



Assessment of knowledge, attitude, and behavior related to children's oral health in pediatricians and students in the pediatric field in Iran: a cross-sectional study

Saba Jafari, DMD, MScD^a, Mahtab Memarpour, DMD, MScD^{b,*}, Maryam Pakniyat Jahromi, DMD, MScD^a, Mehرداد Vossoughi, PhD^c, Seyed Ahmadreza Hamidi, DMD, MScD^a

Background: Pediatricians have an important role to play in motivating and instructing parents on oral health in children. The aim of this study was to assess knowledge of, attitude to, and behavior regarding oral health care in children among pediatricians and students in the pediatric field in Iran.

Methods: This cross-sectional study included all students in the pediatric field (those who had started a residency or fellowship) and practicing pediatricians in provincial centers and universities (61 setting centers) throughout Iran in the course of 2021. Participants completed an online questionnaire assessing details of the parameters of knowledge of, attitude to, and behavior toward oral health for each individual. A convenience sampling technique was used to gather the study sample. All data were coded for each of the parameters. The data were analyzed by one-way ANOVA (Analysis of Variance)/Tukey and Pearson's correlation tests and path analysis.

Results: Out of 582 participants who visited the website, a total of 217 completed the entire questionnaire (participation rate of 37.2%). On the attitude parameter, 84.8% of participants scored above 75% of the possible attainable score, while only 37.9% and 48.1% of them had adequate knowledge and behavior for the possible score, respectively. Specialists had a higher mean score on behavior and knowledge than residents ($P=0.001$). There was a significant correlation between the scores on attitude and behavior ($r=0.42$, $P<0.001$), attitude and knowledge ($r=0.19$, $P=0.005$), and behavior and knowledge ($r=0.25$, $P<0.001$). Nearly all of the participants, 216 (99.5%), felt the need for the principles of dentistry to be included in the curriculum.

Conclusions: Pediatricians showed a favorable attitude to oral health, but their knowledge of and behavior in the field was inadequate. Improvement of pediatricians' interest and performance in oral health in children should be encouraged through the inclusion of these parameters in the curriculum for students of the pediatric field. Implementing training programs for practical pediatricians or incorporating independent theoretical and clinical courses offered by pediatric dentists in dental school departments into the field curriculum of the students in the pediatric field is recommended.

Keywords: attitude, behavior, knowledge, oral health care, pediatricians

^aStudent Research Committee, Department of Pediatric Dentistry, ^bOral and Dental Disease Research Center, Department of Pediatric Dentistry and ^cOral and Dental Disease Research Center, Department of Dental Public Health

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*Corresponding author. Address: Oral and Dental Disease Research Center, Department of Pediatric Dentistry, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran. School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran. Tel.: +98 713 626 3193 4; fax: +98 713 627 0325. E-mail: memarpour@sums.ac.ir (M. Memarpour).

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Introduction

Oral health is a basic part of the 'overall health and well-being' of children. Oral disease, such as managing dental caries, is still a common challenge for pediatric dentists, especially in very young children, even though preventive strategies have been developed over the years. One review study reported a high prevalence of early childhood caries (ECC) in most countries of the world, with no significant difference seen between developed and developing countries^[1].

Severe early childhood caries (S-ECC) are a subset of ECC and are defined as 'any signs of caries, either cavitated or non-cavitated, on the smooth surface of primary teeth in children younger than 3 years old'^[2]. The significance of S-ECC is that caries may begin shortly after tooth eruption and prior to the first dental visit, which should be no later than 12 months. However, most parents are unaware of the risk of dental caries in their children and will only go to the dentist when the child has discomfort, pain, or a dental abscess. These problems are stressful for parents and children, impacting the child's quality of life and

possibly incurring high costs for parents and the healthcare system when treating tooth caries under general anesthesia^[3,4]. Early years supervision and intervention are recommended to prevent S-ECC^[5]. Implementation of an oral health educational program and oral health enhancement has also been recommended to make parents aware of how they can improve their children's oral status and help reduce dental caries^[6].

