

# Knowledge of oral health among family medicine physicians in Riyadh, Saudi Arabia 2020

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## ABSTRACT

**Background:** Preventive oral health care (OHC) is an important part of preventive health care and needs to be started early in life. Family physicians are in a position where they can help to initiate preventive OHC. From previous literature, oral health has an impact on the general health and quality of life of individuals with a large burden on the health care system. In addition, pediatricians and family physicians lack knowledge in oral health and can be unwilling to participate in preventive OHC. We aim to increase family physicians' knowledge of oral health. **Objectives:** This study aimed to measure the level of knowledge about oral health and identify some of its determinants among family physicians working in Riyadh, Saudi Arabia. **Methods:** This is a cross-sectional study that included 187 family physicians to measure the knowledge of family doctors about oral health using a self-administered questionnaire. **Results:** The total mean score was  $119.28 \pm 11.26$  out of 175, indicating a poor level of knowledge level about oral health. **Conclusion:** Family physicians in Riyadh, Saudi Arabia lack knowledge of oral health. These findings make it necessary to include oral health topics during residency and continuing medical education programs.

**Keywords:** Family physicians, knowledge and awareness, oral health, physicians, primary care physicians

## Background

The World Health Organization (WHO) defines health as “a complete state of physical, mental, and social well-being and not just the absence of disease” (WHO, 1948).<sup>[1]</sup> Oral health plays an important role in the general health of individuals. Many systemic diseases have been connected to oral disease, and the systemic diseases have oral manifestations.<sup>[2,3]</sup> Kane<sup>[2]</sup> mentioned in his study that, “Atherosclerotic vascular disease, pulmonary disease, diabetes, and pregnancy-related complications are the major conditions that effect a large percentage of the population and have been well-studied for their relationship to oral health.” Oral health and tooth loss can affect the quality of life of individuals.<sup>[4,5]</sup> Oral hygiene is poor and introduced late in

the life of Saudis.<sup>[6,7]</sup> Parents' oral health status can affect their children's' risk of caries.<sup>[8]</sup> Dental caries are common among Saudi children.<sup>[9]</sup> A systemic study on the prevalence of caries among Saudi children concluded, “The national prevalence is estimated to be 80% in the primary dentition,” and “it is estimated to be 70% for children's permanent dentition.”<sup>[10]</sup> A good oral health status can decrease costs on the health service. In the reviewed literature, the global direct cost because of dental disease was estimated at US \$298 billion and indirect costs at US \$144 billion yearly.<sup>[11]</sup> Family physicians being the connection of the community with the health care system could educate their patients regarding oral health. Low level of knowledge was mentioned in previous literature by physicians as a barrier to providing oral health care (OHC) to their patients.<sup>[12]</sup>

In efforts to improve health care and decrease the large burden on the health care system because of oral disease, this study aimed to increase the awareness of family physicians about the importance of oral health and its impact on patients' overall

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health by implementing educational programs about oral health. We hope this paper shows the importance of oral health and general well-being of individuals to family physicians and to give oral health a place in the postgraduate and continuous medical education.

The objective of this study was to measure the level of knowledge of family physicians working in Riyadh, Saudi Arabia about oral health in terms of the effect of oral health on systemic health, pediatric dentistry, and general dentistry and to identify determinants of oral health knowledge among primary care physicians.

## Methods

This is a cross-sectional study conducted on family physicians working in primary care centers of three large hospitals in Riyadh, Saudi Arabia. We randomly selected and distributed a self-administered questionnaire to 241 family physicians who were working in the primary care centers. Due to the lack of time and different schedules of physicians, the sampling method was convenient. The questionnaire was developed based on previous literature and presented to three consultants of family medicine for validation of the contents, and a pilot study was done on 18 family physicians to evaluate feasibility. The questionnaire consisted of sociodemographic data (including age, gender, nationality, position, years of experience, and whether the participants had received previous training on oral health) and 3-point Likert scale questions on oral health and systemic health with 10 items, pediatric dental questions with 11 items, and general dental questions with 14 items. Participants were asked to answer with "Strongly Agree," "Agree," "I Don't Know," "Disagree," or "Strongly Disagree." One hundred and eighty-seven questionnaires were returned to a response rate of 77%. After excluding the uncompleted questionnaires, 167 questionnaires were included in the study.

