




ORIGINAL RESEARCH ARTICLE

Evaluation of Bedtime Oral Hygiene Behavior and Dietary Habits in Children

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Abstract

Purpose: The purpose of this study was to assess the effect of bedtime oral hygiene and dietary behaviors on dental health in children.

Materials and Methods: For this study, 83 parents with children aged 6 to 8 years participated. All participants who agreed to take part in the study were called on their mobile phones for 7 days (weekdays and weekend) for collecting data of bedtime routine activities of children including oral hygiene behaviors and dietary habits 1 hour before bedtime. Children's clinical oral examination was carried out by trained and calibrated pediatric dentist following WHO guideline 2013. IBM SPSS Statistics (version 22.0) was used for all statistical analyses, including the Mann Whitney U test, the Kruskal Wallis test, and the Kolmogorov-Smirnov test.

Results: The dmft score of children who were allowed to eat or drink 1 hour before bedtime was statistically significantly higher than those who were not allowed ($p=0.014$; $p<0.05$). Although the dmft score of children who consumed snacks or drinks other than water or unflavored milk 1 hour before bedtime were higher than those who consumed only water or unflavored milk, this difference was not statistically significant ($p>0.05$).

Conclusions: The present study highlighted bedtime dietary habits affect the dental health of children. Establishing optimal bedtime routines, including oral hygiene practices and dietary habits, is essential for proper oral hygiene and the well-being and development of children.

Key words: Bedtime; Children; Diet; Oral hygiene

Introduction

About 60% of children globally are estimated to be affected by dental caries, one of the most common diseases in children.¹ It is a multifactorial disease in which the development and progression of dental caries are affected by the oral bacterial flora, and environmental and genetic factors including diet, oral hygiene routines, composition of saliva and tooth structure play an essential role.² As per the findings of the Turkey Oral and Dental Health Profile 2018 survey, there was at least one dental caries in 64.4% of children aged 5 years, 46.6% of children aged 12 years, and 58.3% of children aged 15 years.³ Children with dental caries have discomfort, pain, difficulty sleeping, difficulty chewing, learning disabilities, psychological development problems (e.g. low self-esteem), and missed days of school that lead to a decline in school performance all of which have a detrimental impact on their quality of life.^{4,5}

Bedtime routines are defined as a regular, dynamic, and shared series of activities that occur approximately one hour prior to children going to bed.⁶ These routines include brushing teeth, avoiding electronics such as TVs, avoiding snacks and drinks other than

water or unflavored milk, reading books or storytelling between parent and child, as well as other activities that encourage positive interaction between parents and children.^{7,8} Prior research pertaining to bedtime routines has demonstrated the significance of these practices with respect to sleep quality, dental health, academic achievement, psycho-social and mental growth, general functioning of families, and stress for parents and self-assurance.^{9,10}

Bedtime is especially crucial time for both diet and preventative practices in terms of oral health.¹¹ Consuming food or beverages, particularly those high in free sugars, right before bed increases the risk of dental caries because it causes salivary flow to diminish and shifts the scales in favor of demineralization rather than remineralization.¹² Several clinical guidelines have recommended avoiding foods and beverages containing free sugars and brushing the teeth twice a day at bedtime with fluoride toothpaste under parental supervision.^{13,14} Establishing and maintaining healthy family routines is essential for controlling free sugar consumption, particularly before bedtime, and for brushing twice a day.¹⁵

There is currently a lack of knowledge regarding the features of children's bedtime routines in relation to oral hygiene behaviors

and dietary habits. Thus, the main purpose of this study is to gain a better understanding of the impact of bedtime oral hygiene and dietary behaviors on dental health in children.

Material and Methods

This cross-sectional study was approved by Research Ethical Board of Altınbaş University (2023/217). Participants were approached during dental examination in Altınbaş University Pediatric Dentistry Clinic between January 2024 – April 2024. All participants gave written informed consent in accordance with the Helsinki Declaration before the study, and they were all informed of the study's purpose. Inclusion criteria consisted of I) ability in reading and speaking Turkish, II) having access to working mobile phone and III) having children between the ages of 6 and 8. In all, 83 parents of children between the ages of 6 and 8 took part in present study.

