14)	19 (19)	2 (2)	35 (11.67)
Mother and child together	2 (2)	0 (0)	26 (26)	28 (9.33)
Father and child together	1 (1)	0 (0)	4 (4)	5 (1.67)
Child alone	0 (0)	0 (0)	36 (36)	36 (12)
Did you get instructions by an oral health care professional? <i>n</i> (%)				
Yes	45 (45)	36 (36)	37 (37)	128 (42.67)
No	55 (55)	64 (64)	63 (63)	172 (57.33)
Use of an age-appropriate toothpaste, <i>n</i> (%)				
Observed by the examiner				
Yes	100 (100)	97 (97)	92 (92)	289 (96.33)
No	0 (0)	3 (3)	8 (8)	11 (3.67)
At home (reported by the parent)				
Yes	96 (96)	98 (98)	91 (91)	285 (95)
No	4 (4)	2 (2)	9 (9)	15 (5)
Dispensing technique, <i>n</i> (%)				
Toothbrush with a narrow head				
Central	75 (75)	70 (70)	54 (54)	199 (66.33)
Transversal	2 (2)	5 (5)	12 (12)	19 (6.33)
Axial	23 (23)	25 (25)	34 (34)	82 (27.33)
Toothbrush with a wide head				
Central	70 (70)	67 (67)	57 (57)	194 (64.67)
Transversal	4 (4)	8 (8)	10 (10)	22 (7.33)
Axial	26 (26)	25 (25)	33 (33)	84 (28)
Amount of toothpaste used (g), mean ± SD				
Narrow toothbrush head				
Informed parents	0.22 ± 0.10	0.25 ± 0.17	0.36 ± 0.16	0.27 ± 0.15
Uninformed parents	0.26 ± 0.16	0.37 ± 0.18	0.44 ± 0.18	0.37 ± 0.19
Informed and uninformed parents	0.24 ± 0.13	0.33 ± 0.18	0.41 ± 0.18	0.33 ± 0.18
Wide toothbrush head				
Informed parents	0.24 ± 0.13	0.29 ± 0.16	0.41 ± 0.23	0.31 ± 0.18
Uninformed parents	0.28 ± 0.16	0.45 ± 0.30	0.46 ± 0.22	0.41 ± 0.25
Informed and uninformed parents	0.26 ± 0.14	0.39 ± 0.26	0.44 ± 0.22	0.37 ± 0.23
Narrow and wide toothbrush head, informed and uninformed parents	0.25 ± 0.14	0.36 ± 0.23	0.43 ± 0.20	0.35 ± 0.21
Brushing technique, <i>n</i> (%)				
Only occlusal surfaces (C)	16 (16)	1 (1)	3 (3)	20 (6.67)
Occlusal and outer surfaces (CO)	40 (40)	47 (47)	38 (38)	125 (41.67)
Occlusal, outer and inner surfaces (COI)	44 (44)	52 (52)	59 (59)	155 (51.67)
Toothbrushing duration (s), mean ± SD				
Observed by examiner	35.46 ± 20.4	74.61 ± 39.97	83.55 ± 95.45	64.44 ± 39.43
At home (reported by the parent)	46.2 ± 26.3	90.15 ± 40.94	95.45 ± 55.48	77.17 ± 47.82
Toothbrushing frequency, <i>n</i> (%)				
Once a day	47 (47)	20 (20)	9 (9)	76 (25.33)
Twice a day	43 (43)	64 (64)	72 (72)	179 (59.67)
More than twice a day	10 (10)	16 (16)	19 (19)	45 (15)

n, number; *s*, seconds; *SD*, standard deviation

Results

Of the 300 children recruited, 152 (50.7%) were female, and 148 (49.3%) were male (Table 1). In each age group, both genders were represented almost equally. The majority of the children were supervised by their mothers (n= 258, 86%) during toothbrushing. Among the supervising parents, the 30 to 39-year-old mothers formed the largest group (n=159, 61.6%). Most participating parents completed or attended a vocational school (138 mothers or 53.5% and 22 fathers or 52.4%) (Table 1).

Over 50% of the participants in each age group were not informed by an oral health care professional about the amount and type of toothpaste to use (Table 2). However, nearly all participants used an age-appropriate children's toothpaste containing 500 ppm fluoride during the interview and at home (n= 289, 96.33% and n= 285, 95%). In age group I, two parents brushed their child's teeth only with water, and two used an adult's toothpaste containing 1450 ppm fluoride. Similarly, two parents in age group II and nine parents in age group III used an adult's toothpaste for their children.

