

ORIGINAL RESEARCH

Knowledge, attitudes, and practice of general pediatricians and pediatric subspecialists towards oral health in children: a survey in Turkey

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Abstract

This study aimed to evaluate the level of knowledge, attitudes, and practices of general pediatricians (GPs) and pediatric subspecialists (PSs) practicing in Turkey toward oral health in children. A national sample of 642 pediatricians who attended the Turkish National Pediatrics Congress completed a survey consisting of 36 questions. The results are segmented based on sex, years of experience, and whether the pediatrician was a general pediatrician or pediatric subspecialist. Relationships between dependent categorical variables were tested using the Chi-square test. Four hundred eighty-seven questionnaires were completed, resulting in a 75.8% response rate; 69.8% of general pediatricians and 74.1% of pediatric subspecialists recommended the first dental visit before the first year or eruption of the first teeth; 62.6% agreed that pediatricians have a role in inculcating oral hygiene habits in patients; 98.2% of the respondents indicated they had performed oral examinations on their patients since birth; 72.8% of PSs suggested bottle-feeding to their patients, whereas only 33.5% of GPs did; 65.4% of PSs, 78.2% of GPs ($p = 0.003$), and 76.8% of the physicians with <5 years experience recommended fluoridated toothpaste under 2 years of age. There were statistically significant differences between the knowledge and attitudes of GPs and PSs. Female respondents were more knowledgeable than male respondents about oral health in children. Additionally, years of experience did not correlate with increased knowledge and proper attitudes toward oral health in children.

Keywords

Knowledge; Attitudes; Oral health; Pediatrician; Pediatric subspecialist

1. Introduction

Dental caries is a serious public health concern and remains the most prevalent oral disease worldwide [1]. The Global Burden of Disease Study in 2019 reported that approximately 2 billion people suffer permanent teeth caries, and 520 million children experience primary teeth caries [2]. Early childhood caries (ECC) is defined as the “presence of one or more decayed, missing or filled tooth surfaces in any primary tooth in a child at 71 months of age or younger” [3]. ECC poses a significant oral health challenge, particularly within socially disadvantaged communities [4]. Regular dental examinations are crucial to maintaining the oral health of children [5]. Unfortunately, in many countries, most children do not receive regular dental visits [6]. Young children often do not go to the dentist unless they have an urgent need [7]. Chewing, eating, speaking and physical appearance are strongly associated with oral and dental health, making it an integral part of overall health in children. The significance of oral health as a crucial determinant in enhancing the quality of life among the pediatric

population is evident [8]. Optimal oral health constitutes a pivotal factor that significantly impacts overall well-being, academic achievements, and forthcoming oral health outcomes in children [9]. The American Academy of Pediatric Dentistry (AAPD) has emphasized the importance of oral health care and preventive education for protecting children from oral diseases [10]. For this purpose, health workers such as general dentists, doctors, nurses and community organizations should be included in these programs [11].

Pediatrics is a specialty of medicine that deals with the development, medical care and treatment of infants and children. In Turkey, general pediatricians are medical doctors who have undergone specialized training in child health and diseases for at least 4 years following their 6-year medical education that constitutes their foundational medical training [12]. Pediatricians perform examination, diagnosis and treatment planning in children by obtaining medical histories. They are the first reliable source for oral health motivation and caries prevention among children. Guidelines encourage primary health care providers to counsel families on oral and dental care [10, 13].

In the past decades, the rapid development of biological sciences has led to the emergence of subspecialties in medicine [14]. Pediatric subspecialists are the only physicians with unique qualifications to treat children with serious and chronic health conditions. Specifically, they provide preventive care, which differs from basic care provided by general pediatricians focused on the common cold, fever and other common illnesses and injuries [15].

It is crucial to increase the role of pediatricians in promoting oral health, especially in patients who lack professional pediatric dentistry services. There is limited information on the difficulties pediatricians face in the oral care of patients, how much they care about providing oral care, and how much they are willing to improve themselves. Therefore, it is necessary to periodically evaluate the behaviors and attitudes of pediatricians regarding oral and dental health and disease prevention [16].

