Original Article

Dicle Dent J. 2024;25(4):102-110.

Evaluation of parents' attitudes and behaviors towards products and practices containing fluoride

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Cite this article as: Durmaz Ç, Ayna B, Polat Y. Evaluation of parents' attitudes and behaviors towards products and practices containing fluoride. *Dicle Dent J*. 2024;25(4):102-110.

Received: 15/10/2024 • **Accepted**: 26/11/2024 • **Published**: 30/12/2024

ABSTRACT

Aims: The aim of this study was to evaluate parents' attitudes and behaviors about fluoride-containing products and practices.

Methods: The study was conducted between April 2023 and February 2024. Parents of children who applied to Dicle University Faculty of Dentistry, Department of Pediatric Dentistry voluntarily participated in the study and a total of 350 parents participated. A face-to-face questionnaire consisting of 2 sections and a total of 26 questions was administered to the parents.

Results: Among the parents who participated in our study, 56.86% stated that they had never heard of fluoride before. Those who had heard of fluoride stated that they had heard about it from school screenings and dentists. 16.86% of the parents stated that fluoride is harmful, but 68% of them did not have any information about it. 78.8% of the parents stated that they did not know the effect of brushing teeth with fluoride toothpaste on the prevention of dental caries and 76.57% stated that they did not look at the fluoride content when choosing toothpaste. 84% of the parents stated that they did not know the fluoride applications made by the physician and 74.57% stated that they would not have their children do it. The vast majority of those who would not have their children fluoridated (73.95%) stated that they would not do so because they did not have information about fluoride. We found that 92% of the parents did not know systemic fluoride applications, 90% did not know whether the drinking water they used contained fluoride, and 93.43% did not know whether fluoride in drinking water helps prevent dental caries formation.

Conclusion: Considering the high caries risk and oral hygiene deficiencies in our country, the need to use fluoride in dental treatments is increasing. Therefore, the public's lack of knowledge and concerns about fluoride should be addressed and the use of preventive treatments such as fluoride should be increased.

Keywords: Child, dental treatment, parent, fluoride, caries

INTRODUCTION

Oral and dental health is extremely important for healthy growth of the child. Dental caries is one of the main factors that impair oral health.[1] In order to prevent this situation and to ensure good oral hygiene, preventive oral and dental health practices should be started in the early period, including the first years of infancy. Parents' attitudes are very important in terms of providing their children with preventive oral dental health habits at an early age. Therefore, informing parents, who constitute the main target group, about preventive practices will be effective in preventing possible caries in children.[2,3]

Fluoride is one of the most frequently preferred agents among preventive applications in our country and in the world. Fluoride is used by dentists both as a therapeutic and prophylactic agent. Fluoride has topical and systemic applications. When the protective effect of fluoride is evaluated, it is known that topical applications made after the eruption of teeth provide more benefit compared to systemic applications.[4] Fluoride applications, which have therapeutic effect at the right dose in both topical and systemic use, may cause dental and skeletal fluorosis cases in overdose. Dentists should have a detailed knowledge of human metabolism and the toxic aspects of the organism in order to avoid the undesirable effects of fluoride in the short and long term. However, recent studies have shown that there is a prejudice against topical fluoride products and fluoride toothpastes.[5]

The goal of the World Health Organization (WHO) and the World Dental Association (FDI) is to achieve a DMFT (D: caries M: missing F: filled T: total) index below 1 in children. In the report of the last study conducted in Turkiye, DMFT values of 3.64±4.04 in the 5-year age group, 1.57±2.16 in the 12-year age group and 2.72±2.96 in the 15-year age group were reported, and these figures are above the WHO

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targets.[6] Considering the high DMFT rate in our country, it is important for dentists to raise awareness by informing parents about fluoride and to use fluoride at the right time, in the right indication and at the appropriate dose.

In this study, we aimed to evaluate the attitudes and behaviors of parents about fluoride-containing products and applications.

METHODS

The study was carried out with the permission of the Dicle University Faculty of Dentistry Ethics Committee (Date: 29.03.2023, Decision No: 2023-15). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This study is a descriptive study conducted to evaluate the attitudes and behaviors of parents about fluoride-containing products and practices. The population of this study consisted of parents of children who applied to Dicle University Faculty of Dentistry, Department of Pediatric Dentistry, who volunteered to participate in the study. The sample size of the study was targeted with at least 321 observations in total. A total of 350 parents participated in this study.

In local theses dealing with similar topics, the Council of Higher Education Documentation Center was used, while the EBSCOHOST database was used in international studies. As a data collection tool, a questionnaire was created with validated questions used in previous local and international studies. The questionnaire form, which was modified from similar studies in the literature, consists of 2 parts. The first part of the questionnaire consists of 4 personal information questions. In the second part, there are 22 questions evaluating the behaviors and attitudes of parents. In total, there are 26 questions in the questionnaire.