The most commonly used application technique was the central dispensing of toothpaste, regardless of the shape of the toothbrush head, followed by the axial and transversal application. Overall, one hundred fifty-five participants were observed to use the COI technique, whereas 41.7% (n=125) brushed the occlusal and outer surfaces. The duration of toothbrushing per toothbrushing session reported by the participants differed from the duration observed by the investigator, with the latter being shorter in each age group. While most participants in age groups II and III reported brushing their teeth twice daily (age group II: 64% and age group III: 72%), the percentage of participants in age group I brushing their teeth once or twice daily was similar (47% and 43%).

The amount of toothpaste applied to the two toothbrushes by a parent is shown in Figure 1.

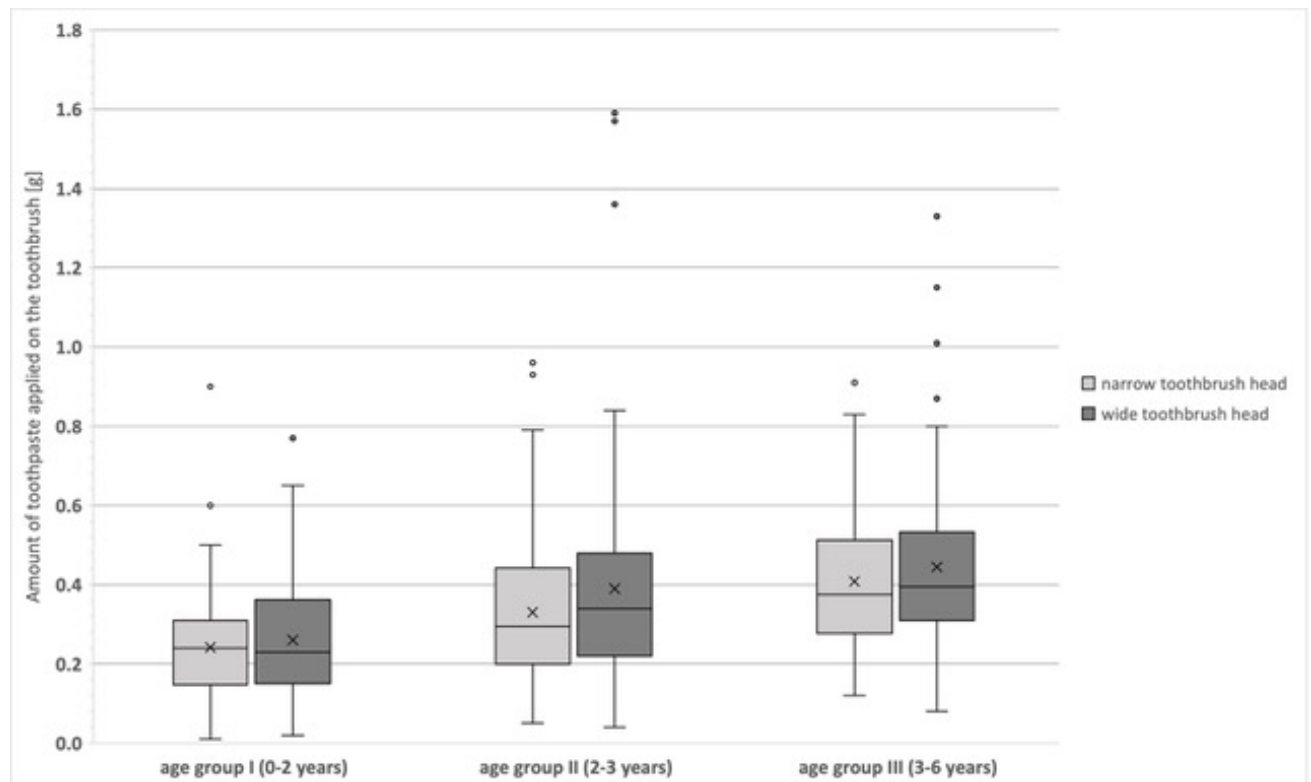


Figure 1. Boxplot summarizing the amounts of toothpaste [g] applied on both toothbrushes with median, mean (cross), 25th and 75th percentile, whiskers with the maximum and minimum values within the 1.5x interquartile range, and outliers.

