Submitted: 04 July, 2023 Accepted: 24 August, 2023 Published: 03 March, 2024 DOI:10.22514/jocpd.2023.075

ORIGINAL RESEARCH

Journal of Clinical Pediatric Dentistry

Evaluation of pediatric dentists' knowledge and approaches to tooth discoloration

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Abstract

In recent years, esthetic expectations have come to the fore in pediatric dentistry, as in every field of dentistry. Therefore, to better meet patients' expectations, the steps taken to determine and improve the current level of knowledge of pediatric dentists on tooth discoloration gain importance. This study aims to measure the knowledge levels of pediatric dentists regarding tooth discoloration. A 33-questioned survey created online was emailed to pediatric dentists between March and December 2021. The first part included four multiple-choice and two open-ended questions regarding demographic characteristics. The second part was to measure the participants' knowledge of tooth discoloration. The last part was to evaluate the clinical approaches of the participants. Participants who agreed to answer all of the questions were included in the study (n = 129). The knowledge levels of the participants were scored according to the accuracy of their answers. The data were statistically analyzed using descriptive statistics and chi-square tests. Of the pediatric dentists who participated in this study, 16.3% had high knowledge, 79.8% had medium knowledge, and 3.9% had insufficient understanding of tooth discoloration. There was no correlation between time since dental school graduation and time spent practicing as a pediatric dentist ($p > 0.05$). The group with the highest average level of knowledge was the group most frequently encountered with tooth discoloration in the clinic ($p \leq 0.05$). On average, pediatric dentists had moderate knowledge of tooth discoloration. The group with the highest average expertise in this field was the group that most frequently encountered and treated tooth discoloration. Information on tooth discoloration due to systemic factors was insufficient. To increase the knowledge level of pediatric dentists about the causes and treatments of tooth discoloration, it may be beneficial to establish training programs during and after specialization education.

Keywords

Pediatric dentist; Knowledge; Questionnaire; Tooth discoloration

1. Introduction

Teeth play a vital role in facial aesthetics as well as in proper chewing and speaking [1]. Addressing aesthetic concerns during childhood and adolescence is crucial for healthy psychosocial development and peer interactions [2]. The increasing importance of appearance has led to a growing demand for tooth discoloration treatments [3]. However, determining the most effective solutions can be challenging for clinicians. Early intervention is important because of the adverse effects of tooth discoloration. Dentists must be well-versed in safe, up-to-date treatment options for young patients [2]. The natural color of teeth changes from white to yellowish cream and darkens physiologically with age, beginning in childhood. In addition, the color of teeth may vary due to the internal or external attachment of various pigments to dental tissues [4]. Various internal and external factors can cause tooth color variation, including external deposits, developmental influences and systemic conditions. External tooth discoloration is traditionally categorized as metallic or non-metallic [3]. Non-metallic discoloration occurs when deposits, such as plaque or pellicle, absorb coloring agents. Factors such as diet, oral hygiene, habits, mouthwashes and medications contribute to this type [4]. Meanwhile, metallic discolorations result from exposure to metal salts or the use of drugs containing them [5]. Intrinsic discolorations can manifest before or after tooth eruption, sometimes due to metabolic disorders [6]. Preeruptive discolorations can occur due to metabolic disorders (*e.g.*, congenital hyperbilirubinemia [7] and congenital erythropoietic porphyria [8], germ damages (*e.g.*, Turner's hypoplasia) [9], nutritional deficiencies [10], molar-incisor hypomineralization [11], genetic disorders (*e.g.*, amelogenesis imperfecta [12], dentinogenesis imperfecta and dentin dysplasia [13], and drugs (*e.g.*, tetracycline) [14]. After

the eruption, the discoloration can be caused by pulpal disease [15], abrasions [16], trauma [17], internal resorptions [18] and dental materials [19–21].

In addition to various bleaching methods, restorative and prosthetic approaches are preferred in tooth discoloration treatment [2]. Bleaching lightens tooth color by oxidizing pigments within enamel and dentin using agents, such as hydrogen peroxide, sodium perborate and carbamide peroxide. Microabrasion, involving the simultaneous application of pumice and 18% hydrochloric acid, is another technique [22, 23]. Cases that cannot be treated with conservative methods may require restorative and prosthetic approaches, such as the resin infiltration technique [24], composite restorations [2], porcelain veneers [25] or stainless steel crowns [26].