The data obtained in this study were analyzed with the licensed IBM SPSS V.21 package program. Frequency distribution tables for the variables were evaluated. Chi-square analysis was applied when examining the relationships between groups of nominal variables. In 2x2 tables, Fisher's exact test was used in cases where the expected values in the cells did not have sufficient volume, and in RxC tables, Pearson Chi-square analysis was applied with the help of Monte Carlo Simulation. When interpreting the results, 0.05 was used as the significance level and it was stated that there was a statistically significant relationship in case of $p<0.05$ and there was no statistically significant relationship in case of $p>0.05$.

RESULTS

The frequency distribution table for the personal information of the parents is shown in Table 1, and the frequency distribution table for their attitudes and behaviors is shown in Table 2.

Table 3 shows the results of the analysis of the relationship between the degree of closeness and parental attitudes and behaviors; Table 4 shows the results of the analysis of the relationship between educational status and parental attitudes and behaviors.

Table 1. Frequency distribution table for parents' personal information

		n	%
Degree of closeness	Mother	184	52.57
	Father	166	47.43
Education status	Primary education	172	49.14
	High school	69	19.71
	University	109	31.14
Number of children	1	27	7.71
	2	79	22.57
	3	107	30.57
	>3	137	39.14
Age of the child attending the clinic	0-3 years	21	6
	4-6 years	61	17.43
	7-12 years	180	51.43
	>12 years	88	25.14
Total		350	100

Of the parents who participated in our study;

- 56.86% had never heard anything about fluoride before,
- 68% do not know whether fluoride is harmful,
- 74.57% do not know whether the toothpaste they use contains fluoride or not,
- 76.57% did not consciously check whether toothpaste contains fluoride or not,
- 78.86% did not know the effect of brushing teeth with fluoride toothpaste on the prevention of dental caries,
- 84% did not know the topical fluoride applications applied by the physician,
- 74.57% would not have topical fluoride application by a dentist and 73.95% of those who would not have topical fluoride application would not have it because they did not have information about fluoride,
- 82.86% did not know the effect of topical fluoride applications applied by the physician on the prevention of dental caries,
- 92% did not know systemic fluoride applications,
- 90% do not know whether the drinking water they use contains fluoride,
- 93.43% stated that they did not know whether fluoride in drinking water helps prevent tooth decay.

DISCUSSION

Despite being a largely preventable condition, dental caries is a major public health problem, especially in children, and according to WHO, it affects 60% to 90% of school-age children. Considered together with economic and social conditions, prevention of dental caries is an imperative. Avoiding preventive treatments has consequences at the individual and societal level. Even today, parents may exhibit behaviors such as delaying vaccination, refusing certain vaccines or refusing

Table 2. Frequency distribution table for parents' attitudes and behaviors

		n	%
Is information about oral and dental health adequately communicated in our country?	Yes	124	35.43
	No	226	64.57
What are your ways of accessing information on oral and dental health?	Television	101	28.86
	Internet	142	40.57
	Newspaper	20	5.71
	Dentist	216	61.71
	Social environment	117	33.43
Information read and heard about oral and dental health	I don't believe it	125	35.71
	I am skeptical	89	25.43
	I question its veracity	136	38.86
Can tooth decay be prevented?	Yes	255	72.86
	No	69	19.71
	I don't know	26	7.43
Is brushing teeth effective in preventing tooth decay?	Yes	273	78
	No	59	16.86
	I don't know	18	5.14
When did you start brushing your child's teeth?	As soon as the first tooth erupts	19	5.43
	After driving a few teeth	76	21.71
	After driving all the teeth	240	68.57
	Not brushing	15	4.29
How often does your child brush their teeth?	2 times a day and more	139	39.71
	1 time a day	145	41.43
	1 time a week	48	13.71
	Nothing	18	5.14
Do you use toothpaste when brushing your child's teeth?	Yes	324	92.57
	No	26	7.43
Have you heard anything about fluoride before?	Yes	151	43.14
	No	199	56.86
If yes, where did you hear about it?	Television	13	8.61
	Internet	25	16.56
	Friends/relatives	7	4.64
	Oral health brochures	9	5.96
	From the dentist	49	32.45
	My child's school screening	42	27.81
	Other	6	3.97
Is fluoride harmful?	Yes	59	16.86
	No	53	15.14
	I don't know	238	68
What do you look for when choosing toothpaste for your child?	I don't pay attention to anything	70	21.60
	Price	87	26.85
	Taste	100	30.86
	Advertisement	115	35.49
	Box design and color	47	14.51
	Dentist's recommendation	79	24.38
	Suggestions from friends and acquaintances	32	9.88
	Contents	127	39.20
If your child uses toothpaste, does it contain fluoride?	Yes	48	13.71
	No	41	11.71
	I don't know	261	74.57
When using toothpaste, do you consciously determine whether it contains fluoride or not?	Yes	82	23.43
	No	268	76.57
Is brushing with fluoride toothpaste effective in preventing tooth decay?	Yes	60	17.14
	No	14	4
	I don't know	276	78.86
Are you familiar with topical fluoride applications administered by a dentist?	Yes	56	16
	No	294	84
Would you have your child receive topical fluoride application by a dentist?	Yes	89	25.43
	No	261	74.57
If your answer is no; please tell us why?	Since I don't know about fluoride	193	73.95
	I have it done at school	27	10.34
	Children do not need fluoride	6	2.3
	Fluoride is harmful to general health	28	10.73
	Fluoride is a toxic agent	7	2.68
	Fluoride is harmful to teeth	0	0
Are topical fluoride applications applied by a dentist effective in preventing dental caries?	Yes	56	16
	No	4	1.14
	I don't know	290	82.86
Do you know systemic fluoride applications?	Yes	28	8
	No	322	92
Does the drinking water you use contain fluoride?	Yes	15	4.29
	No	20	5.71
	I don't know	315	90
Does fluoride in drinking water help prevent tooth decay?	Yes	18	5.14
	No	5	1.43
	I don't know	327	93.43
Total		350	100