Nearly 50% of parents of 0- to 2-year-old children applied more than the recommended 0.25 g (mean \pm SD; narrow brush head: 0.24 g \pm 0.13 g, wide brush head: 0.26 g \pm 0.14 g), while two-thirds of parents in age group II (mean \pm SD; narrow brush head: 0.33 g \pm 0.18 g, wide brush head: 0.39 g \pm 0.26 g) and nearly 90% of parents in age group III applied more than 0.25 g (mean \pm SD; narrow brush head: 0.41 g \pm 0.18 g, wide brush head: 0.44 g \pm 0.22 g), even more, when asked to dispense on the toothbrush with the wide brush head (Table 2). The amount of toothpaste used was neither significantly correlated with the age of the parent (mother: narrow head $p=0.38$, wide head $p=0.23$ / father: narrow head $p=0.88$, wide head $p=0.78$) nor with the gender (narrow head: $p=0.16$, wide head: $p=0.13$) (Table 3). However, parents previously informed by oral health professionals about the appropriate amount and type of toothpaste to use applied significantly more often the pea-sized amount than uninformed parents, irrespective of the brush head shape ($p<0.001$). Similarly, parents who applied toothpaste centrally on the brush applied significantly more toothpaste in the correct amount for both narrow and wide toothbrush heads ($p<0.001$). Parents of age groups II and III dispensed significantly more toothpaste, irrespective of the toothbrush head shape, compared to parents of age groups I ($p<0.001$), exceeding the recommended pea-sized amount of 0.25 g.

Table 3. Amount of toothpaste applied

	Narrow toothbrush head		Wide toothbrush head	
	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)
Age mother (y)				
20-29	0.32 ± 0.20	0.27 (0.20, 0.35)	0.35 ± 0.22	0.34 (0.19, 0.39)
30-39	0.32 ± 0.17	0.30 (0.20, 0.43)	0.37 ± 0.24	0.33 (0.21, 0.46)
40-49	0.34 ± 0.19	0.31 (0.19, 0.41)	0.36 ± 0.19	0.35 (0.22, 0.43)
> 50	0.47 ± 0.06	0.47 (0.44, 0.49)	0.75 ± 0.38	0.75 (0.61, 0.88)
Test (<i>p</i> -value)	Kruskal-Wallis (<i>p</i> =0.38)		Kruskal-Wallis (<i>p</i> =0.23)	
Age father (y)				
20-29	0.33 ± 0.19	0.31 (0.22, 0.36)	0.36 ± 0.21	0.34 (0.26, 0.37)
30-39	0.32 ± 0.18	0.28 (0.20, 0.43)	0.36 ± 0.23	0.33 (0.19, 0.45)
40-49	0.34 ± 0.18	0.31 (0.21, 0.42)	0.38 ± 0.23	0.36 (0.23, 0.44)
> 50	0.35 ± 0.21	0.31 (0.18, 0.49)	0.38 ± 0.19	0.42 (0.24, 0.48)
Test (<i>p</i> -value)	Kruskal-Wallis (<i>p</i> =0.88)		Kruskal-Wallis (<i>p</i> =0.78)	
Gender				
Mother	0.32 ± 0.18	0.29 (0.19, 0.41)	0.36 ± 0.23	0.33 (0.2, 0.43)
Father	0.35 ± 0.16	0.34 (0.24, 0.44)	0.40 ± 0.21	0.36 (0.26, 0.5)
Test (<i>p</i> -value)	Ranksum (<i>p</i> =0.16)		Ranksum (<i>p</i> =0.13)	
Informed vs. non-informed				
Informed	0.27 ± 0.15	0.25 (0.17, 0.32)	0.31 ± 0.18	0.29 (0.18, 0.38)
Non-informed	0.37 ± 0.19	0.35 (0.23, 0.47)	0.41 ± 0.25	0.37 (0.24, 0.50)
Test (<i>p</i> -value)	Ranksum (<i>p</i> <0.001)		Ranksum (<i>p</i> <0.001)	
Dispensing technique				
Central	0.28 ± 0.13	0.27 (0.18, 0.35)	0.31 ± 0.16	0.29 (0.19, 0.38)
Transversal	0.44 ± 0.19	0.41 (0.29, 0.56)	0.59 ± 0.38	0.48 (0.39, 0.61)
Axial	0.42 ± 0.23	0.39 (0.28, 0.55)	0.45 ± 0.26	0.41 (0.25, 0.60)
Test (<i>p</i> -value)	Tukey (<i>p</i> <0.001)		Tukey (<i>p</i> <0.001)	
Age group				
I (0-2 years)	0.24 ± 0.13	0.24 (0.15, 0.31)	0.26 ± 0.14	0.23 (0.15, 0.36)
II (2-3 years)	0.33 ± 0.19	0.30 (0.2, 0.44)	0.39 ± 0.26	0.34 (0.22, 0.48)
III (3-6 years)	0.41 ± 0.18	0.38 (0.28, 0.51)	0.45 ± 0.23	0.40 (0.31, 0.53)
Test (<i>p</i> -value)	Tukey (<i>p</i> <0.001)		Tukey (<i>p</i> <0.001)	