Data were analyzed using the Statistical Package for the Social Studies software (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean  $\pm$  standard deviation and categorical variables were expressed as percentages. *t*-test and one-way analysis of variance were used for continuous variables. Cronbach's alpha was used to assess the reliability and internal consistency of the items in the questionnaire. Univariate and multivariate logistic regressions were used to assess the risk factors for poor knowledge.

## Ethical considerations

Approval letter for the study was obtained from Institutional review board (IRB) committee at the Prince Sultan Military Medical City no. HP-01-R079. Participants' consent was taken at the beginning of each questionnaire. The privacy of participants was maintained and no effort was made to identify participants. Collected information is kept confidential, and it was ensured that no harm is done to any study participant. The gathered information was only used for this study and no

other purpose. Departmental heads' approval was taken before distributing the questionnaires.

## Results

This cross-sectional survey study was conducted to assess the level of knowledge of family physicians working in Riyadh, Saudi Arabia about oral health and to identify determinants of oral health knowledge among family physicians. Cronbach's alpha was calculated to assess the reliability of the questionnaire, and it scored at 0.819 for overall items, which reflects good reliability and internal consistency of the items in the questionnaire.

A total of 167 family physicians participated in this study. More than half (55.09%) of the participants were female, the vast majority (90.42%) were Saudi, and the highest number of participants (80.24%) were in the age group of 25 to 34 years. Most (79.64%) of the study participants were residents, and 76.05% had over 5 years of experience. The results of this study revealed that only 7.19% of the family physicians received training on oral health, whereas the vast majority (92.81%) did not. Data are shown in Table 1.

Frequencies of physicians' answers and the mean score of answers for the knowledge of oral health are shown in Tables 2

**Table 1: Characteristics of the participants (n=167)**

	Number	Percentage
Gender		
Male	75	44.91
Female	92	55.09
Age (years)		
18-24	3	1.80
25-34	134	80.24
35-44	18	10.78
45-54	8	4.79
55-64	3	1.80
65-74	1	0.60
Nationality		
Saudi	151	90.42
Non-Saudi	16	9.58
Current position		
Resident	133	79.64
Registrar	13	7.78
Senior registrar	6	3.59
Consultant	13	7.78
SHO <sup>a</sup>	2	1.20
Experience in the medical field (years)		
>5	127	76.05
5-9	13	7.78
10-15	11	6.59
16-20	7	4.19
<20	9	5.39
Receiving training on oral health		
Yes	12	7.19
No	155	92.81

<sup>a</sup>SHO=Senior house officer

and 3. Generally, the total mean score of the whole questionnaire used in this study was  $119.28 \pm 11.26$  out of 175, indicating a poor knowledge level of oral health. For the first domain of *oral health and systemic health*, the overall mean score was  $32.66 \pm 3.73$  out of 50, indicating a poor knowledge of the association of oral health with systemic health. When looking at this domain items, the results showed that most of the family physicians in this study had poor knowledge about the correlation between gingival disease and systemic disease and dental caries and

systemic disease, as most of them incorrectly agreed that they are correlated, at 88.6%, and 85.6%, with mean  $\pm$  SD scores of  $1.72 \pm 0.69$  and  $1.71 \pm 0.88$ , respectively. On the other hand, they were highly knowledgeable about the correlation between infective endocarditis and oral infection and diabetes and oral infection, at 91.0%, and 88%, with mean  $\pm$  SD scores of  $4.32 \pm 0.75$  and  $4.31 \pm 0.81$ , respectively. In addition, 84.4% of the participants knew that there is a correlation between periodontal disease and systemic disease. The results also showed