*More than one answer option was selected

vaccination altogether.[7] Similarly, this attitude of parents is also observed against fluoride applications. In a study, 63% of the posts about fluoride on a social media platform were found to be anti-fluoride.[8] Considering that fluoride applications have an important place among current preventive treatments, this situation becomes alarming.[5]

Therefore, good communication with parents becomes a very important issue in order for the measures to be taken in children to be effective. Understanding the reasons of parents who hesitate or refuse to apply preventive measures is a critical step to increase the effectiveness of fluoride applications, which have an important place in preventive dentistry.

In a study evaluating the trust in news about oral and dental health in the media in our country, 80% of the participants stated that they thought that information about oral and dental health did not reach the public sufficiently and it was also reported that 60% of the participants questioned the accuracy of this information.[9] Similarly, in our study, it was learned that the majority of the participants (64.57%) thought that they were not sufficiently informed about oral and dental health and some of them (38.86%) questioned the accuracy of the information they read and heard about oral and dental health.

Fluoride is one of the trace elements important for human metabolism.[10] Fluorides in the form of compounds are used in dentistry to protect oral and dental health. Fluoride has been proven to prevent dental caries in both children and adults.[11] In a study conducted in Eskişehir, it was found that 74.3% of parents had heard about fluoride from school screenings or dentists. However, it was reported that they were not informed about the substances in which fluoride is found and the role of brushing with fluoride toothpaste in preventing dental caries.[12] On the contrary, it was found that the majority (56.86%) of the parents who participated in our study had not heard anything about fluoride before, and those who had heard something about fluoride usually heard it from dentists or school screenings. When the parents were evaluated separately, 60.87% of the mothers and 52.41% of the fathers stated that they had never heard anything about fluoride before; 34.72% of the mothers and 30.38% of the fathers stated that they had heard about fluoride from dentists. In a study in which it was reported that the education levels of the participants were primary school (13.5%), secondary school (13.1%), high school (35.4%) and university (37.8%) graduates, when the answers given to the question about having heard about fluoride before were analyzed, it was found that the fluoride knowledge levels of the participants with higher education levels were significantly higher and a significant relationship was found between oral and dental health habits and education levels.[13] In another study in which it was reported that 17.6% of the parents' education level was primary school, 19.7% was secondary school, 33.2% was high school and 29.5% was university, it was reported that the rate of those with primary school graduates who had no fluoride knowledge was higher than both high school and university graduates.[14] In our study, 81.98% of primary school graduates, 59.42% of high school graduates and 15.6% of university graduates had not heard anything about fluoride before, while 18.02% of primary

Table 3. Analysis results on the relationship between degree of closeness and parental attitudes and behaviors

