



Early childhood caries and infant's oral health; pediatricians' and family physicians' practice, knowledge and attitude in Riyadh city, Saudi Arabia

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Abstract *Background:* Early childhood caries (ECC) is a significant worldwide oral health problem. However, parents do not take their children to the dentist for regular screening of oral diseases as early as they do with pediatricians and family physicians. As a result, pediatricians and family physicians are considered as a reliable and perfect source for children's oral health promotion and disease prevention. Studies assessing pediatricians' and family physicians' practice, knowledge and attitude regarding ECC and infant's oral health in Saudi Arabia are few. As a result, this study aimed to assess these aspects.

Methodology: A cross-sectional study based on a structured close-ended questionnaire was conveniently distributed among pediatricians and family physicians in Riyadh city, Saudi Arabia. The questionnaire composed of two main sections; demographic characteristics and questions assessing participants' practice, knowledge and attitude. The data was analyzed using SAS software, frequency and chi-square test were conducted, and P-value of <0.05 and less was considered significant.

Results: There was a discrepancy between the participants' knowledge, attitude and practice. The participants' practice was lower (42.6%) compared with their attitude (86.1%) and knowledge (65.3%). Most of the participants (52.5%) indicated lack of clinical time was the main barrier for

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performing oral health related activities. Majority of the participants (76.7%) indicated that they need more dental training and education. Dental caries preventive methods (44.6%) was the most requested topic, of which workshops and seminars were the main preferred method (39.6%).

Conclusion: Although most of the participants reported good dental attitude and knowledge, a lack of the associated dental practice was detected. Therefore, more efforts are encouraged to enhance and facilitate dental practice among pediatricians and family physicians.

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1. Introduction

Early Childhood Caries (ECC), according to the American Dental Association, is “The presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and 71 months of age” (De Grauwe et al., 2004). Bottle-feeding during night-sleep, unhealthy diet with high sugar consumption, lack of parental awareness regarding their children oral health, low socioeconomic status and lack of access for dental care were all reported as risk factors for ECC (Çolak et al., 2013).

ECC is considered as a significant public health problem in both developed and developing countries, with a prevalence of 1–12% and up to 70%, respectively (Çolak et al., 2013; Alotaibi et al., 2017). The prevalence of ECC varies by time, population and country (Çolak et al., 2013; Alotaibi et al., 2017; Strömberg et al., 2012). For instance, ECC was reported with a prevalence of 11.4% in Swedish children and 7–19% among Italian children (Strömberg et al., 2012; Nobile et al., 2014). On the other hand, ECC was reported with a higher percentage (65%) among Native Canadian 3-year-olds children (Peressini et al., 2004). Furthermore, some countries' national surveys showed various prevalence such as 36% in Greece, 45.8% in Brazil, 51.9% in India, and 61.4% in Egypt (Oulis et al., 2012; Gomes et al., 2004; Koya et al., 2016; Shalan, 2018). For the Middle Eastern countries, a high prevalence of ECC was reported such as 76% and 83% in Palestine and United Arab Emirates, respectively (Azizi, 2014; El Nadeef et al., 2010). Similarly in Saudi Arabia, two previous studies conducted in Jeddah and Riyadh cities, both reported a high prevalence of ECC with a percentage of 73% and 72.77%, respectively (Al-Malik et al., 2001; Alotaibi et al., 2017).

ECC can start early in the child's life, progresses rapidly especially in children whom are at high risk of developing dental caries, and it is frequently left without proper treatment. Also, ECC might lead to adverse effects on children's physical, psychological and social well-being, as the associated dental pain and tooth loss can negatively influence children's nutrition, phonetics, socializing and sleeping. Moreover, treating ECC is a financial burden for both the family and health care organizations, as it usually necessitates the aid of general anesthesia (Prakash et al., 2006). As a result, ECC must not be neglected and preventive dental measures for children's oral health should be considered. The initiation and the application of these preventive measures are significantly associated with the child's first dental visit, which is recommended within 6 months of the first primary tooth eruption and not later than 12 months (Anand et al., 2017).

However, access to dental care might be compromised as well as most parents are unaware of the importance of the child's first dental visit. In addition, children in their first years of life are often seen more by family physicians or pediatricians compared with dentists. In that context, children were found to be seen by the physician on an average of 11 times by the age of three years old (Anand et al., 2017). As a result, it is crucial for pediatricians and family physicians to recognize their role in the promotion of children's oral health by several means such as; assessing the child's risk of developing dental caries, providing basic screening services for early detection of dental problems, parental education, and referral of required conditions (Anand et al., 2017). Furthermore, the American Academy of Pediatric Dentistry recommends the utilization of different preventive strategies for prevention and early detection of ECC as well as emphasizes the importance of its initiation in the primary health care provider's office (Committee O, Council R. 2014). Similarly, Lewis et al. (2000) found that pediatricians who had sufficient dental knowledge and training were able to reduce the prevalence of ECC by 77%.

