

Research Article

Knowledge and Behaviors of Oral Health in Children: A Cross-Sectional and Correlational Study

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Abstract

Background: Due to their high prevalence and incidence, oral diseases represent one of the main health problems of children and adolescents. The early diagnosis of oral diseases and the identification of risk factors are essential to establish preventive measures, and nursing community intervention programs can reduce the negative impact of complications.

Purpose: Understanding the influence of knowledge of oral health on the behaviors of 235 children attending the first cycle of basic education in a group of schools in a municipality in the Central Region of Portugal.

Methods: A quantitative, cross-sectional, and correlational study was carried out, integrated in the community intervention project “Smiles at School”. Data collection was carried out using a questionnaire built for the purpose, and all inherent ethical requirements were met. In the data analysis, descriptive statistics were used for categorical variables and inferential statistics for the analysis of the association between two categorical variables.

Results: Children of older age and with a higher level of education and adequate oral hygiene habits have more knowledge. Children with knowledge of oral health report that the intake of cariogenic foods is sporadic and once or twice a week, with a statistically significant association. Boys have the most deficient hygiene habits. Regarding the ingestion of cariostatic foods, the pattern of consumption is found mostly at meals and at mealtimes.

Conclusions/Implications to Practice: Children with knowledge of oral health have a lower number of decayed teeth and a greater number of treated teeth, have better oral hygiene behaviors, regularly carry out oral health surveillance and have correct eating habits. This confirms that knowledge of children/adolescents influences their behavior in the context of oral health. Projects in the field of oral health must be developed to empower and improve the knowledge and behavior of children/adolescents.

Keywords: Oral health; Oral hygiene; Knowledge and behavior; Nursing community intervention; Children

Introduction

Due to their high prevalence and incidence, oral diseases represent one of the main health problems of children and adolescents in all regions of the world. However, if properly prevented and treated early, caries and periodontal diseases are highly treatable, with reduced economic costs and relevant health care gains [1,2]. The severe impact in terms of pain and suffering, impairment of function, and effect on quality of life must also be considered [3]. Oral health,

being an integral part of health in general, should be understood in a broader context, where oral diseases are influenced by behaviors, both individual and collective, and have a more or less significant weight in the quality of life of the populations [4]. The World Health Organization (WHO) states that oral health is part of the health and general well-being of the individual, being considered important for a good quality of life. The European strategy and the goals defined by the WHO for 2020 point out that the DMFT index (decayed, missing, and filled permanent teeth) among the 12-year-old age group does not exceed the value of 1.5 [5]. A study of the prevalence of oral diseases, carried out in Portugal in 2008, showed that at 12 years old, the DMFT index was 1.48. The prevalence of dental caries has been decreasing in children and adolescents in recent years, due to the implementation of an oral health program. Although Portugal is among the countries with low prevalence of dental caries, this disease is one of the main oral health problems [6]. This is associated with the implementation of various strategies in health promotion, prevention, and early treatment of oral diseases, with an important reinforcement of public sector intervention [7]. Recognizing the magnitude of this problem and the effectiveness of primary and secondary prevention measures, the Direção Geral da Saúde (Portuguese government agency) keeps the National Oral Health Promotion Program operational in all