Literature shows several studies on the knowledge, attitude and practice toward oral health in children; however, no study has evaluated the differences between general pediatricians and pediatric subspecialists [17–20]. Therefore, this study aimed to determine the knowledge, attitudes, and practices of general pediatricians and pediatric subspecialists toward patient oral health in Turkey.

2. Materials and methods

2.1 Questionnaire design

This descriptive cross-sectional study was conducted following the guidelines of “Strengthening the Reporting of Observational Studies in Epidemiology” (STROBE statement) [21].

A cross-sectional survey, based on previous studies, was developed by the researchers [16, 17, 19, 20, 22, 23]. It consisted of 36 questions (Q) within four domains and aimed to assess the knowledge, attitudes and practices among pediatric healthcare professionals toward oral health in children. The first domain encompassed demographic characteristics, such as sex, years of experience (categorized as <5 years, 5–10 years and >10 years), subspecialties, type of practice (private practice, public hospital, university), and number of patients attended per day (categorized as <10, 10–30, >30 patients) (6Q). The second domain involved the attitudes, practices and beliefs concerning oral health in pediatricians (13Q). The third domain covered basic oral health knowledge (8Q), while the fourth domain evaluated participant approach to fluoride (9Q).

2.2 Data collection

A pilot study was conducted at Kartal State Hospital, a public hospital in Istanbul. According to the answers given by the general pediatricians and pediatric subspecialists, the *post hoc* power ($1 - \beta$) calculated at the $\alpha = 0.05$ level was 96%. The data from the pilot study were excluded from the main study results.

The number of respondents in each group was evaluated as 161 participants per group based on a previous study by G*power version 3.1.9.6 (Computer software, Heinrich Heine University, Germany, Düsseldorf) ($\alpha = 0.05$, $1 - \beta = 0.95$, effect size: 0.248) [17]. Anticipating a low participation rate

in the survey and accounting for attrition, 642 individuals who participated in the Turkish National Pediatrics Congress (Girne, Turkish Republic of Northern Cyprus 2022) were invited to the study. Of those who agreed to participate, the study excluded 14 individuals due to incomplete survey responses and analyzed the responses of 162 pediatric subspecialists and 325 general pediatricians.

2.3 Statistical analysis

Descriptive statistics are given as numbers and percentages. Relationships between categorical variables were tested with the chi-square test. SPSS version 22.0 (IBM Corporation, Chicago, IL, USA) package program was used in the analysis. $p < 0.05$ was considered significant.

3. Results

3.1 Demographic data

Four hundred eighty-seven pediatricians between 27–48 years (mean age was 36 ± 2.4) completed and returned the surveys giving a response rate of 75.8%. Almost one-third of the responder pediatricians (33.3%) were pediatric subspecialists in 11 departments (Table 1). Among the 487 respondents who identified as pediatricians, 302 (62%) were female, while 185 (38%) were male. Participants indicated that more than half of them (57.5%) had an experience of at least five years, and 46.6% were working in a university hospital; 302 (62%) of the respondents reported that they saw more than 30 patients per day. Table 1 presents the demographic data of respondents.

3.2 Attitudes and practices

Attitudes, practices and beliefs among pediatricians toward oral health in children are presented in Table 2. Results show that all pediatricians “agree” or “strongly agree” with the statement that “Pediatricians have a role in inculcating oral hygiene habits in patients”. Most of those surveyed doctors (98.2%) indicated that they had performed oral examinations on their patients since birth. A significantly higher proportion of female participants (58.6%) compared to male participants (24.3%) demonstrated a greater tendency to counsel their parents for tooth brushing ($p = 0.001$). Additionally, while 48.3% of GPs engaged in parental counseling for tooth brushing, this percentage slightly decreased to 40.1% among PSs ($p = 0.088$). Doctors with more than 5 years of experience demonstrated a lower tendency to counsel parents about toothbrushing than doctors with <5 years of experience (Table 2). A substantial number of PSs (45.7%) and GPs (57.8%) encountered children with ECC daily.

A small percentage of the participants (2%) reported that they had no idea about ECC; 93.8% of the PSs and 84.6% of the GPs stated that they warned parents of ECC; 98.3% of the respondents agreed with the statement that “Nutritional counseling is important to prevent ECC”. 72.8% of PSs and only 33.5% of GPs suggested bottle-feeding to their patients. There was a statistically significant difference in the percentage of male pediatricians (50.8%) compared to female pediatricians (30.8%) who indicated asking about the oral hygiene habits of

TABLE 1. Overview of demographic characteristics.