For pediatricians and family physicians' oral health knowledge and practice assessment, Prakash et al. (2006) founded that 46% of Canadian pediatricians and 62% of Canadian family physicians lack knowledge in recognizing the early signs of tooth caries. Decreased knowledge regarding children's oral health was also a common finding in studies conducted by Baladan et al. (2012) among Brazilian pediatricians and Eke et al. (2015) among Nigerian pediatricians. However, an European survey conducted by Hadjipanayis et al. (2018) indicated that pediatricians have a sufficient knowledge regarding some oral health's aspects with majority of them reported their performance of dental examination. Also, In Brazil, 92% of pediatricians indicted that they routinely examine children's oral cavity (Soares et al., 2013).

On the other hand, a study published by Sezer et al. (2013) founded that 23.3% of Turkish pediatricians reported examining children teeth as part of their regular basic practice. Similarly, in the United States, Lewis et al. (2000) reported only 33% and 19% of pediatricians and family physicians, respectively, reported their examination of children's teeth for early signs of dental caries. On the other hand, Dela Cruz et al. (2004) reported a better practice among pediatricians in North Carolina, of which 78% participants reported performing dental referral of children with early signs of dental caries. Furthermore, a national survey among the members of the American Academy of Pediatric Dentistry, more than 90% of the pediatricians considered their role in the examination of children's teeth and parental dental education, but only

54% whom reported examining children's teeth in their daily practice (Lewis et al., 2000).

In Saudi Arabia, a study among pediatricians in Jeddah city founded that only 23% of the participants reported examining children's teeth, and dental knowledge was founded to be limited among the majority of the participants (1.4% only had a score higher than 60%) (Sabbagh et al., 2011). Another study conducted by Al-Hussyeen et al. (2003) among pediatricians in Riyadh, Dammam and Jeddah cities founded a low level of oral health associated knowledge, attitude and practice, of which almost half of the participants were not including dental examination in their routinely practice.

Reviewing the literature, studies assessing physician's knowledge, attitude and practice regarding infants' oral health in Riyadh, Saudi Arabia are few. Therefore, the aim of the current study is to assess pediatricians' and family physicians' knowledge, attitude and practice towards infants' oral health and Early Childhood Caries in Riyadh, Saudi Arabia.

2. Methodology

Prior to the conduction of this cross-sectional study, an ethical approval was obtained from the ethical committee of King Abdullah International Medical Research Center, Saudi Arabia. Convenient sampling was employed, which included pediatricians and family physicians working at healthcare facilities that are providing healthcare for pediatric patients in Riyadh city, including; university hospitals, ministry of health military hospitals, private hospitals, governmental hospitals, specialized hospitals and private clinics.

A self-administered, close ended questionnaire adapted by literature review (Lewis et al., 2000; Sezer et al., 2013; Dela Cruz et al., 2004; Sabbagh et al., 2011; Al-Hussyeen et al., 2003) was used for the data collection. The questionnaire composed of the following sections; (A) Sociodemographic data including: gender, nationality, marital status, having children, experience years, place of practicing, dental training and education, place of dental training along with the associated hours. (B) Knowledge assessment questions including; primary teeth development and importance, timing of first child's dental visit, child's oral hygiene practice, child's diet and questions for the knowledge regrading dental caries's signs. (C) Attitude assessment questions for the participants' belief of having a role in several aspects including; prevention of dental caries, parents' education, children's teeth examination and referral of required cases. (D) Participants' practice assessment questions regarding; parents' dental counseling, diet analysis, children's teeth examination, and type of action that will be carried once dental caries has been identified. (E) Questions regarding the barriers preventing the performance of oral health related activities. (F) Questions for the participants' desire of receiving dental training and education beside the preferred dental topics and training methods.

In the beginning, participants were asked to sign a consent form before filling out the questionnaire. Confidentiality and privacy of the participants were governed and protected. The questionnaire was distributed in English language using two different formats; hard copies distributed to the hospitals and clinics, and an online softcopy using Google Forms mailed to the participants.

Collected data were entered, cleaned, and analyzed using the IBM SPSS Statistical program version 23 (IBM Inc. NY, USA). Statistical analyses included; frequency distribution and chi-square test, which was conducted for the assessment of the differences between pediatricians and family physicians regarding their knowledge, attitude, practice, associated barriers of oral health practice, and oral health training and education. P-value of <0.05 and less was considered significant. Twelve questions were used for knowledge assessment measured on a 2-point scale. The minimum score was 0 and maximum one was 12, of which score of 6 and less considered poor knowledge and score of 7 and more considered as good knowledge. For the attitude assessment, it included four questions measured on a 2-point scale. The minimum score was 0 and maximum one was 4, of which score of 2 and less considered poor attitude and score of 3 and more considered as good Attitude. Regarding the assessment of practice, it involved six questions measured on 2-point scale. The minimum score was 0 and maximum one was 6, of which score of 3 and less considered poor practice and score of 4 and more considered as good practice.