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institutions providing primary health care under the Ministry of Health. This program points to a global intervention strategy based on health promotion, prevention, and treatment of oral diseases. It develops throughout the life cycle, allowing the access of priority and vulnerable groups to dental care, namely children and adolescents. In 2008 the “dental voucher” strategy was added to the program, with an extension of beneficiary groups and a model of contracting between the National Health Service (NHS) and private providers in the dental area. Dental vouchers are awarded by primary care health centers to certain beneficiary patients, allowing access to a range of preventive and curative treatments provided, free of charge, by any private dentist who has agreement with the NHS [8]. Dental caries are an infectious, preventable disease, with higher prevalence during life and to which high morbidity is associated, constituting the main cause of tooth loss [9]. Dental caries are a multifactorial disease, which depends on various factors, predominantly on the presence of fermentable sugar, host factors, presence of cariogenic microbial flora, and other associated environmental factors [10]. It is a disease that adversely influences the individual's general health by decreasing the masticatory function and altering psychosocial development and facial aesthetics, causing phonetic disorders, pain, and infectious complications with local and general repercussions. It also has socioeconomic repercussions for the cost of treatment and is responsible for days of absenteeism at work and at school. Currently, the early diagnosis of oral diseases and the identification of risk factors are essential to establish preventive measures and community intervention programs that reduce the negative impact of complications and repercussions of these diseases [11]. Oral health depends on good oral hygiene, which is achieved by brushing the teeth at least twice a day, using dental floss from 8/9 years old (when the child has the skills to use it), using mouthwashes with fluoride, a healthy diet, and regular monitoring of oral health by a health professional [12]. Oral diseases can decrease with significant improvement in oral hygiene, promotion of topical and systemic use of fluorides, and a decrease in the intake of cariogenic foods, and it is essential to involve parents, the school, and the community in general. Thus, projects must be developed in the area of oral health to empower and improve the knowledge and behavior of children/adolescents, involving parents/guardians and contributing to the empowerment of the population in the scope of oral health. It is important that parents are included in oral health programs to acquire knowledge about oral health and be able to transmit this information and motivation to their children [13]. The school as an ideal space for learning and working is a privileged place for the promotion of oral health [14]. It is advantageous to use the school as a place for education since it is a place where children spend most of their time [15]. School also is the most appropriate setting for conducting health-education programs as opportunities to promote public health goals in a large population of children that can be achieved at low expense. In this perspective, and to continue the National Oral Health Promotion Program, the community intervention project “Smiles at School” was created, developed by nurses and an oral hygienist of a primary health center of the Central Region of Portugal, focused on the educational community of the first cycle of basic education, because behaviors for oral health are formed at this stage of development [16]. Considering this context, the present study aims to understand the implication of knowledge and behaviors in oral health in children attending the first cycle of basic education, specifically the frequency of brushing, the use of dental floss, dental surveillance consultations, and the frequency and pattern of consumption of cariogenic and cariostatic foods.

Methods

Design and Participants

An exploratory quantitative and transversal design was adopted. This study evaluated a sample of 235 children from the first cycle of basic education, belonging to four schools in the school park of one municipality of the Central Region of Portugal. This study result, of the application of an oral health intervention project named “Smiles at School” under the responsibility of a community care unit of a health center of the Central Region of Portugal. Considering the purpose of the study, a convenience sample was used, including 235 children aged between 5 and 10 years old who were attending primary school and present at school on the day of the application of the data collection instrument. All children whose parents did not authorize the application of the study, who did not speak Portuguese, and who had physical or psychological changes that compromise the understanding of the questions and thus the children's answers were excluded.

Data Collection

Research for this study was carried out between April and May 2018. Before data collection, the researchers informed the teachers about the research. The researchers, with the help of the teachers, sent a letter to the parents or another adult legally responsible for the children with all the information about the study and requesting authorization for its application. In this letter it was mentioned that participation in this study was voluntary and that they could withdraw without prejudice at any time. Those who agreed to participate were given the study instruments in a sealed envelope. The children completed the instruments at home with the help of their parents or an adult who lived with them. Data collection lasted approximately 20–25 minutes. After applying the questionnaires, all those who did not mention any sociodemographic variable were excluded. In the construction of the database, all items with missing, incomplete, or null answers were identified. At the end of this process, was obtained a final sample of 235 questionnaires correctly filled out.

Instrument

Data collection was performed using a self-administered and simplified questionnaire adapted to the age group under study. The questionnaire is composed of questions grouped into five fundamental areas: sociodemographic and clinical data of children (gender, age, year of schooling, number of decayed and treated teeth), knowledge about oral health (dental caries and plaque), oral hygiene behaviors (frequency of tooth brushing, use of fluoride toothpaste, use of dental floss, and taking fluoride supplements), oral health surveillance behaviors (prior consultation of dental medicine and reason for consultation), and eating behaviors (frequency and pattern of ingestion of cariogenic and cariostatic foods). Regarding the children's age, it was decided to create three different age groups (5–6 years, 7–8 years, and ≥ 9 years), considering the relevance of changing milk teething to the definitive dentition. In the ingestion of cariogenic foods, sweets/caramels, gums, dry cakes, cakes with cream, lozenge gum, soft drinks, chocolate, chocolate milk, tortilla chips, and cereals were considered. In the ingestion of cariostatic foods, simple milk, natural fruit juices, fruit, yogurt, bread, water, soup, fish, meat, and vegetables were considered. The variable “Knowledge about oral health” was obtained by answering questions about correct hygiene habits, dental caries, and bacterial plaque. If the participants answered correctly to more than half of the questions, they were