Oral health education programs for parents by healthcare providers might be an effective way to increase parents' awareness of this subject. Pediatricians are front-line providers who will see children during the first years of life. The American Academy of Pediatrics (AAP) announced that pediatricians should be able to: undertake an oral exam when the child is 6 months old; teach and review oral health care during their visits; and perform a caries risk assessment; and refer to a pediatric dentist when necessary. This will allow them to diagnose and provide advice on caries prevention, guiding parents to follow preventive strategies and to seek early treatment^[7,8]. Increased oral health knowledge among pediatricians and their implementation of increased awareness in practice will play an important role in the prevention of oral disease in children. While most pediatricians believed it was their responsibility to maintain children's oral health, only a few activities, such as routine oral health screening and referral, were reported by physicians. Their inactivity may be due to a lack of knowledge and training regarding oral and dental problems. One study of pediatricians in one city in Iran showed 85% had moderate to low knowledge on the prevention of dental caries^[9]. Most other studies have also revealed insufficient pediatrician awareness and practice in oral health, issuing recommendations for educational programs to increase knowledge and function in pediatricians^[10-18]. Despite global requests to promote oral health in pediatric practice, physicians' engagement in children's oral health is restricted due to a lack of research identifying the contributing variables. To our knowledge, there have been no comprehensive countrywide studies to assess Iranian pediatricians' knowledge, attitudes, and behavior toward oral health to date. The aim of the present study was to evaluate knowledge of, attitude to, and behavior toward the etiology, problems, and prevention of oral disease in children among Iranian pediatricians and students in the pediatric field.

Materials and methods

Registration

Our study was registered at Iranian Research Registry by this identifying number research registry 23514.

Ethics

The study was approved by the Research Ethics Committees of the School of Dentistry, Shiraz University of Medical Sciences (IR.SUMS.DENTAL.REC.1400.032). All methods were carried out in accordance with relevant guidelines and regulations. The informed consent was obtained from all subjects, and those who agreed to participate in the study completed an online questionnaire.

Setting and time frame of research

Participants in provincial centers and universities (61 setting centers) throughout Iran from September till November 2021.

HIGHLIGHTS

- A comprehensive, user-friendly design questionnaire was used.
- The questionnaire was made available to participants throughout the country via social media.
- The data-gathering method was chosen due to otherwise limited access to participants under the COVID-19 restrictions.
- All students in the pediatric field (those who had started a residency or fellowship) and practicing pediatricians participated in the study.
- Self-reporting and not using the face-to-face interview method were limitations of the present study.
- Participants in provincial centers and universities (61 setting centers) throughout Iran participated in the study.

Study design and data collection procedure

The study design was cross-sectional and the work has been reported in line with the STROCSS (strengthening the reporting of cohort, cross-sectional and case-control studies in surgery) criteria^[19] (Supplemental Digital Content 1, <http://links.lww.com/MS9/A208>). Following the study's approval, a convenience sampling technique was used to gather the study sample. For this purpose, we issued invitations to students in the pediatric field and pediatricians' members of provincial centers and universities throughout the country via social media. The questionnaire was distributed electronically (www.porsline.ir) due to the limited access to participants throughout the country, especially during the coronavirus disease of 2019 (COVID-19) pandemic. In total, 582 participants were invited and visited the website.

Inclusion and exclusion criterion

The study inclusion criteria included all students in the pediatric field (those who had started a residency or fellowship) and practicing pediatricians. Exclusion criteria were unwillingness to participate in the study and incomplete questionnaires.

Sample size determination

The sample size ($n=217$) was computed based on the expected ability of pediatricians to diagnose caries ($P=0.17$)^[20], estimation error $d=5\%$, and confidence level 95%.

Questionnaire and study variables

A self-reporting questionnaire was made available to the study population who agreed to participate in the survey. The study population included students in the pediatric field (those who had started a residency or fellowship) and practicing pediatricians. All participants were given assurances of the confidentiality of the data. The questionnaire opened with a brief explanation of the aim of the study and ethical concerns in counting responses to the questions, asking participants to indicate agreement to participate in this study. Also, the information of the research team, including contact details and the declaration, was mentioned in the questionnaire. The questions were compiled following a comprehensive literature review. All the questions were validated in those studies. The questionnaire included three basic sections to access pediatricians' views on knowledge of, attitude to,

and behavior toward oral health (Supplementary Data File, Supplemental Digital Content 2, <http://links.lww.com/MS9/A209>). The questionnaire contained:

- (1) Demographic information such as age, sex, marital status, level of education, date of graduation, and duration of practice.
- (2) Knowledge of oral health was evaluated via 28 questions to evaluate basic and preliminary knowledge of predisposing factors to dental caries or gingivitis in children and caries prevention methods, the role of diet in dental caries in children, and managing dental infectious. These multiple-choice questions (including images) focused on pediatricians' knowledge regarding oral disease in young children. Each correct answer received a score of 1, and each incorrect response obtained a score of 0.
- (3) Attitudes toward oral health were assessed by nine questions scored on a 5-point Likert rating scale ranging from strongly agree (score 5) to strongly disagree (score 1) and one multiple-choice question. The total attitude score for each participant was calculated as a sum of their total number of scores (5-point Likert) to all questions. The questions focused on the role of pediatricians and the importance of oral health in children, the assessment of oral and dental conditions during a visit to a child, and their attitude toward oral health with general health.
- (4) Finally, practice and behavior toward oral health in children were evaluated through nine 5-point Likert scale questions, which were assessed in the same way as the questions evaluating attitude. The questions concentrated on practice and recommendations regarding oral health hygiene and methods to reduce dental caries in children. Also one question focused on the pediatricians feeling the need for a dental educational program for children in curriculum.

The relevance of the questions and the comprehensibility of the questionnaire were assessed by a panel of 50 professors and students at the Shiraz University of Medical Sciences to ensure participants would be able to understand the questions before the study was opened to respondents. The Cronbach's alpha (α) score was 0.75 for attitude, 0.88 for knowledge, and 0.71 for behavior questionnaires, all of which indicate acceptable reliability. To study the content validity of the questionnaire, an expert panel of eight dental pediatricians was asked to evaluate the essentiality of each item. Then, the content validity ratio (CVR) was determined for each item and items. Items with a CVR value lower than 0.75 were removed from the questionnaire^[21].

Statistical analysis

All data were gathered from completed forms and coded for each of the questions. The answers were assessed and compared based on age, sex, marital status, level of education, and years of practice. IBM SPSS for Windows version 22.0 (IBM Corp, Armonk, New York, USA) and AMOS version 22.0 were employed for data analysis. The assumption of normal distribution was tested using the Kolmogorov–Smirnov test for variables. Data were described using mean \pm standard deviation (SD) and frequency (%). Independent *t*, one-way Analysis of Variance (ANOVA) and Tukey's post hoc were used to compare the mean score of questionnaires between demographic groups of participants. Pearson's correlation coefficient (*r*) and path analysis were used to study the relationship between knowledge, attitude, and

behavior. A *P*-value (*P*) less than 0.05 was considered statistically significant for all tests.

Results

Descriptive statistics

Out of 582 participants who visited the website, a total of 217 completed the entire questionnaire (participation rate of 37.2%). Only the completed questionnaires were included in the analysis.

The median (mean \pm SD) age and years of professional experience were 38 (41.06 \pm 14.74) years old and 5 (9.82 \pm 9.78) years, respectively. The sample of the study comprised 168 (77.4%) married participants and 134 (61.8%) specialists (vs. fellows and residents).

The overall mean scores of participants on knowledge, attitude, and behavior were 37.02 \pm 3.55, 15.93 \pm 2.90, and 31.46 \pm 5.91, respectively.

Knowledge, attitude, and behavior scores associated with demographic characteristics

Table 1 shows the association between the scores of questionnaires and demographic characteristics.

The mean scores for knowledge (*P* = 0.285), attitude (*P* = 0.704), and behavior (*P* = 0.977) were not statistically different between the two sexes. Those who were married had higher mean attitudes and knowledge than single participants (*P*¹ = 0.018 and *P*² = 0.007, respectively). Age had a positive and significant correlation with behavior (*r* = 0.24, *P* < 0.001) and knowledge (*r* = 0.18, *P* = 0.007) scores. Years of professional experience had no significant correlation with any score of questionnaires.

Table 1
Association between the score of questionnaires and demographic characteristics of participants.

	Number (%)	Knowledge	Attitude	Behavior
Sex				
Female	164 (75.6)	15.81 \pm 2.78 ^A	37.08 \pm 3.51 ^A	31.45 \pm 5.86 ^A
Male	53 (24.4)	16.3 \pm 3.25 ^A	36.90 \pm 3.73 ^A	31.48 \pm 6.12 ^A
<i>P</i> ¹		0.285	0.704	0.977
Marital status				
Married	168 (77.4)	16.21 \pm 2.9 ^A	37.34 \pm 3.34 ^A	31.53 \pm 5.84 ^A
Single	49 (22.6)	14.96 \pm 2.7 ^B	35.98 \pm 4.07 ^B	31.22 \pm 6.22 ^A
<i>P</i> ¹		0.007	0.018	0.751
Title				
Specialist	134 (61.8)	16.33 \pm 2.8 ^A	37.2 \pm 3.38 ^A	32.51 \pm 5.65 ^A
Fellow	42 (19.4)	16.71 \pm 2.57 ^A	37.49 \pm 4.02 ^A	30.75 \pm 6.5 ^{AB}
Resident	41 (18.9)	13.83 \pm 2.63 ^B	36.02 \pm 3.53 ^A	28.76 \pm 5.26 ^B
<i>P</i> ²		< 0.001	0.12	0.001
Age				
<i>r</i>		0.18	0.088	0.24
<i>P</i> ³		0.007	0.204	< 0.001
Professional experience				
<i>r</i>		0.07	0.009	0.14
<i>P</i> ³		0.331	0.907	0.065