3. Results

The final total number of participants whom agreed to participate and complete the questionnaire was 202 participants, of which 40.1% were females and 59.9% were males. The participants were classified according to their medical specialty into two main categories; pediatricians (56.9%) and family physicians (43.1%). Majority of the sample were Saudi (53.5%), of which Saudi's family physicians were significantly higher than Saudi's pediatricians, 65.6% and 44.3%, respectively, ($p < 0.05$). Furthermore, most of the participants were married, 81.7% (pediatricians 82.6%, family physicians 80%) by which 78.2% (pediatricians 80%, family physicians 75.9%) reported that they have children. According to the participant's medical practice, 55% of them (pediatricians 60%, family physicians 48.3%) reported having an experience of more than ten years, and 62.9% (pediatricians 62.6%, family physicians 63.2%) indicated that they are working in a governmental hospital, of which 93.6% (pediatricians 94.8%, family physicians 92%) reported the existence of a dental department in their hospitals. Furthermore, previous dental training was reported by only 21.8% participants, with family physicians (39.1%) being more significantly trained compared to pediatricians (8.7%), ($p < 0.05$). Regarding the hours of dental training, the highest percentage was associated with having a training of more than 6 h (16.5%), of which family physicians were significantly higher than pediatricians, 31% and 5.2%, respectively, ($p < 0.05$). The participants also reported three main sources for dental training; medical school, residency and practice experience. In that context, medical school was founded to be the main source of dental training (12.4%), with more family physicians received training compared to pediatricians, (23%) and (4.3%), respectively, ($p < 0.05$) (Table 1).

From the total sample, 74.3% were knowledgeable about the eruption's age of the first primary tooth, of which 56.7% of them were pediatricians and 43.3% were family physicians. On the other hand, there was a lack of the knowledge regarding the required child's dental visit after the eruption of the first primary tooth, 32.7% (pediatricians 56.1%, family

Table 1 Frequency distribution of biographic and demographic variables among the groups.

Variable	Response	Frequency n (%)			P value
		Pediatricians	Family physicians	Total	
Gender	Male	70 (60.9)	51 (58.6)	121 (59.9)	0.74
	Female	45 (39.1)	36 (41.4)	81 (40.1)	
Nationality	Saudi	51 (44.3)	57 (65.5)	108 (53.5)	0.003*
	Non-Saudi	64 (55.7)	30 (34.5)	94 (46.5)	
Marital status	Single	20 (17.4)	17 (19.5)	37 (18.3)	0.69
	Married	95 (82.6)	70 (80.5)	165 (81.7)	
Having children	Yes	92 (80)	66 (75.9)	158 (78.2)	0.48
	No	23 (20)	21 (24.1)	44 (21.8)	
Experience (In Yrs.)	< 5 years	21 (18.3)	27 (31)	48 (23.8)	0.09
	5–10 years	25 (21.7)	18 (20.7)	43 (21.3)	
	> 10 years	69 (60)	42 (48.3)	111 (55)	
Type of practice	Government Hosp.	72 (62.6)	55 (63.2)	127 (62.9)	0.08
	Private Hosp.	34 (29.6)	31 (35.6)	65 (32.2)	
	Personal Clinic	9 (7.8)	1 (1.1)	10 (5)	
Presence of dental department	Yes	109 (94.8)	80 (92)	189 (93.6)	0.41
	No	6 (5.2)	7 (8)	13 (6.4)	
Dental training	Yes	10 (8.7)	34 (39.1)	44 (21.8)	0.000*
	No	105 (91.3)	53 (60.9)	158 (78.2)	
Place of dental training	I Have not received	104 (90.4)	53 (60.9)	157 (77.7)	0.000*
	Medical school	5 (4.3)	20 (23)	25 (12.4)	
	Residency	4 (3.5)	4 (4.6)	8 (4)	
	Practice experience	2 (1.7)	10 (11.5)	12 (5.9)	
Hours of dental training	None	105 (91.3)	53 (60.9)	158 (78.2)	0.000*
	< 1 h	1 (0.9)	5 (5.7)	6 (3)	
	1–3 h	1 (0.9)	1 (1.1)	2 (1)	
	3–6 h	2 (1.7)	1 (1.1)	3 (1.5)	
	> 6 h	6 (5.2)	27 (31)	33 (16.5)	

* P-Value significant at < 0.05 .

physicians 43.9%). For the maintenance knowledge about the children's oral hygiene, 55% of the participants (55% pediatricians and 45% family physicians) were not aware that parents should start cleaning their children's oral cavity from time of birth after every feed. Similarly, 77.2% of the participants (57.1% pediatricians and 42.9% family physicians) lack the knowledge regarding the time when children should start using fluoridated toothpaste. However, more than half of the sample, 60.9% (56.9% pediatricians and 34.1% family physicians) had a sufficient knowledge regarding the tooth paste's amount to be used when start brushing their child's teeth. For the knowledge regarding the effect of the diet on children's oral health, 84.7% of the participants (55% pediatricians and 45% family physicians) were aware about the effect of bottle feeding at night. Moreover, more than half of the participants (68.8%) were knowledgeable about the most cariogenic sugar, of which pediatricians were significantly more aware than family physicians, 63.3% and 36.7%, respectively, ($p < 0.05$). Similarly, of the total 84.7% whom were knowledgeable regarding the effect of juice and carbonated beverages, pediatricians were significantly more knowledgeable compared to family physicians, 62% and 38% respectively, ($p < 0.05$). For the possibility of the transmission of cariogenic bacteria from a mother to her child, 64.4% of the participants (58.5% pediatricians and 41.5% family physician) did not answer this question correctly. On the other hand, 52% (59% pediatricians and 41% family physician) of the participants answered the question about the first sign of tooth decay correctly. Also, more than two third of the participants, 77.2%