	N	%
Gender		
Male	185	38.0
Female	302	62.0
Situation		
Pediatric Subspecialists	162	33.3
General Pediatricians	325	66.7
Years of experience		
<5 years	207	42.5
5–10 years	220	45.2
>10 years	60	12.3
Subspeciality		
Pediatric Emergency Care	11	6.8
Pediatric Allergy and Immunologist	16	9.9
Pediatric Infectious Diseases	11	6.8
Pediatric Gastroenterology	19	11.7
Pediatric Pulmonology	10	6.2
Pediatric Hematology/Oncology	18	11.1
Pediatric Endocrinology	14	8.6
Pediatric Cardiology	12	7.4
Neonatology	22	13.6
Pediatric Neurology	15	9.3
Pediatric Intensive Care	14	8.6
Type of Practice		
Private practice	166	34.0
Public hospital	94	19.3
University hospital	227	46.6
Number of patients attended per day		
<10 patient	19	3.9
10–30 patient	166	34.0
>30 patient	302	62.0

mothers ($p = 0.001$). Similarly, the difference between PSs (50.0%) and GPs (32.6%) enquiring about the oral hygiene habits of mothers was significant ($p = 0.001$).

Female and male respondents showed differences in attitudes and practices. Most female participants supported proper attitudes toward pediatric oral health. Meanwhile, differences in attitudes and practices among GPs and PSs also varied depending on the question. However, professional experience did not consistently correlate with proper oral hygiene habits.

3.3 Knowledge

Table 3 shows the knowledge among pediatricians regarding oral health in children; 74.1% of the pediatric subspecialists and 69.8% of the general pediatricians were aware of AAPD recommendations that children be referred to the dentist by 1 year of age ($p = 0.331$). The correct answer for the primary and permanent teeth count was provided by 76.2% of the female

respondents, 68.5% of the pediatric subspecialists, and 64.7% of the doctors with <5 years of experience. When participants were asked about the age to start brushing, 84.3% of general pediatricians and 74.1% of pediatric subspecialists answered correctly ($p = 0.007$).

When asked, “Can the microorganism that causes caries be passed from mother to baby”, 132 male and 236 female respondents answered yes, with no statistically significant difference between sexes ($p = 0.090$); 73.8% ($n = 240$) of general pediatricians and 79% ($n = 128$) of pediatric subspecialists indicated that bacteria responsible for dental caries could be transmitted from mothers to children ($p = 0.211$).

In the entire sample, the statement that “Toothpaste is essential for toothbrushing” received an agreed response rate of 92.6% by PSs and 76.6% by GPs. Furthermore, the response rate for the statement that “Long-term nighttime bottle-feeding causes tooth decay in children” was 96.3% for PSs and 85.5% for GPs, with a combined percentage of “Absolutely I agree” and “I agree” responses (Table 3).

Differences in knowledge levels were observed between GPs and PSs, with several PSs providing correct answers for most questions. In comparison, female pediatricians exhibited greater knowledge levels of pediatric oral health than their male counterparts, while years of experience did not correlate with increased knowledge.

3.4 Fluoride approach

The fluoride approach followed by pediatricians is reported in Table 4. Fluoridated toothpaste under 2 years of age was recommended by 77.3% of male pediatricians, 71.9% of female pediatricians ($p = 0.184$), 65.4% of pediatric subspecialties, 78.2% of general pediatricians ($p = 0.003$), and 76.8% of the doctors with less than 5 years’ experience recommended fluoridated toothpaste under 2 years of age.

Most participants (91.9%) did not know about the correct parts per million (ppm) ratio of toothpaste used in children 2 to 6 years, and 84.5% did not know the correct ppm ratio of toothpaste used in children above 6 years (Table 4). All surveyed participants (100%) reported that they did not prescribe systemic “fluoride tablets” to their patients (Table 4).

There were disparities in the approach to fluoride among both GPs and PSs and between sexes, with a substantial percentage of PSs and female participants offering correct responses to most questions. Years of experience did not consistently correlate with the proper fluoride approach for children across most questions.