During children's examination, sociodemographic data, including the age and gender of the parents and children, family income, and number of children, were obtained. Children's clinical oral examination was carried out by trained and calibrated pediatric dentist (S.C.İ) following WHO guideline 2013.¹⁶ All participants who accepted to take part in the study were called on their mobile phones for 7 days (weekdays and weekend) to collect data on bedtime routine activities of children. Specific questions were asked regarding the oral hygiene behaviors of the children (e.g., did they brush their teeth that evening, and if so, by whom), as well as their dietary habits before bed. Parents were asked whether they allowed their children to eat or drink 1 hour before going to bed at night and, if yes, what they ate. Two postgraduate students (E.S and M.K) noted data of bedtime routine activities of children.

Statistical Analysis

Data were analyzed with the Statistical Package for Social Sciences version 22.0 software (IBM Corp.; Armonk, NY, USA). Using the Kolmogorov-Smirnov test, the parameters' suitability for a normal distribution was assessed, and it was found that the parameters did not exhibit a normal distribution. When analyzing the data, the Kruskal-Wallis test was utilized for parameter comparisons between more than two groups in quantitative data comparisons, and the Mann-Whitney U test was employed for comparisons between two groups. Descriptive statistical methods such as minimum, maximum, mean, standard deviation, median, and frequency were used as well. The statistical significance was accepted as $p < 0.05$.

Results

In total, 83 parents and their children participated in the study. An overview of the sample characteristics is given in Table 1, which includes the number of children, the age and gender of the parents and children, and the family's income level. The mean age of the parents was 39.05 (SD=3.98), and only 23 male parents participated in the study. The majority of the parents were female. Only three families had more than 3 children, compared to the majority of families with 2 (n=35). 53% of the children in the study were female and 47% were male, and their ages ranged from 5 to 8. Most of the income level of the families (92.9%) was above minimum wage.

Regarding whom was brushing the children's teeth, majority of the children (81.9%, n=68) brushed their teeth on their own with no assistance, 13.3% of them were brushed by parents. 59% of parents (n=49) stated that they brushed their children's teeth every night of the week. 77.1% of parents (n=64) allowed children food or drink 1 hour before bedtime. While 20.3% of parents who allowed to eat or drink before bedtime, only allowed to drink water or unflavored milk, 79.7% allowed snacks or drinks other than water or unflavored milk. Of the 51 parents who allowed snacks and

Table 1. Sociodemographic characteristics

	Min-Max	Mean±SD	
Age of parents	30-50	39.05±3.98	
Age of child	5-8	7.12±0.85	
Number of children (median)	1-6	1.83±0.93 (2)	
	n	%	
Gender of parents	Female	60	72.3
	Male	23	27.7
Gender of child	Female	44	53.0
	Male	39	47.0
Family income	Medium	6	7.2
	High	77	92.9

SD: Standard Deviation, Min: Minimum, Max: Maximum

drinks other than water or unflavored milk, 76.5% allowed them on Saturdays and 59.8% on Sundays. While 38.6% of the children did not consume snacks at all, 27.7% consumed snacks less than 3 days a week, 24.1% consumed snacks more than 3 days a week and 9.6% consumed snacks every day (Table 2). Foods and drinks consumed by children 1 hour before bedtime according to days are shown in Table 3.

The mean dmft and DMFT scores of children are shown in Table 4. The dmft score of children who were allowed to eat or drink 1 hour before bedtime was statistically significantly higher than those who were not allowed ($p=0.014$; $p<0.05$). Although the dmft score of children who consumed snacks or drinks other than water or unflavored milk 1 hour before bedtime was higher than those who consumed only water or unflavored milk, this difference was not statistically significant ($p>0.05$) (Table 5).

Discussion

In this study, the dental health of children was investigated regarding the oral hygiene behaviors and dietary habits of children 1 hour before bedtime. The findings of this study, in consistent with previous studies¹⁷⁻¹⁹ has demonstrated the significance of bedtime dietary habits and oral hygiene behaviors for oral health of children.