(59.6% pediatricians and 40.4% family physician) were aware about the effect of early childhood caries on children's general health and development if left untreated. Furthermore, 84.2% of the participants (59.4% pediatricians and 40.6% family physician) were aware about the important role of primary teeth in child's general health and development (Table 2).

Majority of the sample, 92.1% (57.5% pediatricians and 42.5% family physician), believed that they play an important role in the prevention of dental caries and promotion of infants' oral health. Similarly, 86.1% (58% pediatricians and 45% family physician) considered their role of educating parents regarding preventive dental measurements for their children. Regarding the fact that pediatricians and family physicians have to examine children teeth for teeth caries, 74.3% of the participants responded positively, in which pediatricians considered it more significantly than family physicians, 63.3% and 36.7%, respectively, ($p < 0.05$). Moreover, when they were asked about the scenario of suspected cases with dental caries, if pediatricians and family physicians have to advice parents to see a dentist and to perform the appropriate referral, 92.6% (57.8% pediatricians and 42.2% family physicians) of the participants responded positively (Table 3).

Furthermore, participants were asked about the performance of children's oral health-related activities during children's well visits. Most of the participants, 57.9% (59.8% pediatricians and 40.2% family physicians), indicated that they do not counsel parents regarding teething, dental care and check-up for their children. Fewer pediatricians and family physicians reported doing diet counseling with parents about

Table 2 Frequency distribution of knowledge domain among the groups.

Question	Response	Pediatricians	Family physicians	Total	P value
First primary tooth erupts at age of 6 months	No	30 (57.7)	22 (42.3)	52 (25.7)	0.89
	Yes	85 (56.7)	65 (43.3)	150 (74.3)	
Children should have their first dental visit after eruption of first primary teeth	No	78 (57.4)	58 (42.6)	136 (67.3)	0.86
	Yes	37 (56.1)	29 (43.9)	66 (32.7)	
Parents should start cleaning their children's oral cavity from time of birth after every feed	No	61 (55)	50 (45)	111 (55)	0.53
	Yes	54 (59.3)	37 (40.7)	91 (45)	
Children should start using fluoridated tooth paste at age of 6 months	No	89 (57.1)	67 (42.9)	156 (77.2)	0.94
	Yes	26 (56.5)	20 (43.5)	46 (22.8)	
Tooth paste's amount to be used when start brushing child's teeth is smear or the size of a grain of rice	No	45 (57)	34 (43)	79 (39.1)	0.99
	Yes	70 (56.9)	53 (43.1)	123 (60.9)	
Bottle feeding at night for sleep might cause teeth decay	No	21 (67.7)	10 (32.3)	31 (15.3)	0.18
	Yes	94 (55)	77 (45)	171 (84.7)	
Sucrose is the most cariogenic sugar (can cause teeth decay)	No	27 (42.9)	36 (57.1)	63 (31.2)	0.007*
	Yes	88 (63.3)	51 (36.7)	139 (68.8)	
Juice and carbonated beverages can cause teeth decay	No	9 (29.0)	22 (71.0)	31 (15.3)	0.001*
	Yes	106 (62.0)	55 (38.0)	171 (84.7)	
Bacteria that are responsible of teeth decay can be transmitted from the mother to her child	No	76 (58.5)	54 (41.5)	130 (64.4)	0.55
	Yes	39 (54.2)	33 (45.8)	72 (35.6)	
White spots are the first sign of tooth decay	No	53 (54.6)	44 (45.4)	97 (48)	0.52
	Yes	62 (59.0)	43 (41.0)	105 (52)	
Early Childhood Caries if untreated it could affect child general health and development?	No	22 (47.8)	24 (52.2)	46 (22.8)	0.15
	Yes	93 (59.6)	63 (40.4)	156 (77.2)	
Primary (baby) teeth have a significant role in child's health and development	No	14 (43.8)	18 (56.3)	32 (15.8)	0.10
	Yes	101 (59.4)	69 (40.6)	170 (84.2)	

* P-value significant at <0.05 .

cariogenic food with a total percentage of 38.6% (48.7% pediatricians and 51.3% family physicians). Only 43.6% of the participants reported doing routine examination for children's teeth, of which pediatricians (64.8%) had a significantly better practice compared with family physicians (35.2%), ($p < 0.05$). Moreover, participants were asked regarding which type of practice they will do when they identify a child with teeth caries. Most of the sample (82.7%) indicated that they will advise the parents to see a dentist, (57.5% pediatricians and 42.5% family physicians). Performing referral to the dentist, was the second type of practice among the participants with a percentage of 58.4% (56.8% pediatricians and 43.2% family physicians). The third reported type of practice among the participants was to record it in the child's medical chart, 47.5% (51% pediatricians and 49% family physicians). On the other hand, ignorance and doing nothing was the least reported practice in the study with percentage of 7.4% (60% pediatricians and 40% family physicians) (Table 4).