4. Discussion

Dental caries remains a prevalent chronic condition among children, with a high incidence rate observed among Turkish children [24]. The World Health Organization (WHO) emphasizes improving oral health worldwide [25]. In many countries, oral health care is not included in primary health care coverage [26]. While intraoral examination is a recommended pediatric practice, pediatricians receive limited training in oral health during their residency [23]. Furthermore, the work pace of pediatricians is often quite intense [27]. Pediatric

TABLE 2. Pediatrician's attitudes, practices and beliefs on children's oral health.

	Sex		<i>P</i>	Field		<i>P</i>	Years of experience			<i>P</i>	Total N (%)	
	Male N (%)	Female N (%)		PSs N (%)	GPs N (%)		<5 years N (%)	5–10 years N (%)	>10 years N (%)			
Pediatricians have a role in inculcating oral hygiene habits in patients.												
Absolutely I agree	43 (23.2)	139 (46.0)	0.001*	64 (39.5)	118 (36.3)	0.492	80 (38.6)	82 (37.3)	20 (33.3)	0.755	182 (37.3)	
I agree	142 (76.8)	163 (54.0)		98 (60.5)	207 (63.7)		127 (61.4)	138 (62.7)	40 (66.7)		305 (62.6)	
I'm undecided	0	0		0	0		0	0	0		0	0
I do not agree	0	0		0	0		0	0	0		0	0
I strongly disagree	0	0		0	0		0	0	0		0	0
Do you perform oral examinations on your patients since birth?												
Rarely	48 (25.9)	24 (7.9)	0.001*	28 (17.3)	44 (13.5)	0.001*	33 (15.9)	39 (17.7)	0	0.001*	72 (14.7)	
Sometimes	60 (32.4)	95 (31.5)		67 (41.4)	88 (27.1)		66 (31.9)	62 (28.2)	27 (45.0)		155 (31.8)	
Often	30 (16.2)	115 (38.1)		47 (29.0)	98 (30.2)		41 (19.8)	85 (38.6)	19 (31.7)		145 (29.7)	
Always	47 (25.4)	59 (19.5)		20 (12.3)	86 (26.5)		60 (29.0)	32 (14.5)	14 (23.3)		106 (21.7)	
Never	0	9 (3.0)		0	9 (2.8)		7 (3.4)	2 (0.9)	0		9 (1.8)	
Do you counsel your patients for tooth brushing?												
Yes	45 (24.3)	177 (58.6)	0.001*	65 (40.1)	157 (48.3)	0.088	119 (57.5)	80 (36.4)	23 (38.3)	0.001*	222 (45.5)	
No	140 (75.7)	125 (41.4)		97 (59.9)	168 (51.7)		88 (42.5)	140 (63.6)	37 (61.7)		265 (54.4)	
How often do you encounter early childhood caries?												
Everyday	80 (43.2)	182 (60.3)	0.001*	74 (45.7)	188 (57.8)	0.001*	123 (59.4)	109 (49.5)	30 (50.0)	0.001*	262 (53.7)	
Once a week	26 (14.1)	48 (15.9)		34 (21.0)	40 (12.3)		52 (25.1)	22 (10.0)	0		74 (15.1)	
Once a month	48 (25.9)	66 (21.9)		31 (19.1)	83 (25.5)		25 (12.1)	86 (39.1)	3 (5.0)		114 (23.4)	
I have no idea	4 (2.1)	6 (1.9)		3 (1.6)	7 (2.3)		7 (1.4)	3 (1.4)	0		10 (7.5)	
Do you warn parents about early childhood caries?												
Yes	177 (95.7)	260 (86.1)	0.001*	152 (93.8)	275 (84.6)	0.001*	172 (83.1)	209 (95.0)	56 (93.3)	0.001*	437 (89.7)	
No	8 (4.3)	42 (13.9)		10 (6.1)	50 (15.4)		35 (16.9)	11 (5.0)	4 (6.7)		50 (10.2)	

TABLE 2. Continued.