		Degree of closeness							
		Mother		Father		Total		Chi-square test	
		n	%	n	%	n	%	Chi-square	p
Is information about oral and dental health adequately communicated in our country?	Yes	64	34.78	60	36.14	124	35.43	0.071	0.79
	No	120	65.22	106	63.86	226	64.57		
What are your ways of accessing information on oral and dental health?	Other routes	71	38.59	63	37.95	134	38.29	0.015	0.903
	Dentist	113	61.41	103	62.05	216	61.71		
Do you read and hear information about oral and dental health?	I don't believe it	68	36.96	57	34.34	125	35.71	6.456	0.04
	I am skeptical	55	29.89	34	20.48	89	25.43		
	I question its veracity	61	33.15	75	45.18	136	38.86		
Can tooth decay be prevented?	Yes	135	73.37	120	72.29	255	72.86	0.087	0.957
	No	36	19.57	33	19.88	69	19.71		
	I don't know	13	7.07	13	7.83	26	7.43		
Is brushing teeth effective in preventing tooth decay?	Yes	144	78.26	129	77.71	273	78	0.051	0.975
	No	31	16.85	28	16.87	59	16.86		
	I don't know	9	4.89	9	5.42	18	5.14		
When did you start brushing your child's teeth?	As soon as the first tooth erupts	15	8.15	4	2.41	19	5.43	8.667	0.034
	After driving a few teeth	45	24.46	31	18.67	76	21.71		
	After driving all the teeth	117	63.59	123	74.1	240	68.57		
	Not brushing	7	3.8	8	4.82	15	4.29		
How often does your child brush their teeth?	2 times a day and more	75	40.76	64	38.55	139	39.71	3.538	0.316
	1 time a day	69	37.5	76	45.78	145	41.43		
	1 time a week	30	16.3	18	10.84	48	13.71		
	Nothing	10	5.43	8	4.82	18	5.14		
Do you use toothpaste when brushing your child's teeth?	Yes	173	94.02	151	90.96	324	92.57	0.784	0.376
	No	11	5.98	15	9.04	26	7.43		
Have you heard anything about fluoride before?	Yes	72	39.13	79	47.59	151	43.14	2.546	0.111
	No	112	60.87	87	52.41	199	56.86		
If yes, where did you hear about it?	Television	5	6.94	8	10.13	13	8.61	*	0.03
	Internet	7	9.72	18	22.78	25	16.56		
	Friends/relatives	3	4.17	4	5.06	7	4.64		
	Oral health brochures	3	4.17	6	7.59	9	5.96		
	From the dentist	25	34.72	24	30.38	49	32.45		
	My child's school screening	28	38.89	14	17.72	42	27.81		
	Other	1	1.39	5	6.33	6	3.97		
Is fluoride harmful?	Yes	20	10.87	39	23.49	59	16.86	10.685	0.005
	No	27	14.67	26	15.66	53	15.14		
	I don't know	137	74.46	101	60.84	238	68		
What do you look for when choosing toothpaste for your child?	Other causes	105	60.69	92	60.93	197	60.8	0.002	0.966
	Contents	68	39.31	59	39.07	127	39.2		
If your child uses toothpaste, does it contain fluoride?	Yes	23	13.29	21	13.91	44	13.58	7.682	0.021
	No	12	6.94	25	16.56	37	11.42		
	I don't know	138	79.77	105	69.54	243	75		
When using toothpaste, do you consciously determine whether it contains fluoride or not?	Yes	32	18.5	42	27.81	74	22.84	3.972	0.046
	No	141	81.5	109	72.19	250	77.16		
Is brushing with fluoride toothpaste effective in preventing tooth decay?	Yes	31	16.85	29	17.47	60	17.14	0.602	0.74
	No	6	3.26	8	4.82	14	4		
	I don't know	147	79.89	129	77.71	276	78.86		
Are you familiar with topical fluoride applications administered by a dentist?	Yes	29	15.76	27	16.27	56	16	0.017	0.898
	No	155	84.24	139	83.73	294	84		
Would you have your child receive topical fluoride application by a dentist?	Yes	56	30.43	33	19.88	89	25.43	5.127	0.024
	No	128	69.57	133	80.12	261	74.57		
If your answer is no; please tell us why?	Since I don't know about fluoride	101	78.91	92	69.17	193	73.95	*	0.099
	I have it done at school	15	11.72	12	9.02	27	10.34		
	Children do not need fluoride	2	1.56	4	3.01	6	2.3		
	Fluoride is harmful to general health	8	6.25	20	15.04	28	10.73		
	Fluoride is a toxic agent	2	1.56	5	3.76	7	2.68		
Are topical fluoride applications applied by a physician effective in preventing tooth decay?	Yes	32	17.39	24	14.46	56	16	*	0.805
	No	2	1.09	2	1.2	4	1.14		
	I don't know	150	81.52	140	84.34	290	82.86		
Do you know systemic fluoride applications?	Yes	17	9.24	11	6.63	28	8	0.493	0.482
	No	167	90.76	155	93.37	322	92		
Does the drinking water used contain fluoride?	Yes	8	4.35	7	4.22	15	4.29	4.337	0.114
	No	6	3.26	14	8.43	20	5.71		
	I don't know	170	92.39	145	87.35	315	90		
Does fluoride in drinking water help prevent tooth decay?	Yes	12	6.52	6	3.61	18	5.14	*	0.486
	No	3	1.63	2	1.2	5	1.43		
	I don't know	169	91.85	158	95.18	327	93.43		
Total						350	100		

Table 4. Analysis results on the relationship between educational level and parental attitudes and behaviors