Table 5 presents the overall score for the participants' knowledge, attitude and practice along with the combined overall score, in which there was a difference between knowledge, attitude and practice among the participants. The majority of the participants had a higher percentage of a good attitude (86.1%) compared with having a good knowledge (65.3%) and a good practice (42.6%), of which having a good practice was the least. However, there was no significant difference between pediatricians and family physicians for all; knowledge, attitude and practice ($p > 0.05$). Furthermore, the percentage of combined overall good score in the study was 47% (61.1% pediatricians and 38.9% family physicians), with no significant difference ($p > 0.05$) (Table 5).

Furthermore, the participants were asked about the barriers prevented them from performing children's oral health

related activities. Most of the participants (52.5%) indicated that lack of clinical time was the main barrier, (53.8% pediatricians and 46.2% family physicians). Followed by several barriers such as; the fact that parents do not perceive the need of dental care, 29.2% (54.2% pediatricians and 45.8% family physicians), the belief that these activities should be performed by dentists, 26.7% (53.7% pediatricians and 46.3% family physicians), and lack of knowledge for identifying oral health problems, 26.2% (62.3% pediatricians and 37.3% family physicians). Other barriers also included; lack of knowledge regarding parent's education, 24.3% (53.1% pediatricians and 46.9% family physicians), lack of dental health professionals in the area for referral, 14.4% (51.7% pediatricians and 48.3% family physicians), and 11.9% (45.8% pediatricians and 48.3% family physicians) for the lack of reimbursement for performing oral health related activities. The least barrier reported by the participants (6.95%) was associated with the fact that; it is early for infants and toddlers to have an oral examination, of which majority of family physicians significantly (78.6%) perceived this as a barrier, when compared with pediatricians (21.4%), ($p < 0.05$). On the other hand, only 5.4% of the participants (63.6% pediatricians and 36.4% family physicians). Among the participants, 5.4% stated that they do not have any barriers for performing children's oral health related activities (Table 6).

More than two third of the participants (76.7%), (53.5% pediatricians and 46.5% family physicians), indicated that they need more dental training and education. The main requested topic was; methods of preventing dental caries (44.6%), (60% pediatricians and 40% family physicians). Other requested topics were; early childhood caries, 44.1% (52.8% pediatricians and 47.2% family physicians), followed by 25.2% (60.8% pediatricians and 39.2% family physicians) for fluoride

Table 3 Frequency distribution of questions related to Attitude domain among the groups.

Question	Response	Pediatricians	Family physicians	Total	P value
Pediatricians and family physicians play an important role in prevention of dental caries and promotion of infants’ oral health	No	8 (50)	8 (50)	16 (7.9)	0.56
	Yes	107 (57.5)	79 (42.5)	186 (92.1)	
Pediatricians and family physicians have to educate parents or caregivers regarding preventive dental measurements	No	14 (50)	14 (50)	28 (13.9)	0.42
	Yes	101 (58)	73 (42)	174 (86.1)	
Pediatricians and family physicians have to examine children teeth for presence of caries	No	20 (38.5)	32 (61.5)	52 (25.7)	0.002*
	Yes	95 (63.3)	55 (36.7)	150 (74.3)	
Pediatricians and family physicians have to refer or advice parents in case of suspected cases of dental caries	No	7 (46.7)	8 (53.3)	15 (7.4)	0.40
	Yes	108 (57.8)	79 (42.2)	187 (92.6)	

* P-value significant at < 0.05.

Table 4 Frequency distribution of questions related to Practice domain among the groups.

Question	Response	Pediatricians	Family physicians	Total	P value
I counsel parents or caregivers regard teething, dental care and check-up of their children	No	70 (59.8)	47 (40.2)	117 (57.9)	0.32
	Yes	45 (52.9)	40 (47.1)	85 (42.1)	
I do diet counseling with parents or caregiver regard cariogenic food	No	77 (62.1)	47 (37.9)	124 (61.4)	0.06
	Yes	38 (48.7)	40 (51.3)	78 (38.6)	
I routinely examine children’s teeth for presence of decay	No	58 (50.9)	56 (49.1)	114 (56.4)	0.04*
	Yes	57 (64.8)	31 (35.2)	88 (43.6)	
When I identify a child with a teeth decay, I record it in the medical chart	No	66 (62.3)	40 (37.7)	106 (52.5)	0.10
	Yes	49 (51.0)	47 (49.0)	96 (47.5)	
When I identify a child with a teeth decay, I advise parents to see a dentist	No	19 (54.3)	16 (45.7)	35 (17.3)	0.72
	Yes	96 (57.5)	71 (42.5)	167 (82.7)	
When I identify a child with a teeth decay, I do a referral to a dentist	No	48 (57.1)	36 (42.9)	84 (41.6)	0.95
	Yes	67 (56.8)	51 (43.2)	118 (58.4)	

* P-value significant at < 0.05.