	Sex		<i>p</i>	Field		<i>p</i>	Years of experience			<i>p</i>	Total N (%)
	Male N (%)	Female N (%)		PSs N (%)	GPs N (%)		<5 years N (%)	5–10 years N (%)	>10 years N (%)		
Nutritional counseling is important to prevent ECC.											
Absolutely I agree	90 (48.6)	124 (41.1)		105 (64.8)	109 (33.5)		129 (62.3)	46 (20.9)	39 (65.0)		214 (43.9)
I agree	87 (47.0)	178 (58.9)	0.001*	57 (35.2)	208 (64.0)	0.001*	77 (37.2)	171 (77.7)	17 (28.3)	0.001*	265 (54.4)
I'm undecided	7 (3.8)	0		0	7 (2.2)		0	3 (1.4)	4 (6.7)		7 (1.4)
I do not agree	1 (0.2)	0		0	0		0	0	0		1 (0.2)
I strongly disagree	0	0		0	1 (0.3)		1 (0.5)	0	0		0
Do you recommend bottle-feeding?											
Yes	32 (17.3)	49 (16.2)		66 (40.7)	15 (4.6)		15 (7.2)	33 (15.0)	33 (55.0)		81 (16.6)
No	120 (64.9)	140 (46.4)	0.001*	44 (27.2)	216 (66.5)	0.001*	92 (44.4)	154 (70.0)	14 (23.3)	0.001*	260 (53.3)
Sometimes	33 (17.8)	113 (37.4)		52 (32.1)	94 (28.9)		100 (48.3)	33 (15.0)	13 (21.7)		146 (29.9)
Do you ask about the mother's oral hygiene habits?											
Yes	94 (50.8)	93 (30.8)	0.001*	81 (50.0)	106 (32.6)	0.001*	106 (51.2)	49 (22.3)	32 (53.3)	0.001*	187 (38.3)
No	91 (49.2)	209 (69.2)		81 (50.0)	219 (67.4)		101 (48.8)	171 (77.7)	28 (46.7)		300 (61.6)

*Significance at $p < 0.05$, Chi-square test. PSs: Pediatric Subspecialists. GPs: General Pediatricians.

TABLE 3. Pediatrician's knowledge of children's oral health.

	Gender		<i>p</i>	Field		<i>p</i>	Years of experience			<i>p</i>	Total N (%)
	Male N (%)	Female N (%)		PSs N (%)	GPs N (%)		<5 years N (%)	5–10 years N (%)	>10 years N (%)		
First dental visit time											
Correct	101 (54.6)	246 (81.5)	0.001*	120 (74.1)	227 (69.8)	0.331	159 (76.8)	142 (64.5)	46 (76.7)	0.012*	347 (71.2)
False	84 (45.4)	56 (18.5)		42 (25.9)	98 (30.2)		48 (23.2)	78 (35.5)	14 (23.3)		140 (28.7)
Primary and permanent teeth count											
Correct	62 (33.5)	230 (76.2)	0.001*	111 (68.5)	181 (55.7)	0.006*	134 (64.7)	131 (59.5)	27 (45.0)	0.023*	292 (59.9)
False	123 (66.5)	72 (23.8)		51 (31.5)	144 (44.3)		73 (35.3)	89 (40.5)	33 (55.0)		195 (40.0)

TABLE 3. Continued.