y, years; SD, standard deviation; IQR, interquartile range

Discussion

The primary source of fluoride intake by young children is the swallowing of fluoridated toothpaste, the excessive use of which at a young age is mainly responsible for the observed increase in dental fluorosis (MARTIGNON ET AL. 2021). In Switzerland, fluoridation of table salt with 250 mg F-/kg as further collective caries prevention measure contributed significantly to the decrease in caries prevalence, while no increase in enamel fluorosis was observed (MENGHINI 2005; STEINER ET AL. 1989). Two measures can control exposure to fluoride from toothpaste. First, by controlling the fluoride concentration in toothpaste, which governments generally regulate, and second, by controlling the amount of toothpaste used daily, which is the responsibility of parents. Therefore, understanding how much toothpaste parents apply to their children's toothbrushes is critical to assessing their children's exposure to fluoride. The present study aimed to evaluate the amount of toothpaste dispensed by parents on their children's toothbrushes and to assess toothbrushing practices among preschool children in the cantons of Basel-Stadt and Berne.

Surprisingly, over 50% of the parents reported never being instructed by an oral health care professional regarding toothpaste dosing. Consequently, uninformed parents over-dispensed significantly more toothpaste than informed parents highlighting the importance of providing advice on oral hygiene practices and the use of fluoride during children's dental examinations. However, a study comparing the amount of fluoridated toothpaste dispensed before and after verbal instructions concluded that instructing the parents or guardians using descriptions of amounts such as "pea-sized" was ineffective in reducing the dose applied (HUEBNER ET AL. 2013). Following, the recommendation is to teach by demonstrating how much to dispense. Overall, the majority of parents in all age groups applied more than the recommended amount of 0.25 g. Besides the lack of instructions on the amount to use, the resembling of the applied toothpaste to the size of a pea is subject to the parent's own interpretation, potentially leading to overdosing of toothpaste. Furthermore, parents dispensed more on the wide toothbrush head, suggesting that the toothbrush head shape influences to a large extent the dosing of toothpaste. Comparing data from several countries, the dosing of toothpaste before instruction was approximately 1.16 g \pm 0.46 g for German parents, 0.58 g \pm 0.55 g for British parents, and 0.52 g \pm 0.26 g for parents in the United States (CREETH ET AL. 2013). Accordingly, the participating parents appear to dispense on average lower amounts. However, the toothpaste amounts at the 75th percentile, which are more than twice the amounts at the 25th percentile in age groups I and II, and almost twice the amounts used at the 25th percentile in age group III (narrow brush head: 0.51 g, wide brush head: 0.53 g) should be considered too. Assuming that a 4-year-old child weighing 15 kg uses 0.53 g of 500 ppm toothpaste twice a day and swallows 50% of it, the resulting fluoride intake would be 0.035 mg F- /kg body weight/day, half the upper limit recommended by WHO (WHO 2014). By using toothpaste for adults containing 1450 ppm fluoride, the fluoride intake would result in 0.105 mg F- /kg body weight/day, thereby exceeding the upper limit of daily fluoride intake. Encouragingly, considering that most participants used an age-appropriate toothpaste containing 500 ppm and assuming the intake of fluoridated toothpaste as the only source of fluoride, the average amounts of toothpaste used reported in the present study are safe in terms of fluorosis risk. In contrast, the children of participants using significantly higher amounts have a higher enamel fluorosis risk.

The present study has several limitations. Besides the well-known bias of convenience sampling, the sample size was limited to 300, and most children were recruited in the cantons of Basel-Stadt and Berne. In addition, the sample studied was not drawn completely randomly from a large population, as approximately two-thirds were recruited from the UZB and private practices as patients or as the patient's children. Therefore, the findings may not reflect the toothbrushing practices of all Swiss children. However, the COVID-19 pandemic and resulting restrictions significantly complicated the recruitment process, and many daycare centers refused to participate and did not allow data collection. Additionally, the toothpaste dosing and the children's brushing behavior were observed in an artificial environment, thus potentially influencing the amount of toothpaste applied. Moreover, parents and children attending the Department of General Pediatric and Adolescent Dentistry, University Center for Dental Medicine Basel UZB, might be more oral health conscious since they might have encountered an oral health problem before. Furthermore, it cannot be excluded that parents of participants with an older sibling are more appropriately informed. Consequently, further studies are required to confirm the observed results.