considered to have knowledge of oral health. The questionnaire was constructed based on the recommendations for oral health of the WHO and the Direção Geral da Saúde of Portugal and the results of previous research studies [17-20]. Prior to obtaining the final version of this instrument, it was analyzed by a group of experts in the field (composed by a nurse, an oral hygienist, and a dentist), and a pre-test was carried out on three children chosen at random in another educational setting, not considering the children who would be part of this study. After these two processes, some changes suggested or found in the pre-test were made.

Ethical considerations

Prior to the application of the questionnaire, free and informed consent was requested from the parents of the children or another adult legally responsible for the children. A letter provided information about the main objectives of the study, and they could then give their consent in writing. Ethical measures such as respect for autonomy, beneficence, self-determination, non-maleficence, and justice were adhered to.

Data analysis

In the analysis of the data, the software Statistical Package for the Social Sciences (SPSS) version 23.0 was used. For categorical variables, the corresponding prevalence expressed in absolute and relative values was calculated. The chi-square test (when the assumption of not more than 20% of the expected cells with a value less than 5 is verified) or Fisher's exact test (otherwise) was used in the analysis of the association between two categorical variables. Statistical tests were performed considering a significance level of 5%.

Results

Table 1 shows the sociodemographic and clinical characteristics of the sample under study. Regarding sociodemographic characteristics, this sample consists mainly of female children (55.7%), with a predominance of children between 7 and 8 years of age (44.7%), with the most represented group being children who attend the fourth year of schooling (31.9%). Regarding clinical characteristics, most children reported not having decayed teeth (51.5%), and a high number already had treated teeth (47.4%). It should be noted that 35.2% of children did not know if their teeth were treated. In terms of the relationship between these sociodemographic and clinical variables and the variable "Knowledge about oral health", shown in Table 1, we verified that there is no significant dependency relationship with the gender variable, indicating a relatively homogeneous sample. On the other hand, the relationship is statistically significant with the categorized age (5–6 years; 7–8 years; ≥ 9 years) and with the school year (first, second, third, fourth), pointing out that children of older age (7–8 years [34.0%] and ≥ 9 years [32.3%]) and with a higher level of education (fourth year [28.9%]) have more knowledge about oral health. Regarding clinical variables, no significant values were found in relation to knowledge about oral health (Table 1). For oral hygiene behaviors, we found that most children brush their teeth "many times/always" after breakfast (58.7%), "rarely/sometimes" after lunch (45.9%), and "many times/always" at bedtime (75.5%). We also found that most children use fluoride toothpaste "many times/always". Regarding the use of dental floss, we found that most children never used it (66.2%). Finally, most children report that they have previously taken fluoride supplements (59.1%) (Table 2). Regarding the relationship between the variable "Knowledge about oral health" and the variables of the category "Oral hygiene", although the result

is not significant, we verify that there is a tendency for the frequency of daily brushing with the category "many times/always", with greater regularity in the population that has knowledge about oral health. The same is true for the variables "Use of fluoride toothpaste" (60.6%) and "Previous intake of fluoride supplements" (50.2%). Regarding the variable "Use of dental floss", it appears that most of the participants says that they never use it in their daily oral hygiene (18.9% in children without knowledge and 49.3% in children with knowledge). In the category "Oral health surveillance", most of the children had a previous dentistry consultation (91.5%). The majority also reported that they had this consultation in the last year (72.9%). Analyzing the relationship between the variable "Knowledge about oral health" and the variables of the category "Oral health surveillance", it appears that children with knowledge of oral health are those who have previously consulted with dentists (70.3%), with a dental appointment in the last year (64.2%), although there are no statistically significant associations ($p > 0.05$) (Table 2). Regarding the characterization of the eating habits of the children studied (Table 3), we can see that most participants report that they eat cariogenic foods once or twice a week or sporadically (47.1% and 39.5%, respectively). Regarding the consumption pattern, most children report that they eat them at mealtimes (96.2%) and in between these meals (83.8%). On the

Table 1: Sociodemographic and clinical characteristics of the sample under study and their relationship with knowledge about oral health (n=235).