For qualitative variables, mean and standard deviation (\pm SD) of the scores are presented in each category. For qualitative variables, *r* indicates Pearson's correlation coefficient between the variables and the scores.

For the title variable, mean values with at least one letter the same in superscript were not statistically different. *r*: Pearson's correlation coefficient; *P*¹: independent *t*-test; *P*²: one-way ANOVA (Analysis of Variance); *P*³: Z-test for Pearson's correlation coefficient.

The mean score for attitude was not significantly different between the three groups of educational level ($P=0.12$). The specialists had a higher mean score of behavior than the residents ($P=0.001$). Residents (13.83 ± 2.63) had lower mean knowledge than specialists (16.33 ± 2.8 , $P < 0.001$) and fellows (16.71 ± 2.57 , $P < 0.001$). However, there was no significant difference between specialists and fellows ($P=0.703$).

Correlation between knowledge, attitude, and behavior scores

There was a significant correlation between the scores for attitude and behavior ($r=0.42$, $P < 0.001$), attitude and knowledge ($r=0.19$, $P=0.005$), and behavior and knowledge ($r=0.25$, $P < 0.001$) (Table 2).

The levels for knowledge of, attitude to, and behavior toward oral health were evaluated according to the percentage of pediatricians falling in each quartile of the possible score for each parameter (Table 3). Our findings showed most of the participants (84.8%) had an adequate attitude toward oral health, which fell above the 3rd quartile of the attainable score of the attitude questionnaire. However, only 37.9 and 48.1% of participants had an adequate knowledge and behavior score on oral health, respectively.

Figure 1 shows the path model used to assess the effect of attitude and knowledge on the behavior of pediatricians. It was concluded that both attitude and knowledge had a significant and positive effect on behavior scores. Moreover, knowledge was indirectly affected in terms of behavior via attitude. Table 4 displays direct, indirect, and total effects resulting from the path model.

Oral health educational program

Table 5 gives information about participants' educational programs in the field of dental and oral health, including the reasons why they do not perform oral examinations during their medical examinations. A total of 214 (98.6%) participants studied oral pathology and oral medicine during their education; 209 (96.3%) studied the oral cavity, 197 (90.8%) studied oral hygiene, and three participants did not study any of this content in their education; 216 (99.5%) felt there was a need to learn the principles of dentistry in the curriculum to promote the health of their patients; 136 (62.7%) participants indicated that the most important barrier to examining the oral cavity in children was that they did not receive the appropriate training in this regard; whereas, 52 (24%) stated that they do not have enough time during a clinical exam, and 26 (12%) cited having patients who were very young and uncooperative.

Table 2
Correlation between the scores of knowledge, attitude, and behavior.

	Knowledge	Behavior
Attitude		
<i>r</i>	0.193	0.421
<i>P</i>	0.005	< 0.001
Knowledge		
<i>r</i>		0.253
<i>P</i>		< 0.001

r: Pearson's correlation coefficient, *P*: P-value of Z-test for Pearson's correlation coefficient.

Table 3
Distribution of knowledge, attitude, and behavior scores of participants regarding the percentages of total attainable score.

Percentage of the total score	Knowledge	Attitude	Behavior
< 25%	—	—	—
25–50%	4%	—	5.3%
50–75%	58.1%	15.2%	46.6%
≥ 75%	37.9%	84.8%	48.1%

The values in the table are frequency (%). The attainable score is the range of all possible scores of a questionnaire. For example, the knowledge questionnaire included 28 (correct = 1/incorrect = 0) questions. Therefore, the attainable score ranged from 0 to 28. The scores lower than 7 are those under 25% of the attainable score.