Additionally, the daily fluoride intake from toothpaste can be estimated in future studies by analyzing the fluoride content of the expectorated toothpaste and residual toothpaste on the toothbrush. By subtracting these amounts from the amount initially used, multiplying by the brushing frequency, and dividing by the child's body weight, the daily fluoride dose can be calculated and compared with the total optimal fluoride intake of 0.05 – 0.07 mg F-/kg body weight/day.

Considering the intake of fluoridated toothpaste as the only source of fluoride, the average amounts of toothpaste used reported in the present study are safe in terms of fluorosis risk. Accounting for the participants, who over-dispensed remarkably, the present study emphasizes the importance of monitoring children's toothbrushing behavior and to routinely educating parents about oral health care, including toothpaste dosing during children's dental examinations.

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Zusammenfassung

Einleitung

Einer der Hauptgründe für den beobachteten Kariesrückgang in industrialisierten Ländern ist die weit verbreitete Verwendung von Fluoridverbindungen in Zahnpasten. Die präventiven Effekte der lokalen Fluoridanwendung sind heute mit hohem Evidenzgrad belegt. Eine übermäßige Fluoridaufnahme bei Kleinkindern aufgrund der Verschluckproblematik im Zeitraum der Schmelzbildung kann jedoch zu einer Dentalfluorose an den bleibenden Zähnen führen. Daher ist für eine möglichst effektive Kariesprävention bei gleichzeitiger Vermeidung von Fluorosen die richtige Dosierung von fluoridierter Zahnpasta bei Vorschulkindern von grosser Bedeutung.

Material und Methoden

Ziel dieser Studie war es, die Zahnputzgewohnheiten bei Vorschulkindern im Alter von 0-6 Jahren und die Dosierung der Zahnpasta durch ihre Eltern zu untersuchen. Die Rekrutierung der Studienteilnehmer erfolgte in der Abteilung für Allgemeine Kinder- und Jugendzahnmedizin des Universitätszentrums für Zahnmedizin Basel UZB, in Kindertagesstätten oder in privaten Zahnarztpraxen im Kanton Bern. Insgesamt wurden 300 Eltern zu sozioökonomischen Merkmalen, Zahnputzgewohnheiten ihrer Kinder und zur Verwendung einer altersgerechten Zahnpasta befragt. Zusätzlich wurden sie befragt, ob sie von einer Fachperson über die richtige Zahnpflege und die zu verwendende Menge an Zahnpasta aufgeklärt wurden. Des Weiteren wurden die Eltern gebeten, Zahnpasta auf zwei verschiedene Zahnbürsten aufzutragen, eine mit einem schmalen und eine mit einem breiten Bürstenkopf. Die aufgetragene Zahnpastamenge wurde mit einer tragbaren Waage gewogen.

Abschliessend wurden die Eltern aufgefordert, dem Kind die Zähne zu reinigen. Dabei wurden Daten zur Zahnputzdauer und Zahnputztechnik erhoben.

Resultate

Über 50% der Eltern gaben an, nie von einer Fachperson über die angemessene Zahnpflege und Zahnpasta-Dosierung aufgeklärt worden zu sein. Allerdings verwendeten fast alle Teilnehmer eine altersgerechte Zahnpasta. Ungefähr 50% der Eltern von 0- bis 2-jährigen Kindern verwendeten mehr als die empfohlenen 0.25 g Zahnpasta mit 500 ppm Fluorid (beide Zahnbürstenköpfe, MW \pm SD: 0.25 g \pm 0.14 g), während zwei Drittel der Eltern von 2- bis 3-jährigen Kindern (beide Zahnbürstenköpfe, MW \pm SD: 0.36 g \pm 0.23 g) und fast 90% der Eltern von 3- bis 6-jährigen Kindern (beide Zahnbürstenköpfe, MW \pm SD: 0.43 g \pm 0.20 g) mehr als 0.25 g auf die Zahnbürsten auftrugen. Insgesamt applizierten die Eltern mehr Zahnpasta auf die Zahnbürste mit dem breiten Bürstenkopf.