Enhancing patient outcomes relies on in-depth knowledge and skill in this crucial facet of aesthetic dentistry [27, 28]. There is scarcity of studies in the literature on the general view of tooth discoloration of pediatric dentists constitutes the original value of this study. Therefore, the present study aimed to measure the knowledge levels of pediatric dentists about the etiologies, clinical features and treatment of tooth discoloration. The null hypotheses postulated for this investigation are as follows: A statistically significant correlation cannot be established between the variables of age, gender, duration post-graduation, duration of specialization, and workplace characteristics among pediatric dentists and their levels of knowledge about tooth discoloration (1). There is no statistically significant relationship exists between the frequency of encountering tooth discoloration, the frequency of corresponding treatment, the predominant dentition type of cases, and the level of subject-specific knowledge among pediatric dentists (2).

2. Materials and methods

This cross-sectional survey study was conducted between March and December 2021, involving pediatric dentists working across Turkey. The study was conducted following STROBE guidelines (**Supplementary Table 1**) [29].

A power analysis (G-Power 3.1.9.7 Software, Dusseldorf, Germany) was performed to determine the appropriate sample size, indicating a minimum of 124 participants to achieve 95% power at an effect size of 0.4 and a 5% error rate. The study encompassed pediatric dentists from both private and public institutions in Turkey. Participants who voluntarily agreed to participate in this study were included.

The authors modified a previously used and validated questionnaire from a similar study to create a new questionnaire [30]. The survey was formulated utilizing the online platform (https://docs.google.com/forms). The internet link to the questionnaire was sent *via* e-mail to pediatric dentists working in public and private dental health institutions in Turkey. Before its dissemination, a pilot phase was undertaken involving a cohort of seasoned pediatric dentists. The principal objectives of this pilot were to ascertain the lucidity and comprehensibility of the questionnaire, to preempt potential ambiguities in responses, and to validate the inclusiveness of the response options. Moreover, attention was directed toward the incorporation of ample provisions for open-ended responses.

The questionnaire included three sections with a total of 32 questions (**Supplementary material**). The initial part included six questions focusing on participants' demographic characteristics. The second part had 14 questions assessing participants' knowledge levels about tooth discoloration and its treatment. The final section included 12 multiple-choice questions to ascertain participants' clinical approaches. The questionnaire was created online, with a link sent to pediatric dentists *via* email and social media. Eligibility criteria included pediatric dentists who agreed to participate and provided complete questionnaire responses.

Knowledge levels were evaluated based on the 14 questions in the second part, offering 180 answer options, with 70 being correct. Scores ranged from 0 to 70, indicating levels of knowledge: 70 points for complete knowledge, 47–70 for high knowledge, 24–46 for moderate knowledge, 0–23 for insufficient knowledge, and 0 for unawareness.

Statistical analysis was performed using the IBM Statistical Package for the Social Sciences 22 (IBM, Armonk, NY, USA) software. Descriptive statistics were utilized to evaluated data, and chi-square tests were used to analyze the relationships among age, sex and knowledge regarding tooth discoloration. Statistical significance was determined as $p < 0.05$ for all tests.

3. Results

In the initial phase of the study, analysis of responses to sociodemographic questions revealed that 88.4% of participating dentists were female, while 11.6% were male. The majority (65.4%) were within the age range of 23–30 years. Of all participants, 52.7% possessed >5 years of professional experience. Among the 51 participants with completed specialty education, 39.5% had <5 years of specialization experience. Notably, 70.5% of the participants were affiliated with state universities.

Table 1 illustrates the correlation between the sociodemographic characteristics of the surveyed pediatric dentists, their answers to the second part of the survey, and their knowledge level and scores. Regarding systemic factors linked to tooth discoloration, a majority of pediatric dentists identified erythropoietic porphyria (83.8%), hyperbilirubinemia (76.9%), erythroblastosis fetalis (74.6%), and tetracycline (96.2%), and minocycline (60%) use as causing discoloration. In the preeruptive period, tetracycline use (91.5%), amelogenesis imperfecta (85.4%), dentin dysplasia (82.3%), and dentinogenesis imperfecta (81.5%) were most often associated with discoloration. In the post-eruptive period, intracanal medicaments (93.8%) and dietary factors (92.3%) were cited as the leading causes of discoloration. For discoloration induced by anticaries topical agents, silver diamine fluoride (86.2%) and stannous fluoride (79.2%) were prominent responses.