		Education status									
		Primary school		High school		University		Total		Chi-square test	
		n	%	n	%	n	%	n	%	Chi-square	p
Is information about oral and dental health adequately communicated in our country?	Yes	58	33.72	28	40.58	38	34.86	124	35.43	1.035	0.596
	No	114	66.28	41	59.42	71	65.14	226	64.57		
What are your ways of accessing information on oral and dental health?	Other routes	70	40.7	26	37.68	38	34.86	134	38.29	0.975	0.614
	Dentist	102	59.3	43	62.32	71	65.14	216	61.71		
Do you read and hear information about oral and dental health?	I don't believe it	65	37.79	30	43.48	30	27.52	125	35.71	9.354	0.053
	I am skeptical	49	28.49	15	21.74	25	22.94	89	25.43		
	I question its veracity	58	33.72	24	34.78	54	49.54	136	38.86		
Can tooth decay be prevented?	Yes	121	70.35	51	73.91	83	76.15	255	72.86	2.201	0.699
	No	39	22.67	13	18.84	17	15.6	69	19.71		
	I don't know	12	6.98	5	7.25	9	8.26	26	7.43		
Is brushing teeth effective in preventing tooth decay?	Yes	131	76.16	54	78.26	88	80.73	273	78	2.909	0.573
	No	34	19.77	11	15.94	14	12.84	59	16.86		
	I don't know	7	4.07	4	5.8	7	6.42	18	5.14		
When did you start brushing your child's teeth?	As soon as the first tooth erupts	2	1.16	1	1.45	16	14.68	19	5.43	*	0.001
	After driving a few teeth	24	13.95	14	20.29	38	34.86	76	21.71		
	After driving all the teeth	138	80.23	52	75.36	50	45.87	240	68.57		
	Not brushing	8	4.65	2	2.9	5	4.59	15	4.29		
How often does your child brush their teeth?	2 times a day and more	60	34.88	30	43.48	49	44.95	139	39.71	14.191	0.028
	1 time a day	67	38.95	28	40.58	50	45.87	145	41.43		
	1 time a week	33	19.19	9	13.04	6	5.5	48	13.71		
	Nothing	12	6.98	2	2.9	4	3.67	18	5.14		
Do you use toothpaste when brushing your child's teeth?	Yes	159	92.44	64	92.75	101	92.66	324	92.57	0.009	0.996
	No	13	7.56	5	7.25	8	7.34	26	7.43		
Have you heard anything about fluoride before?	Yes	31	18.02	28	40.58	92	84.4	151	43.14	120.079	0.001
	No	141	81.98	41	59.42	17	15.6	199	56.86		
If yes, where did you hear about it?	Television	3	9.68	4	14.29	6	6.52	13	8.61	*	0.057
	Internet	2	6.45	8	28.57	15	16.3	25	16.56		
	Friends/relatives	2	6.45	1	3.57	4	4.35	7	4.64		
	Oral health brochures	2	6.45	2	7.14	5	5.43	9	5.96		
	From the dentist	7	22.58	3	10.71	39	42.39	49	32.45		
	My child's school screening	13	41.94	10	35.71	19	20.65	42	27.81		
	Other	2	6.45	0	0	4	4.35	6	3.97		
Is fluoride harmful?	Yes	7	4.07	9	13.04	43	39.45	59	16.86	112.058	0.001
	No	10	5.81	10	14.49	33	30.28	53	15.14		
	I don't know	155	90.12	50	72.46	33	30.28	238	68		
What do you look for when choosing toothpaste for your child?	Other causes	116	72.96	32	50	49	48.51	197	60.8	19.386	0.001
	Contents	43	27.04	32	50	52	51.49	127	39.2		
If your child uses toothpaste, does it contain fluoride?	Yes	1	0.63	7	10.94	36	35.64	44	13.58	96.641	0.001
	No	8	5.03	6	9.38	23	22.77	37	11.42		
	I don't know	150	94.34	51	79.69	42	41.58	243	75		
	Total	159	100	64	100	101	100	324	100		
When using toothpaste, do you consciously determine whether it contains fluoride or not?	Yes	6	3.77	11	17.19	57	56.44	74	22.84	98.644	0.001
	No	153	96.23	53	82.81	44	43.56	250	77.16		
Is brushing with fluoride toothpaste effective in preventing tooth decay?	Yes	8	4.65	12	17.39	40	36.7	60	17.14	50.734	0.001
	No	6	3.49	2	2.9	6	5.5	14	4		
	I don't know	158	91.86	55	79.71	63	57.8	276	78.86		
Are you familiar with topical fluoride applications administered by a dentist?	Yes	9	5.23	8	11.59	39	35.78	56	16	47.564	0.001
	No	163	94.77	61	88.41	70	64.22	294	84		
Would you have your child receive topical fluoride application by a dentist?	Yes	41	23.84	13	18.84	35	32.11	89	25.43	4.375	0.112
	No	131	76.16	56	81.16	74	67.89	261	74.57		
If your answer is no, please tell me why?	Since I don't know about fluoride	117	89.31	42	75	34	45.95	193	73.95	*	0.001
	I have it done at school	8	6.11	8	14.29	11	14.86	27	10.34		
	Children do not need fluoride	1	0.76	1	1.79	4	5.41	6	2.3		
	Fluoride is harmful to general health	4	3.05	3	5.36	21	28.38	28	10.73		
	Fluoride is a toxic agent	1	0.76	2	3.57	4	5.41	7	2.68		
Are topical fluoride applications applied by a physician effective in preventing dental caries?	Yes	11	6.4	9	13.04	36	33.03	56	16	*	0.001
	No	1	0.58	1	1.45	2	1.83	4	1.14		
	I don't know	160	93.02	59	85.51	71	65.14	290	82.86		
Do you know systemic fluoride applications?	Yes	2	1.16	3	4.35	23	21.1	28	8	37.594	0.001
	No	170	98.84	66	95.65	86	78.9	322	92		
Does the drinking water you use contain fluoride?	Yes	2	1.16	1	1.45	12	11.01	15	4.29	*	0.001
	No	2	1.16	4	5.8	14	12.84	20	5.71		
	I don't know	168	97.67	64	92.75	83	76.15	315	90		
Does fluoride in drinking water help prevent tooth decay?	Yes	1	0.58	2	2.9	15	13.76	18	5.14	*	0.001
	No	1	0.58	2	2.9	2	1.83	5	1.43		
	I don't know	170	98.84	65	94.2	92	84.4	327	93.43		
Total								350	100		