Diskussion

Wird fluoridierte Zahnpasta als einzige Fluoridquelle angenommen, sind die in der vorliegenden Studie berichteten durchschnittlichen Zahnpastamengen im Hinblick auf das Fluoroserisiko unbedenklich.

Unter Berücksichtigung der Teilnehmer, die auffallend viel Zahnpasta verwendeten, zeigt die vorliegende Studie, dass Aufklärungsbedarf bei Eltern hinsichtlich korrekter Zahnpflege ihrer Kinder besteht. Die Aufklärung und Beratung über die richtige Umsetzung der Empfehlungen

zur Kariesprophylaxe sollten im Rahmen ärztlicher und zahnärztlicher Kontrolluntersuchungen intensiviert werden.

Résumé

Introduction

L'une des principales raisons du recul observé de la carie dans les pays industrialisés trouve son explication dans l'utilisation généralisée de composés fluorés dans les dentifrices. Les effets préventifs de l'application locale de fluor sont aujourd'hui largement démontrés et prouvés. Cependant, une absorption excessive de fluor chez les jeunes enfants, notamment en raison de problèmes d'ingestion pendant la phase de formation de l'émail, peut aboutir à l'apparition d'une fluorose dentaire sur leurs dents définitives. C'est pourquoi, pour une prévention des caries aussi optimale que possible tout en évitant des fluoroses, le dosage adéquat du dentifrice fluoré chez les enfants d'âge préscolaire est capital.

Matériel et méthodes

L'objectif de cette recherche visait à observer les habitudes de brossage des dents chez les enfants d'âge préscolaire, soit entre 0 et 6 ans, ainsi que le dosage de dentifrice apposé par leurs parents sur leurs brosses à dents. Les participants à cette étude ont été sélectionnés au sein du service de médecine dentaire générale pour enfants et adolescents du Centre universitaire de médecine dentaire de Bâle UZB, dans des crèches ou dans des cabinets dentaires du canton de Berne. Au total, 300 parents ont été interrogés sur leurs environnements socio-économiques, leurs habitudes de brossage des dents de leurs enfants et l'utilisation d'un dentifrice adapté à leurs âges respectifs. Il leur a également été demandé s'ils avaient été informés par un professionnel de santé sur les soins dentaires appropriés à prodiguer à leurs enfants ainsi que sur la quantité adéquate de dentifrice à utiliser. En outre, les parents ont été invités à appliquer du dentifrice sur deux brosses à dents distinctes, l'une avec une tête de brosse étroite et l'autre avec une tête de brosse plus large. A préciser que la quantité de dentifrice a été pesée à l'aide d'une balance portable. Enfin, les parents ont été sollicités pour procéder au nettoyage des dents de leurs enfants. Des données tant sur la durée que sur la technique de brossage des dents ont été récoltées.

Résultats

Plus de 50 % des parents ont déclaré n'avoir jamais été informés par un spécialiste ni sur les soins dentaires, ni sur le dosage du dentifrice. Néanmoins, il a été observé que presque tous les participants utilisaient un dentifrice en bonne adéquation avec l'âge de leurs enfants. Environ 50% des parents d'enfants de 0 à 2 ans ont consommé plus que les 0.25 g de dentifrice recommandé contenant 500 ppm de fluor (les deux têtes de brosse à dents, $M \pm \text{écart-type}$: 0.25 g \pm 0.14 g), tandis que deux tiers des parents d'enfants de 2 à 3 ans (les deux têtes de brosse à dents, $M \pm \text{écart-type}$: 0.36 g \pm 0.23 g) et près de 90% des parents d'enfants de 3 à 6 ans (les deux têtes de brosse à dents, $M \pm \text{écart-type}$: 0.43 g \pm 0.20 g) ont appliqué plus de 0.25 g sur les brosses à dents. Globalement, les parents ont utilisé une quantité plus conséquente de dentifrice sur la brosse à dents à tête large.

Discussion

Si le dentifrice fluoré est considéré comme la seule source de fluor, les quantités moyennes de dentifrice rapportées dans cette étude sont sans danger pour le risque de fluorose.

En tenant compte des participants qui utilisaient une quantité de dentifrice remarquablement élevée, la présente étude démontre qu'il est essentiel de délivrer aux parents des indications claires, simples et précises sur l'hygiène dentaire correcte dont doivent bénéficier leurs enfants. Les informations et conseils sur la bonne application des recommandations en matière de prévention des caries devraient être intensifiés dans le cadre des examens de contrôle médicaux et dentaires.

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