**Table 2: Frequencies of physicians' answers for the Knowledge of Oral Health (n=167)**

	Disagree		I don't know		Agree	
	Number	Percentage	Number	Percentage	Number	Percentage
<b>Oral health and systemic health</b>						
A. Dental caries and systemic disease	10	6.0	14	8.4	143	85.6
B. Periodontal disease and systemic disease	—	—	26	15.6	141	84.4
C. Gingival disease and systemic disease	2	1.2	17	10.2	148	88.6
D. Atherosclerosis and oral infection	26	15.6	74	44.3	67	40.1
E. Myocardial infarction and oral infection	37	22.2	64	38.3	66	39.5
F. Infective endocarditis and oral infection	4	2.4	11	6.6	152	91.0
G. Bacterial pneumonia and oral infection	25	15.0	77	46.1	65	38.9
H. Diabetes and oral infection	5	3.0	15	9.0	147	88.0
I. Low birth weight and oral infection	22	13.2	89	53.3	56	33.5
J. Preterm labor and oral infection	21	12.6	100	59.9	46	27.5
<b>Pediatric dental health</b>						
A. Age for first primary tooth eruption is between 6 and 12 months of age	7	4.2	32	19.2	128	76.6
B. Age for first permanent tooth eruption is at 6 years of age	16	9.6	70	41.9	81	48.5
C. Pacifiers are risk factors for dentoalveolar malformation in children past the age of 3 years	5	3.0	65	38.9	97	58.1
D. Thumb sucking is a risk factors for dentoalveolar malformation in children past the age of 3 years	9	5.4	39	23.4	119	71.3
E. Breast milk is less cariogenic* than formula milk	13	7.8	48	28.7	106	63.5
F. Sleeping with bottle protects against dental caries	126	75.4	24	14.4	17	10.2
G. Fluoride tooth paste can be used in children younger than 3 years of age	50	29.9	61	36.5	56	33.5
H. The first visit to the dentist should be by 12 months of age	31	18.6	73	43.7	63	37.7
I. Fluoride supplements can be started from the age of 6 months.	29	17.4	73	43.7	65	38.9
J. White spots on teeth or lines can be the first sign of decay	23	13.8	85	50.9	59	35.3
K. Frequency of sugar intake is more important than the amount in causing tooth decay	13	7.8	75	44.9	79	47.3
<b>General dental health</b>						
A. Smoking is a risk factor for periodontal disease	—	—	6	3.6	161	96.4
B. Aging is a risk factor for periodontal disease	15	9.0	35	21.0	117	70.1
C. Stress is a risk factor for periodontal disease	10	6.0	61	36.5	96	57.5
D. Genetic factor is a risk factor for periodontal disease	5	3.0	47	28.1	115	68.9
E. Antihypertensives can increase risk of dental caries	24	14.4	124	74.3	19	11.4
F. Antidepressants can increase risk of dental caries	17	10.2	126	75.4	24	14.4
G. Analgesics can increase risk of dental caries	29	17.4	124	74.3	14	8.4
H. Antibiotics can increase risk of dental caries	31	18.6	93	55.7	43	25.7
I. If needed, pregnant women can be referred to dental care at the second trimester	16	9.6	70	41.9	81	48.5
J. Pregnancy is a risk for dental caries	36	21.6	79	47.3	52	31.1
K. Pregnancy is a risk for dental erosion	31	18.6	82	49.1	54	32.3
L. Pregnancy is a risk for gingivitis	25	15.0	79	47.3	63	37.7
M. Dental plaque is the main cause of periodontal disease	8	4.8	81	48.5	78	46.7
N. Older adult are at increased risk for dental caries	26	15.6	61	36.5	80	47.9