Table 5 Frequency distribution of overall scores of each domain – knowledge, attitude and practice, and combined among the groups.

Variable	Response	Pediatricians	Family physicians	Total	P value
Knowledge overall score	Poor	37 (52.9)	33 (47.1)	70 (34.7)	0.39
	Good	78 (59.1)	54 (40.9)	132 (65.3)	
Attitude overall score	Poor	13 (46.4)	15 (53.6)	28 (13.9)	0.22
	Good	102 (58.6)	72 (41.4)	174 (86.1)	
Practice overall score	Poor	68 (58.6)	48 (41.4)	116 (57.4)	0.57
	Good	47 (54.7)	39 (45.3)	86 (42.6)	
Combined overall score	Poor	11 (44.0)	14 (56.0)	25 (12.4)	0.30
	Average	46 (56.1)	36 (43.9)	82 (40.6)	
	Good	58 (61.1)	37 (38.9)	95 (47.0)	

* P-value significant at < 0.05.

supplements, and lastly 19.8% (55% pediatricians and 45% family physicians) for the first-aid of tooth injury (Table 7).

Several methods were preferred by the participants to receive their dental education and training. Workshops and seminars were the most preferred method, 39.6% (52.5% pediatricians and 47.5% family physicians). Followed by; distance learning, 28.2% (52.6% pediatricians and 47.4% family

physicians), and 22.3% for in-service training (57.8% pediatricians and 47.4% family physicians) (Table 7).

4. Discussion

As a result of the increasing number of Saudi’s children with dental caries along with the fact that children are not seen

enough by dentist in their first years compared with pediatricians and family physicians, the idea of this research has been established (Al-Hussyeen et al., 2003). Reviewing the literature regarding the studies in Saudi Arabia, few studies that has assessed the practice, knowledge, and attitude of pediatricians and family physicians regarding ECC and infant's oral health (Al-Hussyeen et al., 2003, and Sabbagh et al., 2011). Therefore, this study has been conducted among pediatricians and family physicians in Riyadh city.

For data collection, to insure the variety and maximum coverage of the sample, a convenient sample of pediatricians and family physicians working in both governmental and private sectors in all different regions of Riyadh city has been included. The data has been collected using both distributed hard copies and mailed soft copies. There was no attempt to exclude or select any participant, and all participants whom were willing to participate were invited equally. However, family physicians whom are not providing any medical care for children were excluded. A self-administered questionnaire was used for data collection, which is considered to be as one of the most appropriate and convenient methods by physicians and investigators.

The results of the current study, indicted the presence of discrepancy between participants' practice, knowledge and attitude. The majority of the sample had an acceptable level of knowledge and attitude regarding infant's oral health and ECC. However, fewer percentage of them whom actually reported the performance of oral health related activities, which correspond with the American national survey conducted by Lewis et al. (2000).

Moreover, most of the pediatricians and family physicians were knowledgeable regarding the eruption's age of first primary tooth. However, fewer whom were aware that children should have their first dental visit after the eruption of first primary tooth. Similarly, both Sabbagh et al. (2011) and Sezer et al. (2013) reported similar findings among Saudi's (25.6%) and Turkish population (13.9%), while Indira et al. (2015) reported a better level of knowledge in India (43%). One of the most important aspects that are associated with the child's first dental visit, is allowing the early risk assessment of the child's oral health, and providing the opportunity for the early intervention that helps in reducing the child's risk of developing dental caries, which correspond with the guidelines reported by the American Academy of Pediatric Dentistry (American Academy of Pediatric Dentistry, 2008).

Adequate children's oral health is such of an importance for the prevention of dental caries and its associated adverse effects. As a result, it is necessary that caregivers are well educated and meant to understand the reason of maintaining child's oral hygiene (Prakash et al., 2006). In the recent study, a few participants whom were aware that fluoridated tooth paste should be used at the age of 6 months. On the other hand, they were aware regarding the tooth paste amount to be used when parents start brushing their child's teeth.

Although, it has been reported in the literature that wiping infant's gum pad can help in reducing bacterial and microorganisms' accumulation that could increase the risk of dental caries (American Academy of Pediatric Dentistry 2008). As reported in previous studies (Al-Hussyeen et al., 2003; Indira et al., 2015), the majority of pediatricians and family physicians in the current study, were not adequately knowledgeable

that parents should start cleaning their children's oral cavity from time of birth after every feed.

Furthermore, regarding children's diet, both pediatricians and family physicians were fully aware about the effect of bottle night feeding, sucrose's effect, and the effect of juice and carbonated beverages on children's teeth. Similar findings were reported by Indira et al. (2015), Sabbagh et al. (2011), and Sezer et al. (2013).