The study's findings indicate that allowing a child to eat or drink one hour prior to bedtime and the child's dmft score were significantly associated. There is strong evidence that dietary habits have a negative impact on oral health from a physiological and biological standpoint, and that avoiding free sugars in general is important.¹⁷ The natural sugars in unflavored milk have minimal effects on oral health. Nevertheless, free sugars—that is, naturally occurring sugars that have broken down along with sugar added within food and beverages—have been shown to negatively impact oral health because of their cariogenic load.¹⁹ In present study, for children allowed to eat or drink one hour before bedtime, there was no significant difference in dmfs between those who consumed water or unflavored milk and those who had snacks or beverages. In contrast to our study, a recent study has reported a significant positive correlation between the dmft score and consumption of snacks or drinks before bedtime.⁵ Additionally, a previous study has indicated that the majority of parents permitted snacks or drinks other than water or unflavored milk similar to our study, leading to their children developing unhealthy eating habits.¹⁰

In present study, allowing eat or drink before bedtime was more common on Saturday (76.5%) and Sunday (60.8%) than weekdays. Kitsaras et al.¹⁰ described this situation as the “weekend effect” and has indicated that parents may behave differently on weekdays compared to weekends. Additionally, just identifying certain evenings as school nights and others as weekend nights can be enough to explain the development of behavioral and practical changes in children as well as changed expectations about what is and isn't appropriate for them to be doing.

Brushing teeth is an important bedtime routine activity for chil-

Table 2. Bed time oral hygiene behaviors and dietary habits of children

		n	%
A person who brush child's teeth	Child	68	81.9
	Parents	11	13.3
	Parents + Child	4	4.8
Frequency of tooth brushing	Less than %50	15	18.1
	More than %50	19	22.9
	Every day	49	59.0
Toothpaste containing flouride	Yes	36	43.4
	No	47	56.6
Allowing the child to eat or drink 1 hour before bedtime	Yes	64	77.1
	No	19	22.9
If it is allowed (n=64)	Only water or unflavored milk	13	20.3
	Snack or drinks other than water or unflavored milk	51	79.7
The days allowed (n=51)	Monday	28	54.9
	Tuesday	28	54.9
	Wednesday	29	56.9
	Thursday	28	54.9
	Friday	28	54.9
	Saturday	39	76.5
	Sunday	31	60.8
	Never	32	38.6
Frequency of snacks or drinks	Less than 3 days	23	27.7
	More than 3 days	20	24.1
	Every day	8	9.6

Table 3. Food and drink consumed by children 1 hour before bedtime by day

	Monday n (%)	Tuesday n (%)	Wednesday n (%)	Thursday n (%)	Friday n (%)	Saturday n (%)	Sunday n (%)
Absent	5 (%9.8)	7 (%13.7)	13 (%25.5)	11 (%21.6)	10 (%19.6)	6 (%11.8)	13 (%25.5)
Flavored Milk	2 (%4)	2 (%4)	2 (%4)	1 (%2)	1 (%2)	1 (%2)	1 (%2)
Crips	4 (%7.8)	1 (%2)	2 (%3.9)	2 (%3.9)	2 (%3.9)	11 (%21.6)	7 (%13.7)
Cookie	2 (%3.9)	-	-	2 (%3.9)	-	1 (%2)	2 (%3.9)
Chocolate	4 (%7.8)	8 (%15.7)	4 (%7.8)	6 (%11.8)	5 (%9.8)	7 (%13.7)	3 (%5.9)
Fruit	13 (%25.5)	12 (%23.5)	18 (%35.3)	13 (%25.5)	14 (%27.5)	9 (%17.6)	10 (%19.6)
Fruit Juice	1 (%2)	1 (%2)	-	-	2 (%3.9)	1 (%2)	-
Coke	-	2 (%3.9)	-	-	-	-	-
Nut	-	1 (%2)	-	-	-	-	-
Popcorn	1 (%2)	-	1 (%2)	2 (%3.9)	1 (%2)	4 (%7.8)	4 (%7.8)
Water	18 (%35.3)	13 (%25.5)	8 (%15.7)	10 (%19.6)	10 (%19.6)	5 (%9.8)	5 (%9.8)
Unflavored milk	-	3 (%5.9)	1 (%2)	2 (%3.9)	3 (%5.9)	1 (%2)	2 (%3.9)
Dessert	-	-	1 (%2)	1 (%2)	2 (%4)	4 (%7.8)	3 (%5.9)
Yogurt	1 (%2)	1 (%2)	1 (%2)	1 (%2)	1 (%2)	1 (%2)	1 (%2)

Table 4. DMFT and dmft scores of children

	Min-Max	Mean±SD	Median
dmft	0-12	3.75±3.59	3
DMFT	0-7	0.81±1.61	0

SD: Standard Deviation, Min: Minimum, Max: Maximum

dren to highlight. The recommendations state that parents should supervise and brush their children's teeth until they are ten years old.²⁰ However, the present study has reported that only 13.3% of parents brushed their children's teeth. A significant number of children brush their teeth unsupervised by an adult, which can be detrimental to their dental health even though current guidelines indicate contrary. In terms of frequency of brushing, while 59% of participants brushed teeth every night in present study, Kitsaras et al.¹⁰ found that 53% of parents did so.