—Reference group, \*Causes tooth decay

**Table 3: Knowledge scores (mean, SD) for all items of the questionnaire**

	Mean	SD
<b>Oral health and systemic health</b>		
A. Dental caries and systemic disease <sup>a</sup>	1.71	0.88
B. Periodontal disease and systemic disease	4.22	0.70
C. Gingival disease and systemic disease <sup>a</sup>	1.72	0.69
D. Atherosclerosis and oral infection	3.30	0.94
E. Myocardial infarction and oral infection	3.22	1.00
F. Infective endocarditis and oral infection	4.32	0.75
G. Bacterial pneumonia and oral infection	3.31	0.90
H. Diabetes and oral infection	4.31	0.81
I. Low birth weight and oral infection	3.32	0.93
J. Preterm labor and oral infection	3.23	0.88
Score of oral health (out of 50)	32.66	3.73
<b>Pediatric dental health</b>		
A. Age for first primary tooth eruption is between 6 and 12 months of age	4.05	0.83
B. Age for first permanent tooth eruption is at 6 years of age	3.54	0.88
C. Pacifiers are risk factors for dentoalveolar malformation in children past the age of 3 years	3.74	0.80
D. Thumb sucking is a risk factor for dentoalveolar malformation in children past the age of 3 years	3.94	0.86
E. Breast milk is less cariogenic <sup>a</sup> than formula milk	3.81	1.02
F. Sleeping with bottle protects against dental caries <sup>a</sup>	4.01	1.09
G. Fluoride toothpaste can be used in children younger than 3 years of age	3.06	1.07
H. The first visit to the dentist should be by 12 months of age	3.28	0.93
I. Fluoride supplements can be started from the age of 6 months	3.28	0.99
J. White spots on teeth or lines can be the first sign of decay	3.26	0.82
K. Frequency of sugar intake is more important than amount in causing tooth decay	3.50	0.84
Score of pediatric dentistry (out of 55)	39.49	4.50
<b>General dental health</b>		
A. Smoking is a risk factor for periodontal disease	4.49	0.57
B. Aging is a risk factor for periodontal disease	3.87	0.90
C. Stress is a risk factor for periodontal disease	3.69	0.86
D. Genetic factor is a risk factor for periodontal disease	3.86	0.76
E. Antihypertensives can increase risk of dental caries	3.01	0.68
F. Antidepressants can increase risk of dental caries	3.07	0.65
G. Analgesics can increase risk of dental caries	2.91	0.63
H. Antibiotics can increase risk of dental caries	3.09	0.84
I. If needed, pregnant women referred to dental care at second trimester <sup>a</sup>	2.54	0.83
J. Pregnancy is a risk for dental caries	3.16	0.99
K. Pregnancy is a risk for dental erosion	3.20	0.92
L. Pregnancy is a risk for gingivitis	3.26	0.87
M. Dental plaque is the main cause of periodontal disease	3.52	0.74
N. Older adult are at increased risk for dental caries	3.47	0.94
Score of general dentistry (out of 70)	47.14	5.75
Total score (out of 175)	119.28	11.26

<sup>a</sup>Reversed score. A 5-point Likert scale was used (1=Strongly Disagree, 2=Disagree, 3=I Don't Know, 4=Agree, and 5=Strongly Agree)

that more than half of the participants do not know that there is a relation between low birth weight and oral infection and preterm

labor and oral infection (53.3% and 59.9%, respectively). It was reported by 77% of the participants that they did not know about the correlation between bacterial pneumonia and oral infection.

For the pediatric dental health domain, 76.6% of the physicians knew that the age for first primary tooth eruption is between 6 and 12 months of age and 71.3% of the physicians knew that thumb sucking is a risk factor for dentoalveolar malformation in children past the age of 3 years. Three quarters (75.4%) of the physicians correctly "Disagree" that sleeping with bottle protects against dental caries, whereas 10.2% agreed on this. The highest percentage (43.7%, each) of the respondents did not know the right time for the first visit to a dentist and for starting fluoride supplements. More than half (50.9%) of the family physicians did not know that white spots on teeth or lines can be the first sign of decay, while 35.3% incorrectly disagreed with it, only 13.8% correctly agreed to that point. Forty-seven (47.3%) of participants agreed that frequency of sugar intake is more important than amount in causing tooth decay, 44.9% said "don't know", and 7.8% disagreed. In general, the total score of this domain was  $39.49 \pm 4.50$  out of 55, indicating a good level of knowledge about pediatric dental health.

The results of this study revealed that family physicians have a poor level of knowledge about general dental health, as the total mean score of this domain was  $47.14 \pm 5.75$  out of 70. The highest level of knowledge in this domain was for smoking, aging, and genetic factors as risk factors for periodontal disease by 96.4%, 70.1%, and 68.9% of the physicians, respectively. For the item "If needed, pregnant women referred to dental care at the second trimester," the majority of the physicians' responses were either "Agree" and "Don't know," whereas only 9.6% gave the right answer "Disagree". Antidepressants, antihypertensive, and analgesic drugs can increase the risk of dental caries; however, almost three quarters (75.4%, 74.3%, and 74.3%, respectively) of physicians answered with a "Don't know."