Discussion

Pediatricians have an important role in instructing parents on children's oral health, diagnosing oral health problems, and giving advice on referring children to dentists^[7]. In the current study, we evaluated pediatricians' views toward oral health using questionnaires based on previous studies. Compared to the other studies, we invited all students in the pediatric field (those who had started a residency or fellowship) and practicing pediatricians. However, the use of the self-reporting method is a limitation of the present study, although we used a comprehensive questionnaire^[9–18,20,22–25] presented in a user-friendly design via social media and made available to participants throughout the country. The data-gathering method was chosen due to otherwise limited access to participants under the COVID-19 restrictions. Our findings can be used to recommend that healthcare system programmers conduct periodic courses for practical pediatricians or that they revise the curriculum for students in the pediatric field (those who have started a residency or fellowship).

The present study showed participants had an inadequate knowledge of oral health, with graduate pediatricians having higher knowledge and better practice than their resident peers, but the general level of attitude to oral health in children did not differ between the two groups. This may be related to dealing with referred patients and feeling the need to increase awareness after graduation, both of which have an effect on their practice. Our findings showed marriage had a positive effect on knowledge of and attitude to oral health, which may be related to the marital responsibilities of individuals. The findings of similar studies have agreed with our findings, reporting a lack of knowledge of oral health in children amongst pediatricians^[11–16,18,24]. Yahya and

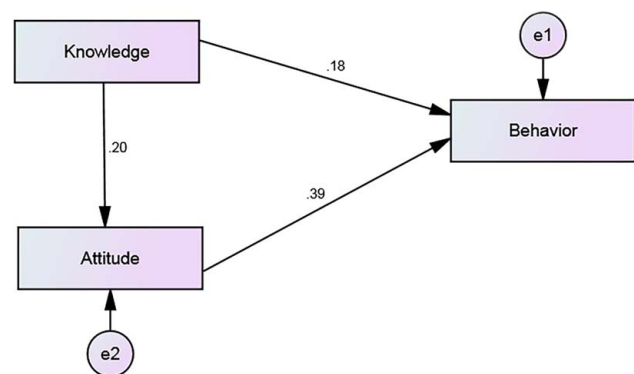


Figure 1. Path diagram demonstrating the effect of knowledge and attitude on behavior. e1 and e2 represent regression errors.

Table 4
Direct, indirect, and total effects of knowledge, attitude, and behavior on each other as resulting from the path model.

	Unstandardized effect			Standardized effect		
	Direct	Indirect	Total	Direct	Indirect	Total
Attitude → behavior	0.64*	–	0.64	0.38*	–	0.38
Knowledge → behavior	0.37*	0.16	0.53	0.18*	0.08	0.26
Knowledge → Attitude	0.24	–	0.24	0.2	–	0.2

The values in the table are regression coefficients resulting from the path model.
 *P-value < 0.05.

Solmaz^[9] showed pediatricians in Tehran had low knowledge of preventive methods for dental caries in children. Kumar *et al.*^[10] showed pediatrician attitude and knowledge of digit-sucking habits in children was inadequate and in need of interventional educational programs. Koirala *et al.*^[20] and Indira *et al.*^[18] reported a lack of awareness about early intervention during visits to child patients among Australian and Indian pediatricians before recommending improved training for pediatricians enabling them to advise parents on oral health conditions. Prathima *et al.*^[17] concluded that pediatricians in Puducherry had poor knowledge related to the prevention of oral disease and ECC in children. However, Nassif *et al.*^[24] showed that Lebanese pediatricians had an acceptable awareness of oral health in children but needed encouragement to include oral health education in the training process. Our findings were in line with other studies indicating a lack of practical knowledge amongst pediatricians that impacts their practice during child visits, particularly in terms of the diagnosis of initial stages of dental caries in young children, the importance of dental visits, and the optimal age for starting visits to the dentist and methods of preventing dental caries.

In the current study, participants showed a positive attitude toward oral health, which agreed broadly with the findings of previous studies^[10–17]. This may be related to the belief of

Table 5
Pediatricians’ educational program in the field of dental and oral health.