Sociodemographic and clinical variables	Total		Knowledge about oral health				Statistical result
			Yes		No		
	N	%	N	%	N	%	
Gender							$\chi^2(1)=0.8$ p=0.38
Male	104	44	75	32	29	12	
Female	131	56	101	43	30	13	
Age (years)							$\chi^2(2)=35.1$ p<0.001
5–6	46	20	20	8.5	26	11	
7–8	105	45	80	34	25	11	
≥ 9	84	36	76	32	8	3.4	
School year							$\chi^2(3)=27.4$ p<0.001
1st	45	19	22	9.4	23	9.8	
2nd	57	24	40	17	17	7.2	
3rd	58	25	46	20	12	5.1	
4th	75	32	68	29	7	3	
Number of decayed teeth							$\chi^2(2)=0.3$ p=0.88
Do not have	120	52	95	48	25	13	
1 tooth	27	12	21	11	6	3	
2 or more teeth	50	22	41	21	9	4.6	
Do not know	36	16	-	-	-	-	
Number of treated teeth							$\chi^2(2)=3.4$ p=0.18
Do not have	37	17	33	24	4	2.9	
1 tooth	39	18	29	21	10	7.2	
2 or more teeth	62	29	53	38	9	6.5	
Do not know	75	35	-	-	-	-	

Table 2: Oral hygiene and oral health surveillance behaviors of the sample under study and their relationship with knowledge about oral health (n=235).

Oral hygiene and oral health surveillance variables	Total		Knowledge about oral health				Statistical result
			Yes		No		
	N	%	N	%	N	%	
Frequency of tooth brushing							
After breakfast							$\chi^2(2)=6.0$ p=0.05
Never	25	11	14	6.2	11	4.9	
Rarely / Sometimes	68	30	55	24	13	5.8	
Often / Always	132	59	99	44	33	15	
After lunch							$\chi^2(2)=4.5$ p=0.11
Never	69	33	49	23	20	9.6	
Rarely / Sometimes	96	46	78	37	18	8.6	
Often / Always	44	21	29	14	15	7.2	
At bedtime							$\chi^2(2)=4.6$ p=0.10
Never	9	3.9	4	1.7	5	2.1	
Rarely / Sometimes	48	21	37	16	11	4.7	
Often / Always	176	76	133	57	43	19	
Use of fluoride toothpaste							$\chi^2(2)=2.6$ p=0.28
Never	9	3.9	5	2.5	4	2	
Rarely / Sometimes	36	16	27	14	9	4.5	
Often / Always	153	67	120	61	33	17	
Do not know	32	14	-	-	-	-	
Use of dental floss							$\chi^2(2)=2.5$ p=0.29
Never	155	66	112	49	43	19	
Rarely / Sometimes	56	24	46	20	10	4.4	
Often / Always	16	6.8	13	5.7	3	1.3	
Do not know	7	3	-	-	-	-	
Previous intake of fluoride supplements							$\chi^2(1)=1.3$ p=0.26
Yes	137	59	105	50	32	15	
No	72	31	60	29	12	5.7	
Do not know	23	9.9	-	-	-	-	
Prior dentistry consultation							$\chi^2(1)=2.0$ p=0.16
Yes	214	92	163	70	51	22	
No	18	7.6	11	4.7	7	3	
Do not know	2	0.9	-	-	-	-	
Dentistry consultation in the last year							$\chi^2(1)=0.2$ p=0.69
Yes	164	73	129	64	35	17	
No	37	16	28	14	9	4.5	
Do not know	24	11	-	-	-	-	

Table 3: Eating habits of the sample and their relationship with knowledge about oral health (n=235).