Common causes of brown discoloration were identified as amelogenesis imperfecta (71.5%) and iron-containing products (44.6%). Copper-containing mouthwashes (33.1%) and chromogenic bacteria (30.8%) were linked to green discoloration. Yellow discoloration was linked to inadequate oral hygiene (62.3%) and amelogenesis imperfecta (58.5%), while chromogenic bacteria (39.2%) were associated with orange

TABLE 1. Demographic profile, working conditions and levels of knowledge among pediatric dentists.

	N (%)	Knowledge Level (%)			*p*	Knowledge Score	*p*
		Low	Moderate	High			
Gender							
Females	114 (88.4%)	4 (3.5%)	90 (78.9%)	20 (17.5%)	0.786	54.76 ± 11.29	0.467
Males	15 (11.6%)	1 (6.7%)	12 (80.0%)	2 (13.3%)		52.48 ± 11.79	
Age							
23–30	84 (65.1%)	2 (2.4%)	67 (79.8%)	15 (17.9%)	0.594	55.34 ± 11.27	0.471
31–40	38 (29.4%)	2 (5.3%)	30 (78.9%)	6 (15.8%)		53.35 ± 11.14	
>41	7 (5.4%)	1 (14.3%)	5 (71.4%)	1 (14.3%)		50.41 ± 11.32	
Time after graduation							
0–5 yr	61 (47.3%)	2 (3.3%)	49 (80.3%)	10 (16.4%)	0.841	54.33 ± 12.17	0.416
6–10 yr	39 (30.2%)	1 (20.0%)	30 (76.9%)	8 (20.5%)		56.96 ± 9.42	
>10 yr	29 (22.5%)	2 (6.9%)	23 (79.3%)	4 (13.8%)		51.49 ± 11.32	
Time of professional specialization experience							
Not completed specialty education	78 (60.5%)	2 (2.6%)	63 (80.8%)	13 (16.7%)	0.617	54.10 ± 12.25	0.573
0–5 yr	31 (24.0%)	1 (3.2%)	24 (77.4%)	6 (19.4%)		55.30 ± 10.50	
6–10 yr	13 (10.1%)	1 (7.7%)	10 (76.9%)	2 (15.4%)		54.62 ± 11.13	
>10 yr	7 (5.4%)	1 (14.3%)	5 (7.4%)	1 (14.3%)		50.41 ± 13.30	
Work place							
State Hospital	5 (3.9%)	0 (0.0%)	5 (100.0%)	0 (0.0%)	0.188	53.43 ± 4.80	0.980
State University	91 (70.5%)	4 (4.4%)	73 (80.2%)	14 (15.4%)		53.75 ± 11.51	
Private Polyclinic/Hospital	29 (22.4%)	0 (0.0%)	22 (75.9%)	7 (24.1%)		56.70 ± 10.57	
Private/Foundation University	4 (3.1%)	1 (25.0%)	2 (50.0%)	1 (25.0%)		56.43 ± 18.75	

discoloration.

Hydrogen peroxide (75.4%) and carbamide peroxide (61.5%) were recognized as vital bleaching agents that could cause tooth discoloration, while hydrogen peroxide (59.2%), sodium perborate-distilled water (45.4%), and sodium perborate-hydrogen peroxide (57.7%) were prominent non-vital bleaching agents. Common responses for post-bleaching complications were postoperative sensitivity (91.5%) and increased dentinal tubule permeability (87.7%). Statements regarding sensitivity in young permanent teeth (81.5%) and effectiveness of lower concentrations of whitening agents (77.7%) were deemed correct.

In the final section probing participants' clinical practices, 96.8% of the dentists reported encountering tooth discoloration in their clinics, with the highest frequency being 2–3 times a week (35.7%). Commonly reported causes of discoloration included caries (90.5%) and insufficient oral hygiene (87.3%). Moreover, 65.9% of the participants had encountered permanent tooth discoloration more frequently than in primary dentition. Factors influencing bleaching decisions in children included the severity of discoloration and the child's psychological status. Among the participants, 56.6% had treated discoloration in young permanent teeth, with 63% reporting them as rare. In addition, 69.9% used restorative materials for such cases. Among the 40.3% preferring to not treat discoloration in young permanent teeth, the reasons included patient or parent preferences (50.9%) and insufficient knowledge (47.2%). Similarly, 46.5% of the dentists who opted to not treat primary teeth for discoloration cited patient or parent preferences and compliance difficulties (50.7%). The relationship between pediatric dentists' clinical approaches and their knowledge scores is presented in Table 2.