school graduates, 40.58% of high school graduates and 84.4% of university graduates had heard something about fluoride before. In a study in which the responses to the question about the relationship between the source from which information about fluoride was obtained and the level of education were analyzed, it was reported that the rate of university graduate parents who obtained information from the internet was higher than that of primary school, middle school and high school graduates.[14] In our study, it was found that there was no statistically significant relationship between the source of fluoride information and educational status.

Although adverse health effects (e.g. decreased cognitive ability, endocrine disruption, cancer) have been attributed to fluoride use over the years, the majority of evidence from large cohort studies and systematic reviews does not support the association of such health problems.[15] Regarding cognitive ability, in a study on maternal urinary fluoride levels and children's IQ, a multicenter prospective cohort study that also used maternal urinary fluoride levels followed children born in Canada between 2008 and 2012. The study results showed that maternal exposure to high levels of fluoride was associated with lower IQ scores in boys and girls; however, it ignored confounding variables that did not adjust for differences in socioeconomic status or maternal IQ, and no IQ difference was found when the entire population was assessed.[16] A prospective study in New Zealand did not support an association between fluoridated water and IQ measurements. The available evidence does not support that consumption of water fluoridated at 0.7 ppm F is associated with a decrease in IQ.[17] In a study conducted in Iran, it was reported that more than 50% of the participants were not informed about the harmful effects of fluoride.[18] Similarly, when the harmfulness of fluoride was questioned to the parents who participated in our study, it was observed that 68% of the parents did not have any information. When the parents were evaluated separately, it was found that 74.46% of the mothers and 60.84% of the fathers did not know whether fluoride was harmful or not ($p<0.05$). In a study in which the educational status of the parents was evaluated, 24.2% were primary school graduates, 17.7% were middle school graduates, 33.9% were high school graduates, and 24.2% were university/graduate graduates, and the relationship between educational status and opinions about fluoride-containing toothpastes was evaluated, a statistically significant relationship was found and it was reported that the opinion that fluoride-containing toothpastes were toxic/harmful increased with increasing educational level.[19] In some other studies, it was reported that the opinion that fluoride is harmful increased with increasing education level.[19,20] Similarly, in our study, 4.07% of primary school graduates, 13.04% of high school graduates and 39.45% of university graduates stated that fluoride was harmful, while 5.81% of primary school graduates, 14.48% of high school graduates and 30.28% of university graduates stated that fluoride was not harmful, and a statistically significant relationship was found between the harmfulness of fluoride and educational level ($p<0.05$).

In a study by Liu et al.[21] on toothpaste selection, it was reported that parents mostly chose toothpaste according to the physician's recommendation and taste. Among the parents who participated in our study, 39.2% stated that they chose toothpaste based on its ingredients and 35.49% stated that they chose toothpaste based on advertisements. When the parents were evaluated separately, 39.31% of the mothers and 39.07% of the fathers stated that they looked at the ingredients when choosing toothpaste. In a previous study, when the answers to the question about toothpaste selection were analyzed, significant differences were observed according to the level of education, and it was reported that 50% of the participants paid attention to the ingredients when choosing toothpaste. This result was particularly influenced by individuals with postgraduate education, which constituted 60% of the participants. Participants with a lower level of education (52%) stated that they paid attention to cost when choosing toothpaste.[9] Similarly, in our study, 27.04% of primary school graduates, 50% of high school graduates and 51.49% of university graduates paid attention to toothpaste content, while 72.96% of primary school graduates, 50% of high school graduates and 48.51% of university graduates paid attention to other reasons. There is a statistically significant relationship between the level of education and the factors considered when choosing toothpaste for children and the results of our study are consistent with the data in the literature.

The most important method of maintaining oral hygiene is tooth brushing. The use of toothpastes containing fluoride is considered indispensable for daily oral care.[22] In a study by Suma Sogi et al.[23] approximately 35% of the parents stated that they preferred fluoride toothpaste. In our study, only 13.71% of the parents stated that they used fluoride toothpaste. When the parents were evaluated separately, 13.29% of the mothers and 13.91% of the fathers stated that they preferred fluoride toothpaste. This may be explained by the fact that 74.57% of the parents were not aware of the presence of fluoride in toothpaste. In our study, 0.63% of primary school graduates, 10.94% of high school graduates and 35.64% of university graduates stated that the toothpaste used contained fluoride, while 5.03% of primary school graduates, 9.38% of high school graduates and 22.77% of university graduates stated that the toothpaste used did not contain fluoride. There is a statistically significant relationship between the fluoride content of the toothpaste used and the level of education.