Knowledge scores for the three domains were calculated by physicians' characteristics and the results are shown in Table 4. Overall, female gender showed a higher mean knowledge score at  $121.38 (\pm 11.09)$  compared to males at  $116.71 (\pm 11.00)$  and was highly statistically significant ( $P = 0.007$ ). There was a statistically significant difference in the oral health knowledge score by age, where the highest knowledge score was for the age group of 55 to 64 years at  $141.33 \pm 8.08$ . Non-Saudi physicians showed a statistically significant higher oral health knowledge scores at  $130.13 \pm 11.87$ , compared with Saudi ones at  $118.13 \pm 10.60$ , with  $P < 0.001$ . For position and oral health knowledge, registrars scored the highest knowledge at  $131.08 \pm 15.69$ , with a significant difference compared with other positions at  $P = 0.001$ . There was a statistically significant correlation between experience in the medical field and oral health knowledge, where the knowledge score was found to increase by increasing the experience years, reaching its highest with those having experience of 16 to 20 years at  $130.00 \pm 13.30$ . However, it decreased again with physicians having experience lesser than 20 years. Family physicians who

**Table 4: Knowledge scores (mean, SD) in the three domains among the physicians (n =) by their characteristics**

	Oral health and systemic health			Pediatric dental health			General dental health			Total knowledge		
	Number	Percentage	P	Number	Percentage	P	Number	Percentage	P	Number	Percentage	P
Gender												
Male	32.17	3.59	0.129	38.47	4.45	0.008 <sup>a</sup>	46.07	5.68	0.029 <sup>a</sup>	116.71	11.00	0.007 <sup>a</sup>
Female	33.05	3.81		40.32	4.40		48.01	5.69		121.38	11.09	
Age (years)												
18-24	32.67	6.66	0.072	35.33	4.04	<0.001 <sup>a</sup>	47.00	6.08	<0.001 <sup>a</sup>	115.00	15.52	<0.001 <sup>a</sup>
25-34	32.30	3.71		38.80	4.21		46.29	5.25		117.39	10.14	
35-44	34.50	3.28		42.39	4.24		51.39	5.54		128.28	11.79	
45-54	33.13	2.64		43.75	3.96		47.00	6.59		123.88	10.43	
55-64	37.00	2.65		45.00	5.29		59.33	5.13		141.33	8.08	
65-74	31.00	—		41.00	—		49.00	—		121.00	—	
Nationality												
Saudi	32.50	3.77	0.085	39.12	4.37	0.001 <sup>a</sup>	46.52	5.32	<0.001 <sup>a</sup>	118.13	10.60	<0.001 <sup>a</sup>
Non-Saudi	34.19	3.04		42.94	4.42		53.00	6.54		130.13	11.87	
Current position												
Resident	32.34	3.79	0.195	38.77	4.28	<0.001 <sup>a</sup>	46.43	5.51	0.004 <sup>a</sup>	117.53	10.54	<0.001 <sup>a</sup>
Registrar	34.69	4.15		44.15	5.32		52.23	7.54		131.08	15.69	
Senior registrar	33.00	2.19		42.83	2.40		46.50	3.78		122.33	3.88	
Consultant	33.77	2.89		40.77	3.37		48.77	4.38		123.31	8.37	
SHO <sup>b</sup>	32.50	0.71		38.50	2.12		52.50	2.12		123.50	0.71	
Experience in the medical field (years)												
>5	32.25	3.82	0.123	38.65	4.23	<0.001 <sup>a</sup>	46.24	5.33	0.001 <sup>a</sup>	117.13	10.36	<0.001 <sup>a</sup>
5-9	33.23	2.65		39.62	3.69		47.23	3.94		120.08	7.49	
10-15	34.64	3.50		43.09	4.25		52.18	5.36		129.91	11.75	
16-20	34.29	3.40		44.71	3.20		51.00	9.24		130.00	13.30	
<20	33.89	3.33		42.67	4.82		50.56	6.42		127.11	12.30	
Receiving training on oral health												
Yes	33.83	2.98	0.259	40.92	3.34	0.254	49.42	5.33	0.155	124.17	9.32	0.119
No	32.57	3.77		39.37	4.57		46.96	5.76		118.90	11.33	

<sup>a</sup>Significant P value <sup>b</sup>SHO=Senior house officer

received training on oral health showed a nonsignificant higher total mean knowledge score compared with those who did not receive training at 124.17 ± 9.32 versus 118.90 ± 11.33, with P = 0.119. When looking at each of the studied domains separately, it is noted that the knowledge score in both pediatric dental health and general dental health differed significantly by gender, age, nationality, years of experience, and study. In contrast, oral health and systemic health score did not show a significant difference with any of these factors.