4. Discussion

A questionnaire is a method for gathering information that uses individuals as data sources through verbal or written means. Internet surveys offer speed and ease of application compared to traditional methods, particularly for reaching microtargeted samples [30]. Hence, this research employed the internet survey approach. Specifically, an online questionnaire was created using Google Forms and distributed to pediatric dentists *via* email.

In contemporary times, a discernible trend has emerged wherein female pediatric dentists transitioning towards academic vocations have experienced a notable upsurge [31]. The phenomenon of a higher representation of female participants (88.4%) as opposed to male participants (11.6%) within our study may plausibly be construed as an indicative manifestation of this observed tendency. Although the age

TABLE 2. Clinical approaches of pediatric dentists to tooth discoloration.

Questions	Knowledge Level (n/%)			Total	*p*	Knowledge Score	*p*
	Low	Moderate	High				
Do you encounter discoloration in your clinic?							
Yes	4 (3.1%)	102 (79.0%)	19 (14.7%)	125	<0.001*	54.37 ± 11.10	0.506
No	1 (0.7%)	0 (0.0%)	3 (2.3%)	4		58.21 ± 18.82	
How often do you encounter?							
Every day	0 (0.0%)	26 (83.9%)	5 (16.1%)	31	0.161	57.42 ± 9.60	<0.001*
2–3 times a week	2 (4.4%)	33 (73.3%)	10 (22.2%)	45		55.84 ± 12.91	
2–3 times a month	2 (7.1%)	22 (78.6%)	4 (14.3%)	28		54.13 ± 9.76	
Rarely	0 (0.0%)	21 (100.0%)	0 (0.0%)	21		47.01 ± 7.41	
Which dentition do you encounter more?							
Permanent teeth	2 (2.4%)	64 (78.0%)	16 (19.5%)	82	0.156	55.77 ± 11.83	0.051
Primary teeth	2 (4.7%)	38 (88.4%)	3 (7.0%)	43		51.69 ± 9.10	
Do you treat the discoloration of young permanent teeth in your clinic?							
Yes	4 (5.6%)	59 (81.9%)	9 (12.5%)	72	0.152	53.05 ± 11.83	0.125
No	0 (0.0%)	43 (81.1%)	10 (18.9%)	53		56.15 ± 9.87	
How often do you treat?							
Every day	0 (0.0%)	2 (100.0%)	0 (0.0%)	2	0.664	48.57 ± 14.29	0.636
2–3 times a week	0 (0.0%)	8 (100.0%)	0 (0.0%)	8		55.36 ± 9.86	
2–3 times a month	2 (12.5%)	12 (75.0%)	2 (12.5%)	16		50.18 ± 14.23	
Rarely	2 (4.3%)	37 (80.4%)	7 (15.2%)	46		53.85 ± 11.83	
Do you treat the discoloration of primary teeth in your clinic?							
Yes	4 (7.1%)	45 (80.4%)	7 (12.5%)	56	0.066	52.96 ± 11.31	0.203
No	0 (0.0%)	57 (82.6%)	12 (17.4%)	69		55.51 ± 10.89	
How often do you treat?							
Every day	0 (0.0%)	2 (66.7%)	1 (33.3%)	3	0.652	54.76 ± 17.86	0.645
2–3 times a week	0 (0.0%)	13 (92.9%)	1 (7.1%)	14		55.51 ± 8.73	
2–3 times a month	3 (13.0%)	17 (73.9%)	3 (13.0%)	23		50.74 ± 13.01	
Rarely	1 (6.3%)	13 (81.3%)	2 (12.5%)	16		52.96 ± 11.31	

**$p < 0.05$ is significant.*

group of 23–30 years demonstrated the highest knowledge level regarding tooth discoloration, this difference was not statistically significant ($p = 0.594$). This age distribution could be attributed to the use of an internet-based questionnaire. Knowledge levels among pediatric dentists working in private practice/polyclinics/hospitals were marginally higher than those at state universities, although this association was not statistically significant ($p = 0.188$). This association may be due to the higher socioeconomic level of patients receiving service from private institutions and the fact that they apply to dentists more frequently than other patients with aesthetic concerns. It is suspected that the questionnaire reached more physicians working at universities and that these individuals were more willing to participate in the present study than physicians in other settings. Furthermore, it was concluded that the physicians working in private institutions had fewer problems with difficulties obtaining materials and could spare more time for post-graduate training programmes. Furthermore, participants still undergoing specialization education might possess higher knowledge due to their proximity to the university.