Eating habits	Total		Knowledge about oral health				Statistical result
			Yes		No		
	N	%	N	%	N	%	
Ingestion of cariogenic foods							
Frequency							$\chi^2(2)=6.6$ p=0.04
Every day	30	14	21	9.4	9	4	
Once or twice a week	105	47	72	32	33	15	
Sporadically	88	40	74	33	14	6.3	
Never	0	0	0	0	0	0	
Consumption pattern							$\chi^2(1)=1.9$ p=0.17
At meals							
Yes	226	96	171	73	55	23	
Do not eat	9	3.8	5	2.1	4	1.7	
Between meals							
Yes	197	84	148	63	49	21	
Do not eat	38	16	28	12	10	4.3	
At bedtime							$\chi^2(1)=3.8$ p=0.05
Yes	67	29	56	24	11	4.7	
Do not eat	168	72	120	51	48	20	
Ingestion of cariostatic foods							
Consumption pattern							$\chi^2(1)=0.0$ p=0.84
At meals							
Yes	226	96	169	72	57	24	
Do not eat	9	3.8	7	3	2	0.9	
Between meals							
Yes	211	90	158	67	53	23	
Do not eat	24	10	18	7.7	6	2.6	
At bedtime							$\chi^2(1)=0.6$ p=0.43
Yes	102	43	79	34	23	9.8	
Do not eat	133	57	97	41	36	15	

contrary, most children report that they do not eat cariogenic foods before going to sleep (71.5%). For the ingestion of cariostatic foods,

we found that 96.2% of children eat this type of food at meals, 89.8% eat it between meals, and 43.4% eat it before going to sleep.

Table 4: Analysis of the variables under study by gender and age and their association.