Univariate logistic regression analysis was done to assess the factor associated factors with a low level of oral health knowledge, and the results are shown in Table 5. Men showed more than two times the risk of poor knowledge with OR 2.42 (95 C1% 1.29–4.52; P = 0.006). Physicians aged <35 years having significantly more than five times (OR =5.79) increased risk of low oral health knowledge (95% CI 2.22-15.07 and p<0.001). The Saudi nationality was a risk of low oral health knowledge with OR 9.02 (95% CI 1.98-41.06, and P 0.004).. In addition, resident position and experience of more than 5 years were significant risk factors for low oral health knowledge, as OR was 4.75 and 5.48, respectively, and P < 0.05 in both cases.

**Table 5: Univariate logistic regression for associated factors with low knowledge of oral health**

	OR	95% CI		P
		Lower	Upper	
Gender				
Male	2.42	1.29	4.52	0.006 <sup>a</sup>
Female <sup>b</sup>	1.00	—	—	—
Age (years)				
<35	5.79	2.22	15.07	<0.001 <sup>a</sup>
≥35 <sup>b</sup>	1.00	—	—	—
Nationality				
Saudi	9.02	1.98	41.06	0.004 <sup>a</sup>
Non-Saudi <sup>b</sup>	1.00	—	—	—
Current position				
Resident	4.75	2.00	11.29	<0.001 <sup>a</sup>
Other <sup>b</sup>	1.00	—	—	—
Experience in the medical field (years)				
<5	5.48	2.41	12.49	<0.001 <sup>a</sup>
≥5 <sup>b</sup>	1.00	—	—	—
Receiving training on oral health				
Yes	0.64	0.19	2.09	0.456
No <sup>b</sup>	1.00	—	—	—

<sup>a</sup>Significant P value. <sup>b</sup>Used as a reference, —Reference group

However, when multivariate regression analysis was done, the male gender was the only factor that remained a statistically significant risk factor for low oral health knowledge, as shown in Table 6.

## Discussion

Primary care providers, particularly family physicians, might have a profound impact on the oral health of their patients through integrating oral health in their practices, which can effectively address patients' oral health needs. This study was conducted to assess the knowledge of family physicians regarding oral health and to shed light on areas in which they need to improve their knowledge. We tried to collect important data regarding systemic health and oral health, pediatric dental health, and general dental health from the participating physicians. Overall, the results of this study showed a substantial lack of knowledge among family physicians regarding oral health. Such a finding is in line with a recently published similar study from India<sup>[13]</sup> and other local, national, and international studies.<sup>[14-21]</sup> This lack of knowledge may act as a barrier to physicians' OHC delivery.

Training is critical for preparing physicians to take on new and expanded roles in OHC.<sup>[22]</sup> In addition, it provides an excellent basis for developing their understanding of dental health. Usually, most young children are not examined by a dentist till they reach the age of 3 years; however, within the first year of their life, they visit primary care providers, including physicians, many times for health screenings.<sup>[23]</sup> If physicians are sufficiently knowledgeable about OHC, they can provide consultation to the parents regarding feeding practices, oral home care (brushing/flossing), and fluorides. Furthermore, they could diagnose a carious lesion in its early stage and refer the child to a dentist

for preventive procedures or early treatment, if necessary. As per the literature,<sup>[24]</sup> some of the US health care centers provide oral health content during training sessions for their primary care providers and physicians to embrace OHC as an integral part of primary care.<sup>[24]</sup> Unfortunately, in this study, 92.81% of the participants did not undergo training in oral health, indicating a lack of OHC training and, consequently, a low level of knowledge.