According to the American Academy of Pediatric Dentistry, early dental examination is one of the keys for the promotion of infant's oral health and prevention of ECC (American Academy of Pediatric Dentistry 2008). Furthermore, as children in their first years of life are encountered with pediatricians and family physicians more often than dentists, it is such of an important that pediatricians and family physicians recognize their role in the promotion of children's oral health. A previous study conducted by Lewis et al. (2000), indicated that the majority of the respondents were not aware about the first signs of dental caries. Furthermore, Sezer et al. (2013), also reported a similar finding among Turkish pediatricians. Similarly, in the present study, most of pediatricians and family physicians did not have adequate knowledge regarding the first signs of dental caries.

Moreover, most of the participants believed that pediatricians and family physicians have to examine children's teeth as part of their daily practice, of which pediatricians had a better attitude compared with family physicians. Another study conducted by Eke et al. (2015), also indicated that pediatricians considered their role in the examination of children's teeth.

Although most of the participants considered their role in children's teeth examination, a fewer percentage whom actually reported the examination of children's teeth, of which pediatricians reported to examine children's teeth more often compared with family physicians. Similarly, Sezer et al. (2013), also reported a low percentage of pediatricians performing children's oral health examination. On the other hand, another study conducted in Jeddah city, Saudi Arabia, by Sabbagh et al. (2011), showed a better level of practice, of which the majority of pediatricians reported the inclusion of children's teeth examination in their routine practice. Indira et al. (2015) and Prakash et al. (2006) also reported in their studies that most of pediatricians are including children's teeth examination in their practice.

Although most of pediatricians and family physicians considered that they have a role in parental counseling and education regarding infant's oral health and ECC, the majority of them were not including it in their daily practice. On the other hand, a better practice regarding parental counseling and education were reported in the previous studies. (Prakash et al., 2006; Sezer et al., 2013; Sabbagh et al., 2011; Indira et al., 2015).

Furthermore, according to the American Academy of Pediatric Dentistry, early referral of children is such of an important for the maintenance of children's oral health, which has been founded as a common practice among the participants of the current study. (American Academy of Pediatric Dentistry, 2008) Similarly, dental referral was also a common finding in the previous studies (Prakash et al., 2006; Sezer et al., 2013; Sabbagh et al., 2011; Indira et al., 2015).

Table 6 Frequency distribution of various barriers in performing Oral health activities.

Type of barrier	Response	Pediatricians	Family physicians	Total	P value
Lack of clinical time	No	58 (60.4)	38 (39.6)	96 (47.5)	0.34
	Yes	57 (53.8)	49 (46.2)	106 (52.5)	
Parents do not perceive the need of dental care	No	83 (58)	60 (42)	143 (70.8)	0.61
	Yes	32 (54.2)	27 (45.8)	59 (29.2)	
Lack of reimbursement for performing oral health related activities	No	104 (58.4)	74 (41.6)	178 (88.1)	0.24
	Yes	11 (45.8)	13 (54.2)	24 (11.9)	
Lack of dental health professionals in the area for referral	No	100 (57.8)	73 (42.2)	173 (85.6)	0.54
	Yes	15 (51.7)	14 (48.3)	29 (14.4)	
Lack of knowledge for identifying oral health problems	No	82 (55)	67 (45)	149 (73.8)	0.36
	Yes	33 (62.3)	20 (37.7)	53 (26.2)	
Lack of knowledge regard parent's education	No	89 (58.2)	64 (41.8)	153 (75.7)	0.53
	Yes	26 (53.1)	23 (46.9)	49 (24.3)	
It is early for infants and toddlers to have an oral health examination	No	112 (59.6)	76 (40.4)	188 (93.1)	0.005*
	Yes	3 (21.4)	11 (78.6)	14 (6.9)	
These activities should be performed by a dentist	No	86 (58.1)	62 (41.9)	148 (73.3)	0.57
	Yes	29 (53.7)	25 (46.3)	54 (26.7)	
No barrier	No	108 (56.5)	83 (43.5)	191 (94.6)	0.64
	Yes	7 (63.6)	4 (36.4)	11 (5.4)	

* P-value significant at < 0.05.

Table 7 Frequency distribution dental training and education among the groups.