	Gender		<i>p</i>	Field		<i>p</i>	Years of experience			<i>p</i>	Total N (%)
	Male N (%)	Female N (%)		PSs N (%)	GPs N (%)		<5 years N (%)	5–10 years N (%)	>10 years N (%)		
Cariogenic microorganisms can be passed from mother to baby.											
Correct	132 (71.4)	236 (78.1)	0.090	128 (79.0)	240 (73.8)	0.211	153 (73.9)	173 (78.6)	42 (70.0)	0.296	368 (75.5)
False	53 (28.6)	66 (21.9)		34 (21.0)	85 (26.2)		54 (26.1)	47 (21.4)	18 (30.0)		119 (24.4)
Start to toothbrushing time											
Correct	141 (76.2)	253 (83.8)	0.039*	120 (74.1)	274 (84.3)	0.007*	164 (79.2)	197 (89.5)	33 (55.0)	0.001*	394 (80.9)
False	44 (23.8)	49 (16.2)		42 (25.9)	51 (15.7)		43 (20.8)	23 (10.5)	27 (45.0)		93 (19.0)
Toothpaste is essential for toothbrushing.											
Absolutely I agree	35 (18.9)	37 (12.3)	0.001*	10 (6.2)	62 (19.1)	0.001*	66 (31.9)	6 (2.7)	0	0.001*	72 (14.7)
I agree	100 (54.1)	227 (75.2)		140 (86.4)	187 (57.5)		105 (50.7)	179 (81.4)	43 (71.7)		327 (67.1)
I'm undecided	47 (25.4)	23 (7.6)		12 (7.4)	58 (17.8)		24 (11.6)	32 (14.5)	14 (23.3)		70 (14.3)
I do not agree	3 (1.6)	15 (5.0)		0	18 (5.5)		12 (5.8)	3 (1.4)	3 (5.0)		18 (3.6)
I strongly disagree	0	0		0	0		0	0	0		0
Long-term nighttime bottle-feeding causes tooth decay in children											
Absolutely I agree	54 (29.2)	125 (41.4)	0.001*	89 (54.9)	90 (27.7)	0.001*	62 (30.0)	89 (40.5)	28 (46.7)	0.001*	179 (36.7)
I agree	116 (62.7)	139 (46.0)		67 (41.4)	188 (57.8)		124 (59.9)	106 (48.2)	25 (41.7)		255 (52.3)
I'm undecided	8 (4.3)	34 (11.3)		6 (3.7)	36 (11.1)		17 (8.2)	22 (10.0)	3 (5.0)		42 (8.6)
I do not agree	0	4 (1.3)		0	4 (1.2)		4 (1.9)	0	0		4 (0.8)
I strongly disagree	7 (3.8)	0		0	7 (2.2)		0	3 (1.4)	4 (6.7)		7 (1.4)

*Significance at $p < 0.05$, Chi-square test. PSs: Pediatric Subspecialists, GPs: General Pediatricians.

TABLE 4. Fluoride approach of the pediatricians.

	Gender		<i>p</i>	Field		<i>p</i>	Years of experience			<i>p</i>	Total N (%)
	Male N (%)	Female N (%)		PSs N (%)	GPs N (%)		<5 years N (%)	5–10 years N (%)	>10 years N (%)		
Which type of paste should be used for babies under 2 years old?											
Fluoride toothpaste	143 (77.3)	217 (71.9)	0.184	106 (65.4)	254 (78.2)	0.003*	159 (76.8)	142 (64.5)	46 (76.7)	0.012*	360 (73.9)
Fluoride-free toothpaste	42 (22.7)	85 (28.1)		56 (34.6)	71 (21.8)		48 (23.2)	78 (35.5)	14 (23.3)		127 (26.0)
What should be the fluoride ratio of toothpaste that should be used in children aged 2 to 6 years?											
Correct (at least 1000 ppm)	13 (7.0)	26 (8.6)	0.532	14 (8.6)	25 (7.7)	0.716	23 (11.1)	16 (7.3)	0	0.018*	39 (8.0)
False (500 ppm, fluoride-free)	172 (93.0)	276 (91.4)		148 (91.4)	300 (92.3)		184 (88.9)	204 (92.7)	60 (100.0)		448 (91.9)
What should be the fluoride ratio of toothpaste that should be used in children aged above 6 years?											
Correct (1450 ppm)	7 (4.0)	53 (18.0)	0.001*	22 (15.0)	38 (11.7)	0.323	24 (11.6)	36 (17.6)	0	0.001*	60 (12.3)
False (500 ppm, 1000 ppm and fluoride-free)	170 (96.0)	242 (82.0)		125 (85.0)	287 (88.3)		183 (88.4)	169 (82.4)	60 (100.0)		412 (84.5)
Do you prescribe systemic fluoride tablets?											
Yes	0	0	NA	0	0	NA	0	0	0	NA	0
No	185 (100.0)	302 (100.0)		162 (100.0)	325 (100.0)		207 (100.0)	220 (100.0)	60 (100.0)		487 (100.0)
I support professional topical fluoride applications applied by dentists.											
Yes	140 (75.6)	260 (86.0)		119 (73.4)	261 (80.3)		122 (58.9)	131 (59.5)	44 (73.3)		400 (82.1)
No	12 (6.4)	29 (9.6)	0.001*	19 (11.7)	22 (6.7)	0.001*	19 (9.1)	19 (8.6)	3 (5)	0.001*	41 (8.4)
I have no idea	33 (10.9)	13 (4.3)		14 (8.6)	32 (9.8)		22 (10.6)	11 (5.0)	13 (21.6)		46 (9.4)

*Significance at $p < 0.05$, Chi-square test.