In a study conducted in Konya, it was reported that 33% made a conscious choice when asked whether they consciously chose toothpaste containing fluoride when choosing toothpaste.[24] In our study, the rate of parents consciously looking at the fluoride content when choosing toothpaste was found to be 23.43%. When the parents were evaluated separately, 18.5% of the mothers and 27.81% of the fathers stated that they consciously looked at the fluoride content when choosing toothpaste. This can be explained by the fact that 56.86% of our participants had not heard anything about fluoride. In another study, the relationship between education level and the use of fluoride-free toothpaste was found to be statistically significant, and it was reported that the rate of use of fluoride-free toothpaste increased in parents with undergraduate and higher education levels.[19] It has been observed that especially families with higher education levels prefer fluoride-free

toothpastes.[25] However, in our study, while 3.77% of primary school graduates, 17.19% of high school graduates and 56.44% of university graduates consciously determine whether toothpaste contains fluoride or not, 96.23% of primary school graduates, 82.81% of high school graduates and 43.56% of university graduates make an unconscious choice when using toothpaste. There is a statistically significant relationship between the consciousness of fluoride content when using toothpaste and educational status. The results of our study were found to be consistent with the data in the literature.

In a study conducted by Mani et al.[26] in Malaysia, the knowledge, attitudes and behaviors of parents about the prevention of early childhood caries were examined. In this study, it was reported that 85.3% of the parents believed that using fluoride toothpaste was important in preventing dental caries. In contrast, in our study, 78.86% of the parents answered that they did not know anything about this subject. When the parents were evaluated separately, 79.89% of the mothers and 77.71% of the fathers stated that they did not know whether brushing with fluoride toothpaste was effective in preventing dental caries. In a previous study, it was reported that the correct response rate increased significantly with increasing education level when the answers given to the questions of the parents about whether brushing the teeth with fluoride toothpaste was effective in preventing dental caries were analyzed.[12] In another study in which it was reported that 13.5% of the participants were primary school graduates, 13.1% were middle school graduates, 35.4% were high school graduates and 37.8% were university graduates, when the answers to the question whether fluoride was effective in preventing dental caries were analyzed, it was reported that the answers of the participants with higher education level were significantly higher and a significant relationship was found between oral and dental health habits and education level.[13] In a study by Hendaus et al.,[27] it was reported that there was no significant difference between the educational level of the family and the knowledge of the families about the protective properties of fluoride. In our study, it was found that 4.65% of primary school graduates, 17.39% of high school graduates and 36.7% of university graduates thought that brushing teeth with fluoride toothpaste was effective in preventing dental caries and 3.49% of primary school graduates, 2.9% of high school graduates and 5.5% of university graduates thought that brushing teeth with fluoride toothpaste was not effective in preventing dental caries. It was observed that there was a statistically significant relationship between the effectiveness of brushing teeth with fluoride toothpaste in the prevention of dental caries and the level of education. It is thought that these differences in education level may affect the results of the studies.

Professionally applied topical fluoride treatments are effective in reducing the prevalence of dental caries. The most commonly used agents for professionally applied fluoride treatments are 5% NaF varnish and APF gel. Meta-analyses of 23 clinical trials, most of which were conducted twice a year, support the use of fluoride varnish on primary and permanent teeth to prevent caries.[28] Fluoride varnish appears to be effective in preventing caries in high caries risk children younger than five years.[29] Unit doses of 5% fluoride varnish are the only professional topical fluoride agent recommended for children younger than six years for safety reasons.[28] In a questionnaire study, it was reported that the participants were asked whether they knew about topical fluoride applications and 87.9% of the participants stated that they did not know.[13] Similarly, 84% of the parents who participated in our study did not know topical fluoride applications. When the parents were evaluated separately, 84.24% of the mothers and 83.73% of the fathers stated that they did not know the topical fluoride applications applied by the physician. In a study in which it was reported that 13.5% of the participants were primary school graduates, 13.1% were middle school graduates, 35.4% were high school graduates and 37.8% were university graduates, it was reported that the fluoride knowledge levels of the participants with higher education level were significantly higher when the responses inquiring whether they knew topical fluoride applications were analyzed.[13] In our study, 5.23% of primary school graduates, 11.59% of high school graduates and 35.78% of university graduates knew the topical fluoride applications applied by the physician, while 94.77% of primary school graduates, 88.41% of high school graduates and 64.22% of university graduates did not know the topical fluoride applications applied by the physician and there was a statistically significant relationship between the knowledge of topical fluoride applications applied by the physician and the educational status. The results of our study were found to be consistent with the data in the literature.