Question	Number (%)
Did you study oral health care as part of your education? If so, what was included? (You can mark more than one option)	
Yes, oral pathology	214 (98.6)
Yes, oral medicine	214 (98.6)
Yes, oral hygiene	197 (90.8)
Yes, the oral cavity	209 (96.3)
No, I did not	3 (1.4)
Do you feel the need for a dental education program or implementation of content on the oral health of children in the curriculum?	
Yes	216 (99.5)
No	1 (0.5)
What is the most important reason pediatricians do not perform oral counseling/examination?	
Doctors do not have enough time to consult/examine with parents	52 (24)
The child’s oral health does not play a role in his/her general health	3 (1.4)
Patients are very young and uncooperative	26 (12)
Pediatricians have not received proper training for oral examination of children and advising of parents	136 (62.7)

The values in the table are frequency (%).

pediatricians in oral health in their careers. Dima *et al.*^[11] showed a positive attitude among Taiwanese pediatricians with a higher level of knowledge. Ramroop *et al.*^[12], Gupta *et al.*^[13] and Indira *et al.*^[18] reported a positive attitude toward oral health in children among pediatricians in Trinidad, Tobago, and India, respectively. However, Kumar *et al.*^[10] reported an unsatisfactory attitude among pediatricians toward digit sucking. The difference between the results may be due to differences between countries, participants, and the limited number of questions in the previous studies.

The current study showed specialists had a higher mean score for behavior than residents, possibly due to the number of years of practice and experience. Our findings also revealed that both attitude and knowledge had a positive effect on pediatricians’ behavior, in line with the findings of Dima *et al.*^[11]. However, the present study showed a lack of performance on oral health in clinical practice, with pediatricians reporting a lack of oral examination skills as the main barrier to the performance of oral examinations, along with issues such as limited time availability due to workload and an unwillingness to manage young children. The rule for teaching oral health principles to the residents or after graduation has been noted in previous studies. Prior studies have noted a lack of support provided by pediatricians and low effectiveness of oral health education. Poor guidance from pediatricians may lead to inadequate attention and a failure to implement early childhood preventive oral health strategies by parents.

The present study showed most participants (99.5%) agreed that revision of the curriculum would increase pediatrician awareness of oral health issues. However, many participants reported already receiving training in oral pathology and oral medicine. Possible shortcomings in the presentation of the content could include elements such as presentation in short theoretical lectures, unsuitable timing, and the lack of practical demonstrations on a patient. Some previous studies reported similar findings to ours, especially in terms of the significant barriers to early intervention and insufficient consultation on oral health, stating that the main issue is the lack of professional training and recommending the implementation of oral health education courses along with curriculum revision to improve the content on the subject^[11–13,15,17,20].

The main strength of our study was using a comprehensive, user-friendly questionnaire made available to participants throughout the country via social media. The questionnaire considered various aspects of oral health in children. One of the notable strengths of the study was that all students in the pediatric field (those who had started a residency or fellowship) and practicing pediatricians participated in the current study. The present study had some limitations. Self-reporting may not reflect the knowledge or behavior of participants. Some pediatricians might have exaggerated how frequently they engage in oral health-related activities in their practice to give a more socially acceptable response. Due to otherwise limited access to participants under the constraints of the COVID-19 pandemic, this data-gathering method was chosen. Additional studies recommend investigating the effect of the implementation of oral health education in pediatrician practice.

Conclusions

Pediatricians and students in the pediatric field (residents or fellows) showed a favorable attitude to oral, but their knowledge of and behavior toward the process was shown to be inadequate.

Participants' lack of practical knowledge affects their practice during child visits, especially regarding the diagnosis of the earliest stages of dental caries, the importance of dental visits, the ideal age to initiate dental visits, and strategies for preventing dental caries. Specialists had higher mean scores in knowledge and behavior than residents. Both attitude and knowledge had a significant positive effect on behavior scores. Participants identified multiple challenges to the performance of oral examinations, including a lack of training in oral examinations, a lack of time, and uncooperative children at medical appointments. It is recommended that pediatricians should be encouraged to participate as active healthcare agents in the assessment and improvement of oral health in children. The study showed that most pediatricians would welcome education programs and revision of curriculum to increase awareness of oral health aspects.

Ethics approval

The study was approved by the Research Ethics Committees of the School of Dentistry, Shiraz University of Medical Sciences (IR.SUMS.DENTAL.REC.1400.032).

Consent

Informed consent was obtained from all subjects, and those who agreed to participate in the study completed an online questionnaire. Pediatricians have an important role to play in motivating and instructing parents on oral health in children. The aim of this cross-sectional study was to assess knowledge of, attitude to, and behavior regarding oral health care in children among students in the pediatric field and pediatricians in Iran.

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Conflicts of interest disclosure

The authors declare that they have no conflicts of interest.

Data availability statement

Data from the study is available. Please contact the corresponding author for data requests.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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