PSs: Pediatric Subspecialists, GPs: General Pediatricians, NA: not applicable.

subspecialists are highly trained to treat children with complex and rare diseases [15]. Both pediatric subspecialists and general pediatricians treat patients within the same age group in pediatrics; however, significant differences can be observed in their patient populations, clinical practices and treatment approaches. There is no known differentiation in knowledge, attitudes and behaviors regarding the oral health of general pediatricians and pediatric subspecialists.

The study used a sample of 487 valid responses. All pediatricians (100%) agreed that they had a role in promoting oral hygiene habits in patients. However, only half of them (51.4%) reported “often” or “always” conducting oral and dental examinations during routine patient check-ups. The results of the present study are consistent with those of Lewis *et al.* [23], who said that 90% of pediatricians believed they had a role in dental examinations of children, but only 54%

reported that they performed dental check-ups in their daily practice. Another study conducted among Turkish pediatricians by Sezer *et al.* [16] also reported a low percentage (23.3%) of pediatricians performing oral health examinations for children. In contrast, Singhal *et al.* [28] (81.3%), Soares *et al.* [29] (92%), and Hadjipanayis (98.8%) [30] reported high percentages of pediatricians performing oral examinations during routine consultations.

Regarding oral hygiene for babies, the American Academy of Pediatric Dentistry recommends oral health examinations within 6 months of the eruption of the first primary tooth but no later than 12 months of age [10]. In the current study, most participants (71.2%) indicated the appropriate timing for a first dental visit. However, Hadjipanayis *et al.* [30] reported that only 7% of pediatricians recommended a first dental visit for children under 1 year of age. Aburahima *et al.* [31] found that nearly half of pediatricians (51.4%) correctly identified the appropriate age for a child's first dental visit. Multiple studies have reported that many pediatricians are unaware of the recommended timing for a child's first dental visit, with varying levels of knowledge in different studies [16, 20, 22, 32, 33].

In the present study, 68.5% of the pediatric subspecialists and 55.7% of the general pediatricians correctly identified primary and permanent teeth ($p = 0.006$). The results of the current study align with the findings of another study, which reported that more than 60% of pediatricians have sufficient knowledge regarding the number of primary teeth [32].

The AAPD guideline also recommends initiating toothbrushing from the appearance of the first tooth, performing it twice a day with a toothbrush, and using toothpaste with a fluoride content of 1000 ppm until the age of 6 years [34]. In the present study, the majority of the total sample demonstrated an acceptable level of knowledge regarding the starting time for toothbrushing (80.9%). However, a lower percentage of pediatric subspecialists (74.1%) compared to general pediatricians (84.3%) exhibited this level of knowledge ($p = 0.007$). Aburahima *et al.* [31] reported that 47.6% believed the appropriate age to start brushing was after the eruption of primary molars. In contrast to this study, Indira *et al.* [32] reported that the importance of initiating oral hygiene practices before the first teeth erupted was not common among pediatricians.

Studies show that fluoride is the most important factor in reducing the prevalence of caries [35]. In the present study, 78.6% of pediatric subspecialists and 92.6% of general pediatricians strongly agreed or agreed that "toothpaste is essential for toothbrushing". Additionally, 78.2% of PSs, 65.4% of GPs, and 73.9% of the entire population declared that babies under 2 years should use fluoridated toothpaste, consistent with the results of another study [19, 36]. In the current study, most participants did not know the correct ppm ratio of toothpaste used in children 2 to 6 years and those above 6 years. Similarly, Goyal *et al.* [37] reported that very few participants knew the recommended fluoride concentration in toothpaste for children. Sabbagh *et al.* [33] found that awareness of fluoride among pediatricians was quite limited. The entire population in this study reported that they did not prescribe fluoride supplements. Likewise, Bozorgmehr *et al.* [38]

found that less than 10% of pediatricians prescribed dietary fluoride supplements in their professional practices. In contrast, Wagner *et al.* [39] reported that 45.9% of pediatricians recommended the simultaneous use of fluoride supplements and fluoride toothpaste in the first three years, and Lochib *et al.* [40] showed that 26% of pediatricians recommended fluoride supplements for caries prevention. In this study, we believe that the primary reason for pediatricians not recommending systemic fluoride is the current recommendation for topical fluoride applications by dental associations [41].