Variables	Gender				Statistical result	Age (years)						Statistical result
	Male		Female			5-6		7-8		≥ 9		
	N	%	N	%		N	%	N	%	N	%	
Clinical characteristics												
Number of decayed teeth												
Do not have	49	57	69	63	$\chi^2 (2)=1.0$ p=0.60	21	57	52	61	45	63	$\chi^2 (4)=1.9$ p=0.76
1 tooth	12	14	15	14		6	16	14	16	7	9.7	
2 or more teeth	25	29	25	23		10	27	20	23	20	28	
Number of treated teeth												
Do not have	14	24	23	30	$\chi^2 (2)=4.7$ p=0.10	7	28	19	28	11	26	$\chi^2 (4)=2.2$ p=0.70
1 tooth	12	20	25	33		9	36	19	28	9	21	
2 or more teeth	33	56	29	38		9	36	31	45	22	52	
Oral hygiene												
Frequency of tooth brushing												
After breakfast					$\chi^2 (2)=0.2$ p=0.90							$\chi^2 (4)=2.9$ p=0.58
Never	11	11	14	11		8	18	10	10	7	8.5	
Rarely / Sometimes	31	32	37	29		14	31	29	30	25	31	
Often / Always	56	57	75	60	23	51	58	60	50	61		
After lunch					$\chi^2 (2)=6.9$ p=0.03							$\chi^2 (4)=6.8$ p=0.15
Never	36	40	33	28		9	23	37	41	23	30	
Rarely / Sometimes	42	47	53	45		18	46	36	40	41	53	
Often / Always	12	13	32	27	12	31	18	20	14	18		
At bedtime					$\chi^2 (2)=2.3$ p=0.32							Fisher=11.4 p=0.02
Never	6	5.8	3	2.3		4	8.7	1	1	4	4.8	
Rarely / Sometimes	23	22	25	20		4	8.7	28	28	16	19	
Often / Always	74	72	100	78	38	83	73	72	63	76		
Use of fluoride toothpaste					$\chi^2 (2)=2.3$ p=0.31							Fisher=8.6 p=0.06
Never	2	2.4	7	6.3		5	14	3	3.4	1	1.4	
Rarely / Sometimes	18	21	18	16		5	14	14	16	17	24	
Often / Always	64	76	87	78	26	72	71	81	54	75		
Use of dental floss					$\chi^2 (2)=1.6$ p=0.45							$\chi^2 (4)=4.8$ p=0.31
Never	69	68	85	69		33	75	71	72	50	61	
Rarely / Sometimes	27	27	28	23		7	16	22	22	26	32	
Often / Always	5	5	11	8.9	4	9.1	6	6.1	6	7.3		
Previous intake of fluoride supplements					$\chi^2 (1)=0.9$ p=0.36							$\chi^2 (2)=4.4$ p=0.11
Yes	66	70	71	63		21	53	64	71	52	68	
No	29	31	41	37	19	48	26	29	25	33		
Oral health surveillance												
Prior dentistry consultation					$\chi^2 (1)=4.3$ p=0.04							$\chi^2 (2)=7.1$ p=0.03
Yes	88	88	124	95		38	84	95	91	79	98	
No	12	12	6	4.6	7	16	9	8.7	2	2.5		
Dentistry consultation in the last year					$\chi^2 (1)=0.7$ p=0.40							$\chi^2 (2)=4.8$ p=0.09
Yes	67	79	96	84		30	79	67	76	66	89	
No	18	21	19	17	8	21	21	24	8	11		
Eating habits												
Ingestion of cariogenic foods					$\chi^2 (2)=2.6$ p=0.28							$\chi^2 (4)=14.1$ p=0.01
Frequency												
Every day	17	18	13	10		11	26	10	10	9	11	
Once or twice a week	44	46	60	48		24	57	45	45	35	44	
Sporadically	35	37	52	42	7	17	45	45	35	44		
Never	0	0	0	0	0	0	0	0	0	0		
Consumption pattern					$\chi^2 (1)=0.5$ p=0.47							Fisher=6.4 p=0.03
At meals												
Yes	97	95	127	97	44	96	96	93	84	100		
Do not eat	5	4.9	4	3.1	2	4.3	7	6.8	0	0		
Between meals					$\chi^2 (1)=0.7$ p=0.40							$\chi^2 (2)=1.9$ p=0.39
Yes	83	81	112	86		37	80	84	82	74	88	
Do not eat	19	19	19	15	9	20	19	18	10	12		
At bedtime					$\chi^2 (1)=0.2$ p=0.70							$\chi^2 (2)=1.4$ p=0.49
Yes	28	28	39	30		10	22	32	31	25	30	
Do not eat	74	73	92	70	36	78	71	69	59	70		
Ingestion of cariostatic foods					$\chi^2 (1)=0.5$ p=0.47							$\chi^2 (2)=0.05$ p=0.98
Consumption pattern												
At meals												
Yes	97	95	127	97	44	96	99	96	81	96		
Do not eat	5	4.9	4	3.1	2	4.3	4	3.9	3	3.6		
Between meals					$\chi^2 (1)=2.3$ p=0.13							$\chi^2 (2)=7.2$ p=0.03
Yes	88	86	121	92		41	89	87	85	81	96	
Do not eat	14	14	10	7.6	5	11	16	16	3	3.6		
At bedtime					$\chi^2 (1)=5.3$ p=0.02							$\chi^2 (2)=3.1$ p=0.21
Yes	36	35	66	50		17	37	42	41	43	51	
Do not eat	66	65	65	50	29	63	61	59	41	49		