Variable	Response	Frequency n (%)			P value	
		Pediatricians	Family physicians	Total		
I Want to have more education and training	Yes	83 (53.5)	72 (46.5)	155 (76.7)	0.07	
	No	32 (68.1)	15 (31.9)	47 (23.3)		
Dent. Topics	I Don't Need	No	83 (53.5)	72 (46.5)	155 (76.7)	0.07
		Yes	32 (68.1)	15 (31.9)	47 (23.3)	
ECC	No	68 (60.2)	45 (39.8)	113 (55.9)	0.29	
	Yes	47 (52.8)	42 (47.2)	89 (44.1)		
Dental caries preventive methods	No	61 (54.5)	51 (45.5)	112 (55.4)	0.43	
	Yes	54 (60)	36 (40)	90 (44.6)		
Fluoride supplements	No	84 (55.6)	67 (44.4)	151 (74.8)	0.52	
	Yes	31 (60.8)	20 (39.2)	51 (25.2)		
First-aid for tooth injury	No	93 (57.4)	69 (42.6)	162 (80.2)	0.78	
	Yes	22 (55)	18 (45)	40 (19.8)		
Method of training and education	I Don't Need	No	83 (53.5)	72 (46.5)	155 (76.7)	0.07
		Yes	32 (68.1)	15 (31.9)	47 (23.3)	
Distance learning	No	85 (58.6)	60 (41.4)	145 (71.8)	0.43	
	Yes	30 (52.6)	27 (47.4)	57 (28.2)		
In-service training	No	89 (56.7)	68 (43.3)	157 (77.7)	0.89	
	Yes	26 (57.8)	19 (42.2)	45 (22.3)		
Workshops & seminars	No	73 (59.8)	49 (40.2)	122 (60.4)	0.30	
	Yes	42 (52.5)	38 (47.5)	80 (39.6)		

* P-value significant at < 0.05.

In the present study, decreased frequency in the practice of infant's oral health related activities among both pediatricians and family physicians was associated with several barriers, of which lack of clinical time and lack of the perceived need by parents for dental care, were the most reported ones. Same barriers were also reported by [Prakash et al. \(2006\)](#) among Canadian pediatricians. The belief that it is early for infants and toddlers to have an oral health examination was the least reported barrier among the study's participants. However,

believing that these activities should be performed by dentists, was the least barrier reported by [Prakash et al. \(2006\)](#).

As reported in the previous study by [Sezer et al. \(2013\)](#), decreased knowledge about some aspects of infant's oral health along with the associated practice among pediatricians and family physicians, could be related to the lack of the required dental training and education among the majority of the participants. In the present study, family physicians reported to have more dental training compared with

pediatricians. However, pediatricians received more training than family physicians in the study conducted by [Prakash et al. \(2006\)](#).

If proper knowledge and awareness is established among pediatricians and family physicians, it could enhance their ability for parental education and accurate identification for patients requiring dental referral. ([Pierce et al., 2002](#)) In this study, most of the participants indicated that they want to receive more dental education and training, which correspond with the findings of the study among Canadian pediatricians and family physicians. ([Prakash et al., 2006](#)) Dental caries preventive methods was the most requested topic by the study's participants, of which workshops and seminars were the most preferred learning method. On the other hand, the topic of ECC along with receiving its information by professional guidelines were the most reported result by [Prakash et al. \(2006\)](#).

As children are encountered with medical care early enough in their first years of life, the study's results provide a beneficial data that could be utilized to enhance the promotion of children's oral health and prevention of dental caries. Sufficient dental knowledge, attitude and training for both pediatricians and family physicians are of such an important, in order to allow them to do their roles in children's oral health promotion in the required way.

The results of the present study revealed that most of pediatricians and family physicians actually considered themselves having an important role in children's oral health promotion. However, there was a lack of knowledge about some aspects of children's oral health along with the associated oral health practice. As a result, education and clinical training regarding the basic information for the maintenance of children's oral health should be included in the curriculum of medical education and training. Furthermore, continuous educational and training programs such as; online or distance training, in-service training, workshops, and seminars should be considered. Other suggested solution is to enhance the collaboration and interference between medical and dental community by several methods such as; facilitating the referral system and organizing more scientific meetings between them.

Furthermore, as several barriers were reported by the study's participants as a reason for not being commitment in the performance of oral health related activities, an immediate interference to provide a solution is such of an important. For example, lack of clinical time, which was the highest reported barrier, could be encountered by increasing the duration of the child's appointment, in order to facilitate the required basic dental assessment. Moreover, lack of parental perceive for the importance of their child's dental care, which was also one of the most reported barrier, enhances the need for increasing the parental dental awareness among the society. This could be achieved by several methods such as; conducting educational campaigns along with emphasizing the role of both the primary health care providers along with dentists regarding parental dental counseling and education.

Referring to the limitations that were encountered in the present study. Due to the employment of convenient sampling technique, these findings may not be representative of the entire pediatricians and family physicians in Saudi Arabia. Furthermore, as with any close-ended and self-administered questionnaire, the given answers may not be reflecting the accurate participants' knowledge, attitude, and practice.

5. Conclusion

Most of the participants reported an acceptable dental attitude and knowledge. However, there was a lack in the associated oral health practice, of which lack of clinical time was reported to be the main barrier. As a result, more efforts are encouraged to enhance and facilitate the provision of the required oral health assessment in the pediatric and family medicine clinics along with increasing the interaction between pediatricians and family physicians with dentists.

6. Areas for further study

Further research is recommended to assess the effect of the suggested solutions for the lack of oral health related practice among physicians, for the promotion of children's oral health.

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Conflict of interests

The authors declare that they have no conflict of interest and there was no external source of funding for the present study.

Ethical approval

This project was approved by the institutional Review Board of King Abdullah International Medical Research Center, Saudi Arabia. All participants signed the provide consents that was attached to the questionnaire.

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