The identified systemic factors that were most often linked to tooth discoloration included congenital erythropoietic porphyria (83.8%), congenital hyperbilirubinemia (76.9%), erythroblastosis fetalis (74.6%), and osteogenesis imperfecta (67.7%). Tetracycline (96.2%) and minocycline (60%) were the drugs most commonly recognized as causing tooth discoloration. Penicillin and ciprofloxacin were less frequently identified, potentially due to the largely reversible blue-gray external discoloration caused by amoxicillin suspension [32]. The fact that only one case of ciprofloxacin-induced tooth discoloration has been reported in children may also explain the knowledge gap [33]. Such cases are seldom emphasized in basic undergraduate education, leading to more complex etiological considerations. Therefore, when faced with tooth discoloration due to these drugs, physicians

may question more complex etiological causes. While amelogenesis imperfecta, dentinogenesis imperfecta and tetracycline use were well-recognized as pre-eruptive causes of discoloration, trauma was identified by less than half of the participants, possibly due to its association with necrosis after direct tooth trauma. Discoloration of permanent teeth due to primary tooth trauma might have been overlooked. Most participants accurately identified the causes of discoloration after tooth eruption.

Topical anti-caries agents that may cause discoloration were correctly identified by most participants; these include silver diamine fluoride and stannous fluoride. Knowledge of stannous fluoride discoloration appears to be well-established among pediatric dentists, while side effects of silver diamine fluoride have recently gained attention [34–36].

In terms of causes of brown tooth discoloration, 71.5% of participants correctly identified amelogenesis imperfecta, 42.3% identified chlorhexidine mouthwashes/sprays, 39.2% identified inadequate oral hygiene, and only 17.7% identified tannin-containing drinks. Tannin-containing drinks might be less commonly addressed due to limited consumption by children, resulting in rare encounters with discolorations from these beverages [37]. In a study in Turkey, the prevalence of tooth discoloration caused by chromogenic bacteria was 18.5% in children aged 5–13 [38]. While solutions with silver nitrate are effective for caries prevention and sensitivity treatment, their discoloration side effect has limited their use [36]. In clinical practice, discolorations due to iron preparations and chromogenic bacteria are relatively common, while those caused by silver nitrate solution are uncommon, potentially explaining the varying identification rates.

While higher concentrations of carbamide peroxide may yield satisfactory outcomes in terms of bleaching, there are concerns regarding their potentially heightened biological impact on teeth and periodontal tissues [39]. Nonetheless, nearly half of the participants in our study reported using it, revealing a knowledge gap, possibly due to infrequent bleaching practices among pediatric dentists.

Post-bleaching adverse effects include changes in the microhardness of enamel, increased porosity, heightened surface roughness, reduced fracture and abrasion resistance, changes in calcium/phosphate ratios and erosion. These effects primarily arise from weakening of the enamel structure through the oxidation of organic and/or inorganic elements. External cervical resorption can occur after intracoronary bleaching, with hypersensitivity rates reported at 18–78% in various studies [40–42]. Other effects include increased dentin permeability, disrupted dentin bonding at various levels, soft tissue damage, and discoloration of restorative material [43–46]. Due to the higher permeability of young permanent teeth, bleaching success and frequency are higher in young patients than adults [47]. Young patients require lower concentrations of bleaching agent; still, they are at high risk for post-procedure sensitivity due to their inherent enamel properties [48]. Consistent with previous studies, 68.5% of the pediatric dentists concurred that “Because enamel permeability is higher in young permanent teeth than in adults, whitening processes yield faster results”; 77.7% agreed that “Enamel permeability being higher in young permanent teeth results in more effective outcomes with lower concentration whitening agents”; while 81.5% stated that “Sensitivity occurrence post-whitening is more prevalent in young permanent teeth compared to adults”. Fewer pediatric dentists endorsed the statement “Carbamide peroxide is safe for young permanent teeth”.