Regarding the relationship between the variable "Knowledge about oral health" and the variables of the category "Eating habits", it appears that children with knowledge of oral health report that the ingestion of cariogenic foods is sporadic (33.2%) and once or twice a week (32.3%), with a statistically significant association ($p = 0.04$). Regarding the consumption pattern, it appears that 51.1% of children with knowledge of oral health do not eat these foods at bedtime; however, 63.0% refer to eating them between meals and 72.8% at meals. In these cases, there were no statistically significant associations ($p > 0.05$). In relation to the ingestion of cariostatic foods and the consumption pattern, we found that 71.9% of children with knowledge of oral health refer to eating them with meals, 67.2% between meals, and 33.6% at bedtime, with no statistically significant associations ($p > 0.05$) (Table 3). Table 4 shows the characterization of the target population's behaviors in relation to gender and age. It appears that the variables do not present significant dependency relationships, indicating a relatively homogeneous sample; however, some exceptions were noted. The variable "Frequency of tooth brushing" shows that most children brush their teeth at least twice a day, after breakfast (57.1% in males and 59.5% in females) and before bedtime (71.8% in males and 78.1% in females). It is also found that boys have higher values in the category "I never brush my teeth after lunch" (40.0%), while girls have higher values in the category "often/always brush my teeth" after lunch (27.1%), with a statistically significant association ($p=0.03$). Regarding the age variable, the group of children 5–6 years old had the highest percentage of participants who reported brushing their teeth "often/always" at bedtime (82.6%); however, it was also the group that most mentioned "never" brushing their teeth at bedtime (8.7%). There was a statistically significant association ($p=0.02$) between these variables. It is found that regarding the use of dental floss, most children have higher values in the category "never" (greater than 68.0% in both genders). There is an increase in the frequency of flossing between the age group 7–8 years (6.1%) for the age group ≥ 9 years (7.3%), despite not being statistically significant. For oral health surveillance and gender, we verify that there is a statistically significant association ($p=0.04$) between the previous consultation of dental medicine and gender as well as with age groups ($p=0.03$). Analyzing these variables, we found that girls (95.4%) and the age group ≥ 9 (97.5%) most report having undergone this consultation. Regarding the ingestion of cariogenic foods, there is a statistically significant association between the frequency of consumption and the age groups ($p=0.01$), specifically the 5–6-year-old group (57.1%), with consumption of these foods once or twice a week. Analyzing the consumption pattern, we verify that it occurs mostly at meals and in the age group ≥ 9 years (100.0%), with a statistically significant relationship between these variables ($p=0.03$). It should be noted that most children do not eat this type of food before bedtime, with 72.5% for males and 70.2% for females. In terms of the ingestion of cariostatic foods, the consumption pattern occurs mainly at meals and at mealtimes, with a statistically significant association between consumption pattern at mealtimes and all age groups ($p=0.03$). It should be noted that boys show lower values in the consumption of cariostatic foods before bedtime (35.3%) compared to girls (50.4%), with a statistically significant association ($p=0.02$) (Table 4).

Discussion

In this study, we confirmed that the knowledge of children/adolescents influences their behavior in the context of oral health. There is evidence that supports the fact that proper oral health

knowledge leads to better oral care practices [1-4]. Assessment of knowledge, perceptions, and habits of a population is essential for the adequate understanding of the oral healthcare needs of society [5]. We found that children who are older and have a higher level of education have more knowledge about oral health. This result is identical to a previous study conducted to evaluate and compare the factors related to oral health status in two age groups of schoolchildren [6]. In that study, the older children had better knowledge of oral health, but the oral hygiene practices were not followed effectively. According to the authors of the study, the thinking process of older children is more scientific and systematic than younger children, and they also have the mental cognition to understand and reply to the questions on oral health. Children with more knowledge about oral health, although not significant, brush their teeth daily after breakfast and at bedtime often/always, in addition to using fluoride toothpaste and previously taking fluoride supplements (fluoridated mouthwash). Similar results were found in previous studies [7], because most of the children report brushing their teeth twice a day with a fluoride paste, without mentioning whether they are the ones who have more knowledge of oral health. Our results are also in agreement with another study that found that the prevalence of tooth brushing (twice a day or more) was 90.6% [8]. Regarding the differences between genders, we found that female children brush their teeth more often than male children. These results are in agreement with other studies conducted in the Portuguese population [9-11]. Regarding the use of dental floss, most children with and without knowledge of oral health reported that they never use it in their oral hygiene. These results are in concordance with a study with Portuguese children, most likely because the effects of flossing are little known in relation to the prevention of dental caries [12]. In another study also conducted in Portugal, only 5.8% of adolescents reported daily flossing, more frequently among females (female, $OR=2.03$ 95% $CI=1.35-3.05$) and adolescents older than 15 years (>15 years, $OR=1.90$ 95% $CI=1.24-2.92$) [13]. It is extremely important that from an early age children acquire correct knowledge and habits of oral hygiene, especially about brushing their teeth at least twice a day, after meals and before bedtime. Brushing should be performed with fluoridated toothpaste, since its use, together with the brush fibers, prevents and controls bacterial plaque [14]. In addition to brushing the teeth, the gums and tongue should also be brushed. As an adjunct to tooth brushing, it is essential to teach and instruct children in the daily use of dental floss, as well as regular visits to the dentist to treat oral diseases as soon as possible and to apply primary prevention measures [15]. In oral health surveillance, prior consultation with dental medicine was undertaken mainly by children with knowledge of oral health, and the reason for this is routine consultation, followed by treatment of dental caries; this is verified in prior studies [16-18], in which the main reason for visits to the dentist was to monitor oral health. It should also be noted that most children in the last year had an appointment with a dentist, proving to be extremely positive. In another study, conducted among Portuguese adolescents, 67.0% of participants had at least one dental appointment in the previous 12 months. The prevalence of dental appointments was associated with socio-economic variables such as the father's professional situation (unemployed, $OR=0.33$ 95% $CI=0.17-0.65$) and crowding index (>1 , $OR=0.4$ 95% $CI=0.16-0.98$) [19]. In another study conducted in Portugal to assess the oral health status of Portuguese schoolchildren aged 6 and 12 years according to gender and urbanization and to analyze the effect of dental care habits on caries experience, the authors found that dental visits were a significant independent variable for dental caries [19]. Therefore, visiting a dentist regularly, such as once