For many years, *Streptococcus mutans* (*S. mutans*) was considered the primary agent responsible for dental caries, with a direct correlation between *S. mutans* levels in adult caregivers and the prevalence of caries in their children [42]. However, only a few studies have investigated the effects of interventions to prevent the vertical transmission of oral microorganisms on dental caries levels in children, and the results of these studies are subject to debate [43, 44]. Recent genetic and microbiological research on dental caries reveals that *S. mutans* is only a minor constituent of the bacterial community. Dysbiosis is related to an imbalance in the microbial community within the oral cavity [45]. From the current perspective, dental caries is considered a non-infectious polymicrobial dysbiosis condition caused by low-level pathogens in oral health [46]. In the present study, 75.5% of the participants found the statement "Cariogenic microorganisms can be transmitted from mother to baby" correct (a higher percentage than reported in other studies) [17, 36].

Previous studies have reported that pediatricians were fully aware of the effect of bedtime bottle feeding [16, 32, 33]. In the present study, 72.8% of pediatric subspecialists (PSs) recommend bottle-feeding to their patients, which is higher than the 33.5% recommended by general pediatricians. We believe that the PSs recommend bottle-feeding at a higher rate due to the inability to switch to solid food or the inability to breastfeed due to special conditions or systemic diseases in PS patients.

In the current study, most participants indicated that they work in a university hospital with a high volume of daily patient examinations. Female participants in this study demonstrated more supportive attitudes and a greater depth of knowledge regarding pediatric oral health. Additionally, our findings revealed that pediatric subspecialists possess more extensive knowledge than general pediatricians. However, the study found no significant correlation between GPs and PSs regarding their attitudes toward proper oral hygiene for children. The results of our study underscore a notable discrepancy in knowledge, behaviors, and attitudes between general pediatricians and pediatric subspecialists in the context of pediatric oral health. Notably, we were surprised to discover that years of clinical experience did not correlate with increased knowledge or adoption of correct attitudes during clinical practice. Pediatricians play a crucial role in enhancing family awareness and knowledge of oral health. While basic oral health education for infants and children is part of the pediatric residency curriculum, it is important to ensure that pediatricians not regularly involved in child follow-up are updated through continuing education programs.

The strength of this study lies in its ability to reveal dif-

ferences in knowledge, attitudes and practices regarding oral health in children among pediatricians who initially specialized in the same field of medicine but later pursued different subspecialties. Additionally, it represents the first comprehensive study with diverse questions. Nevertheless, it is crucial to acknowledge the limitations associated with our research. The convenience sample we employed consisted of individuals who actively sought to update their knowledge, potentially introducing a bias toward participants more motivated to improve their practices. This limitation may restrict the generalizability of the study findings to a broader population of professionals who do not attend such events and may have varying levels of engagement in oral health-related practices. For future research, it is advisable to include a more diverse and representative sample to enhance the external validity of these findings. Moreover, the study results may have been influenced by socially desirable responses, particularly when addressing questions related to participants regarding their oral health issues and dental care for their children.

5. Conclusions

This study identified differences in the knowledge, attitudes, practices, and fluoride approaches between general pediatricians and pediatric specialists toward oral health in children. Pediatric specialists demonstrated higher knowledge levels of oral health in children than general pediatricians. Additionally, the study found that years of experience did not correlate with increased knowledge or adopting proper attitudes toward pediatric oral health.

AVAILABILITY OF DATA AND MATERIALS

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

AUTHOR CONTRIBUTIONS

EAS, EYT and BK—equally designed the research study. EAS, EYT and IHA—equally performed the research. EAS and EYT—analyzed the data. EAS—wrote the manuscript. BK and IHA—provided help and advice on the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This descriptive cross-sectional study was conducted following the guidelines of “Strengthening the Reporting of Observational Studies in Epidemiology” (STROBE statement) and reviewed and approved by the Marmara University Ethics Committee (2022-88). Participants received oral and written information about the study as part of the consent process.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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