According to a study conducted in Turkiye, 70.1% of the participating parents did not allow topical fluoride application by the dentist to their children and the reason for this was that they generally did not have information about fluoride.[12] Similarly, it was found that 74.57% of the parents who participated in our study did not allow topical fluoride application to their children and 73.95% of these people did not have information about fluoride. When the parents were evaluated separately, 69% of the mothers and 80.12% of the fathers stated that they would not allow their children to receive topical fluoride application by a dentist. 78.91% of the mothers and 69.17% of the fathers stated that they would not allow this application because they had no knowledge about fluoride. When the educational status was analyzed in our study, 76.16% of primary school graduates, 81.16% of high school graduates and 67.89% of university graduates did not give permission for topical fluoride application to their children; 89.31% of primary school graduates, 75% of high school graduates and 45.95% of university graduates stated that they did not have information about fluoride as the reason for this situation.

According to the study conducted by Petersen et al.,[30] 79% of the mothers of children attending primary schools in Romania and according to the study conducted by Suma Sogi et al.,[23] approximately 70% of the parents of children younger than 72 months stated that fluoride is important in preventing dental caries. In our study, the rate of parents who stated that topical fluoride applied by a physician prevents caries was 16% and 84% of the parents were not informed about this subject. When the parents were evaluated separately, 17.39%

of the mothers and 14.46% of the fathers stated that topical fluoride applications applied by the physician were effective in preventing dental caries. This may be explained by the participants' lack of knowledge about fluoride and low level of education. In our study, 93.02% of primary school graduates, 85.51% of high school graduates and 65.14% of university graduates stated that they did not know the effect of topical fluoride applications on the prevention of dental caries.

Systemic fluoride applications are performed as multivitamin-fluoride combinations, adding fluoride to salt, lozenge, drops, tablets or milk, and fluoridation of school or drinking water.[31] The most commonly used way of systemic fluoride administration is fluoridation of drinking water. Adding fluoride to drinking water is an economical and effective way to prevent caries. However, the amount of fluoride added should be adjusted depending on the fluoride levels of natural drinking and spring waters in the region, the amount of water consumed daily in the region and other fluoride protection programs implemented.[32] Since the 2015 standardization of optimal fluoride levels in drinking water to 0.7 ppm F, dental fluorosis has been occurring less frequently.[33] In a study, it was reported that 81.2% of the participants who were asked whether systemic fluoride applications were known did not know.[13] Similarly, 92% of the parents who participated in our study did not know systemic fluoride applications. When the parents were evaluated separately, 90.76% of the mothers and 93.37% of the fathers stated that they did not know systemic fluoride applications. When educational status was analyzed in our study, 98.84% of primary school graduates, 95.65% of high school graduates and 78.9% of university graduates stated that they did not know systemic fluoride applications.

In a study conducted in Eskişehir, it was reported that parents were asked whether their drinking water contained fluoride and 73.8% of the parents did not know.[12] Similarly, 90% of the parents who participated in our study stated that they did not know whether their drinking water contained fluoride. When the parents were evaluated separately, 92.39% of the mothers and 87.35% of the fathers stated that they did not know whether the drinking water used contained fluoride. When educational status was analyzed in our study, 97.67% of primary school graduates, 92.75% of high school graduates and 76.15% of university graduates reported that they did not know whether the drinking water they used contained fluoride.

In a study conducted in Australia in which the knowledge and attitudes of parents of 12-24-month-old children about oral and dental health were evaluated, it was reported that 51.3% of the parents believed that fluoride in drinking water was beneficial in preventing dental caries.[34] Only 5.14% of the parents who participated in our study reported that fluoride in drinking water was effective in preventing dental caries, and 93.43% reported that they had no knowledge on this subject. When the parents were evaluated separately, 91.85% of the mothers and 95.18% of the fathers stated that they did not know whether fluoride in drinking water helps prevent dental caries. The most important reason for this is thought to be the participants' lack of knowledge about fluoride. In a study, it was reported that the accuracy rate of the answers given to the questions inquiring the effect of fluoride in drinking water on the prevention of dental caries increased significantly with increasing educational level, but this rate decreased significantly at postgraduate education level.[12] In our study, 0.58% of primary school graduates, 2.9% of high school graduates and 13.76% of university graduates stated that fluoride in drinking water helps prevent dental caries, while 0.58% of primary school graduates, 2.9% of high school graduates and 1.83% of university graduates stated that fluoride in drinking water does not help prevent dental caries. It was observed that there was a statistically significant relationship between the status of fluoride in drinking water helping to prevent dental caries and educational status, and the results of our study were consistent with the data in the literature.

CONCLUSION

The results of our study show that parents do not have sufficient knowledge about fluoride and oral health and cannot make informed decisions. Necessary measures should be taken to increase the level of knowledge of parents and to enable them to make more informed decisions.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Dicle University Faculty of Dentistry Ethics Committee (Date: 29.03.2023, Decision No: 2023-15).

Informed Consent

Informed consent was obtained from all participants in the study.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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