Based on the existing research on bedtime routines, children and their families can benefit much in the long run from successfully and regularly executing the appropriate bedtime routine. Prior research has demonstrated that children who followed robust routines, such as brushing their teeth and not eating late at night, had lower dental caries and generally improved oral health.¹⁵ Eliminating dental problems at an early age can therefore not only benefit a

child's general development by reducing the risk of tooth extractions, dental pain, sleep disturbances but also contribute to public finances by reducing financial expenses.⁴ Other than dental health, good dietary habits one hour before bedtime have been demonstrated to have significant reduction in obesity rates.²¹

The repetitive aspect of bedtime routines and the early emphasis on routines can facilitate children's rapid adoption and long-term maintenance of positive behaviors.⁵ Furthermore, the psychological and emotional wellbeing of parents and children has been connected to bedtime routines. Compared to other children, those who have irregular bedtime routines have greater behavioral issues on a regular basis, while parents who follow an ideal bedtime routine report feeling less stressed, irritated, and tired.^{15,22}

The most significant potential limitation of this study is most likely the risk of bias, particularly desirability bias. Since the participant is required to answer honestly and accurately, there is no way to ensure that their responses are accurate, which makes it challenging to control for the impacts of this kind of bias in self-reported measures. Contacting the parents at different times (on the same day for each patient) without prior notice and learning about their bedtime routines could help provide more objective findings. Another limitation of this study is that it focused solely on bedtime routines, without evaluating dietary habits throughout the

Table 5. Comparison of oral hygiene behaviors and dietary habits 1 hour before bedtime and dmft/DMFT scores

		dmft	DMFT
		Mean±SD (median)	Mean±SD (median)
Frequency of tooth brushing	Less than 50%	5.67±4.78 (5)	1.73±2.22 (0)
	More than 50%	3.21±2.74 (3)	0.58±1.02 (0)
	Every day	3.37±3.35 (3)	0.61±1.51 (0)
	p¹	0.263	0.122
Toothpaste containing flouride	Yes	3.97±3.49 (3)	0.92±1.57 (0)
	No	3.57±3.7 (3)	0.72±1.65 (0)
	p²	0.551	0.306
A person who brush child's teeth	Child	3.60±3.42 (3)	0.90±1.69 (0)
	Parents	4.73±4.94 (3)	0.36±1.21 (0)
	Parents + Child	3.50±2.65 (4)	0.50±1.0 (0)
	p¹	0.918	0.490
Allowing the child to eat or drink 1 hour before bedtime	Yes	4.22±3.61 (4)	0.8±1.6 (0)
	No	2.16±3.15 (1)	0.84±1.71 (0)
	p²	0.014*	0.862
If it is allowed	Only water or unflavored milk	2.77±3.52 (2)	0.23±0.6 (0)
	Snack or drinks other than water or unflavored milk	4.59±3.57 (4)	0.94±1.74 (0)
	p²	0.068	0.267

¹Kruskal Wallis test ²Mann Whitney U Test *p<0.05 SD: Standard Deviation, Min: Minimum, Max: Maximum

day, and drawing conclusions within a short period. A more comprehensive assessment of both daily dietary habits in conjunction with bedtime routines, conducted over a longer duration, would likely provide a healthier understanding of the relationship between dmft and DMFT values and dietary routines.

Conclusion

This study provided evidence that children's dietary habits before bedtime have an impact on their oral health. A critical initial point for excellent short- and long-term oral health outcomes, along with the wellbeing and development of children, is the promotion, creation, and maintenance of optimum bedtime routine activities, including appropriate dental hygiene behaviors and dietary habits before bedtime.

Author Contributions

Idea/Concept: S.C.Í; Design: S.C.Í, E.S, M.K; Control/Supervision: S.C.Í, E.S, M.K; Data Collection and/or Processing: S.C.Í, E.S, M.K; Analysis and/or Interpretation: S.C.Í; Literature Review: S.C.Í, E.S, M.K; Writing the Article: S.C.Í, E.S, M.K; Critical Review: S.C.Í, E.S, M.K.

Conflict of Interest

The authors declare that they have no conflict of interest.

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