Despite the well-established relationship between oral health and systemic/general health,<sup>[25-27]</sup> family physicians who participated in this study showed a poor level of knowledge in terms of oral and systemic/general health. Kane<sup>[2]</sup> reported that atherosclerotic vascular disease, diabetes, pulmonary disease, and pregnancy-related complications are common to major conditions and have been well-studied for their relationship to oral health. However, it is worthy to mention here that although many of the studies on oral disease have not shown a statistically significant impact on these systemic conditions, neither profession will deny that maximizing a patient's health is advantageous.

The pediatric dental health domain showed the highest knowledge score in this study. In contrast to this finding, Rabiei, et al. reported that the knowledge score was significantly lower in the pediatric domain than in the dental and medical domains.<sup>[14]</sup> In addition, the findings of this study are dissimilar to those in other investigations regarding physicians' knowledge about early childhood caries and infant oral health.<sup>[17]</sup> The initial carious lesions are the so-called *white spot* lesions,<sup>[28]</sup> and to diagnose the earliest stages of enamel demineralization, accurate and reliable detection of such lesions is very important. In this study, most of the participants either did not know this or disagreed on it. In accordance with a previous local study,<sup>[29]</sup> this study showed that most of the family physicians were knowledgeable regarding the eruption age of the first primary tooth. In addition, most of them were aware of the effect of bottle night feeding on children's teeth, and this is similar to the findings reported by Indira, et al.<sup>[30]</sup> In Patna, India, a study published in 2017 showed that both pediatricians and family physicians were less aware of the first dental visit, including early childhood caries.<sup>[31]</sup>

It has been reported in the literature that periodontal disease can lead to adverse pregnancy outcomes.<sup>[32,33]</sup> Therefore, physicians are expected to have a thorough knowledge of the impact of oral health on pregnancy and when to refer them to a dentist. However, in our study, only a few participants were aware of this fact. Similar findings were observed in previous studies conducted elsewhere on physicians and health care providers.<sup>[14,22]</sup>

Women showed a significantly higher knowledge score than men. The results of this study are in line with the other studies such as those by Schwarz<sup>[34]</sup> and Al-Omari and Hamasha,<sup>[35]</sup> in which women showed significantly higher oral health knowledge compared with men.

**Table 6: Multivariate logistic regression for associated factors with low knowledge of Oral health**

	OR	95% CI		P
		Lower	Upper	
Gender				
Male	2.72	1.36	5.42	0.004 <sup>a</sup>
Female <sup>b</sup>	1.00	—	—	—
Age (years)				
<35	2.68	0.43	16.53	0.288
≥35 <sup>b</sup>	1.00	—	—	—
Nationality				
Saudi	3.81	0.59	24.65	0.160
Non-Saudi <sup>b</sup>	1.00	—	—	—
Current position				
Resident	0.21	0.01	3.17	0.258
Other <sup>b</sup>	1.00	—	—	—
Experience in the medical field (years)				
<5	5.48	2.41	12.49	<0.001 <sup>a</sup>
≥5 <sup>b</sup>	1.00	—	—	—
Receiving training on oral health				
Yes	6.74	0.70	64.51	0.098
No <sup>b</sup>	1.00	—	—	—

<sup>a</sup>Significant P value. <sup>b</sup>Used as a reference, —Reference group

Based on the current study results, the overall level of knowledge was poor. The highest score was in the domain of pediatric dental health. Highest level of knowledge was among non-Saudi participants, females, older age groups and individuals with more years of experience, but the level falls again above 20 years of experience. Health care authorities should seek the reasons for the low training rate of family physicians on OHC, which might include the lack of training programs. Education and clinical training about the basic information for the maintenance of oral health should be included in the medical education and training curriculum. In addition, continuous education and training programs like web-based or distance training, in-service training, workshops, and seminars should be considered.

### Limitation

This was a cross-sectional study; therefore, we could not establish causality. A longitudinal study is needed to understand the possible determinants of OHC knowledge in different settings. The sample size was small and the majority of the participants were residents; therefore, the results cannot be generalized to cover all family physicians in Saudi Arabia. Due to a lack of time and resources, we could not assess the practices of oral health among family physicians.

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### Conflicts of interest

There are no conflicts of interest.

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