every six months for a check-up, is mandatory for schoolchildren to detect caries early and to adopt preventive treatment to stop the progress of caries [20]. Even in children with knowledge of oral health, the ingestion of cariogenic foods happens sporadically and once or twice a week. Similar results were reported in another study, in which sweets are consumed once, twice, or three times a week by most children [21]. Regarding the pattern of consumption, children with knowledge of oral health report not ingesting cariogenic foods at bedtime, but a significant percentage refers to their ingestion, either between meals or with meals. Studies point out that high frequencies of consumption of cariogenic foods can be considered worrying, given that, for the prevention of dental caries at these ages, the consumption of this type of food should be avoided, especially between meals and before bedtime [22]. Frequency of consumption of sweetened/fast food was a significant factor associated with caries and quality of life [23]. Therefore, investment should be made in the education of children for the restriction or adequate consumption of cariogenic foods. Good oral health in childhood has effective gains for the rest of life, with an evident increase in health in general. In a study carried out in Portuguese participants aged over 15 years [24-28], it was found that 70.3% of the participants had lost permanent teeth and 6.4% were edentulous. The loss of permanent teeth was statistically associated with poor oral hygiene habits ($P < 0.01$). Moreover, 50.1% of the participants had experienced difficulty in eating and/or drinking, 18.0% had felt ashamed of the appearance of their teeth, and 69.3% had experienced toothache or gingival pain. These results show that it is necessary to make efforts to promote good oral hygiene habits among children from an early age so that they become adults with adequate behaviors in oral health. It is essential that programs/projects in oral health are developed and implemented preferably from pre-school education to improve the knowledge and behaviors of oral health of children, who will be the adults of tomorrow, and consequently reduce the risk level of oral diseases. It is essential that parents/guardians are involved to be able to acquire the necessary information about appropriate oral health habits, serving as role models, and in this way to be able to transmit this knowledge to their children.

Limitations

This study is limited to one school cluster of one municipality and district of the Central Region of Portugal. As such, the data may not represent the perception of children in other geographic areas of Portugal. We also detect difficulty in filling out the questionnaires by first-year students. Another limitation is related to timely response from parents/guardians to the request for free and informed consent. The sample consists of children with very different socioeconomic conditions, which may have influenced the knowledge and behavior adopted. It was not possible to study this variable due to difficulty in accessing information.

Conclusions

We conclude that children with knowledge of oral health have a lower number of decayed teeth and a greater number of treated teeth; have better oral hygiene behaviors (they brush their teeth often/always and with a greater daily frequency, use fluoride toothpaste often/always, and have previously taken fluoride supplements); regularly carry out oral health surveillance (with prior consultation with dental medicine); and have correct eating habits (they eat cariogenic food once or twice a week or sporadically; when they eat it they do it at meals or during their interval, and they eat cariostatic foods mainly at or between meals). The school is the ideal place to learn

and work, constituting a privileged place for the promotion of oral health. Oral diseases can decrease with the significant improvement of oral hygiene and knowledge, and projects in oral health should be developed to make responsible and improve the knowledge and behavior of children/adolescents, while involving parents/guardians, thus contributing to the empowerment of the population in the scope of oral health.

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