In agreement with previous studies [49, 50], the decision to whiten non-vital teeth was based on clinical facilities, patient preference and the children’s desire for peer acceptance. Pediatric dentists emphasized that discoloration severity, a child’s aesthetic expectations, and psychological impact influenced this decision. The knowledge levels of four dentists who had not encountered tooth discoloration were significantly higher than the 125 dentists who had ($p < 0.01$). Caries and inadequate oral hygiene were the most frequently indicated causes of discoloration. In addition, 66.4% of the participants reported encountering the discoloration of permanent teeth more often than that of deciduous teeth, possibly because parents prioritize toothache-related dental issues over aesthetics due to limited awareness of any social impacts.

Most participants (63%) had seldom treated permanent teeth and preferred restorative materials (69.9%), possibly due to material accessibility and lower costs. Many dentists who did not perform discoloration treatment on young permanent teeth reported that patients and their guardians did not request this service (50.9%) and did not consider their knowledge of tooth discoloration to be sufficient (47.2%). Dentists who reported treating discoloration of young permanent teeth two to three times per week displayed a lower understanding of this subject than those who said performing this treatment every day or less than three times per week ($p = 0.664$). However, the number of pediatric dentists (n = 2) who reported performing discoloration treatment on young permanent teeth every day was too small compared to the other groups.

Reasons for not treating the discoloration of primary teeth included patient/guardian disinterest, compliance challenges and a perception that such treatment was of little benefit. Dentists who treated primary teeth discoloration twice monthly often favored restorative materials (80.7%). Preferences for restorations in primary and young permanent teeth can be attributed to material accessibility, cost-effectiveness and single-session applicability.

One of the limitations of the study is that the questions are only directed to pediatric dentists working in Turkey who agree to answer the questionnaire. It is ordinary for young pediatric dentists working at state universities and constantly involved in similar studies to be more willing to fill out an online questionnaire. In addition, due to the limited number of questions that can be asked in survey studies, other questions may be asked in future research that will reveal other aspects that could not be explored in this research. Within the limitations, the absence of statistically significant divergence in the responses provided by pediatric dentists, concerning their demographic attributes, corroborated the null hypothesis posited in this context. Although the group with the highest level of knowledge was determined as pediatric dentists working in private practice/outpatient clinics/hospitals, the null hypothesis about the workplace was accepted as this difference was not statistically significant.

The high level of knowledge of the group most frequently

encountered with tooth discoloration is statistically significant. In this case, it is concluded that the possibility of encountering cases creates a positive development in the way the physician handles the case, and the hypothesis established regarding the relationship between the number of patients the physician sees and the level of knowledge is rejected. On the other hand, when the literature on tooth discoloration was scanned, no national or international study was found that measures the knowledge of pediatric dentists on this subject. Therefore, more survey-based studies should be designed to reach more participants for an evidence-based study of pediatric dentists' knowledge and approaches on the subject. In addition, increasing undergraduate and graduate education on tooth discoloration and treatment is important in terms of eliminating the lack of expertise in this field.

5. Conclusions

Pediatric dentists in Turkey possess a moderate level of knowledge of tooth discoloration. No relationship was found between the time passed after graduation, the duration of working as a specialist, the workplace and the level of knowledge on this subject. Nonetheless, it is the category of pediatric dentists who encounter and manage tooth discoloration with the greatest frequency that demonstrates the highest mean proficiency in this particular domain. There is a necessity to include pediatric dentists in more education programs on tooth discoloration during and after specialization education.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

SA, SÇ and NT—designed the research study. DD—performed the research. DD, SA and SÇ—analyzed the data. DD and SA—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Eskişehir Osmangazi University Non-Interventional Clinical Research Ethics Committee (decision date: 12/30/2020; issue no 01) and was conducted by the 2008 Principles of the Declaration of Helsinki. Participants provided informed consent through an attached informational form at the start of the questionnaire. The consent form outlined the study's purpose, data security, permissions and voluntary participation. Privacy was ensured by not collecting identifying information.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.jocpd.com/files/article/1719633741765066752/attachment/Supplementary%20material.docx.

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How to cite this article: Dilara Demirkol, Seçkin Aksu, Seçil Çalışkan, Nuray Tüloğlu. Evaluation of pediatric dentists' knowledge and approaches to tooth discoloration. Journal of Clinical Pediatric Dentistry. 2024; 48(2): 129-135. doi: 10.22514/jocpd.2023.075.