



Referral Patterns of Pediatricians and General Medical Practitioners to Pediatric Dental Clinics and Oral Health Information in Riyadh, Saudi Arabia: A cross-sectional study

Latifa Alhawaish^{1*}, Aziza Aljohar², Mostafa Arafa³, Lujane Almarshad⁴, Reem Binrabbaa⁵, Sara Albabtain⁵

¹Department of Pediatric Dentistry and Orthodontics, King Saud University, Riyadh, Saudi Arabia

²American Board of Pediatric Dentistry, King Faisal Hospital and Research Center, Riyadh, Saudi Arabia

³Epidemiology, King Saud University, Riyadh, Saudi Arabia

⁴Department of Pediatric Dentistry, King Saud University, Riyadh, Saudi Arabia

⁵General Dentist, Ministry of Health, Riyadh, Saudi Arabia

ABSTRACT

Introduction: The single most chronic disease impacting children worldwide is dental caries. Complications caused by dental caries could be contributing factors for pediatric mortality, although this disease is completely preventable.

Aims: This study aimed to evaluate physicians' dental knowledge, preventive measures they would provide, and their referral patterns to pediatric dentists.

Materials and Methods: A cross-sectional survey was conducted in Riyadh, Saudi Arabia. The survey comprised 24 questions, distributed into the following five sections: demographic data, dental knowledge, participation in oral preventive measures, case scenarios, and one question about the participants' opinion in implementing oral health rotations in the pediatric residency program.

Result & Discussion: A total of 406 physicians participated in this study. Only 4.4% of the participants correctly answered all the questions based on dental knowledge; the mean score of those with correct dental knowledge was 2.95 ± 0.9937 out of 5. No significant difference was detected in the total knowledge score according to gender ($P=0.315$), specialty ($P=0.463$), and years of experience ($P=0.985$). Common causes for referral were dental pain or swelling (67%) followed by a child with dental caries (43.6%). Less than 60% of the respondents would refer children to any dentist in the same hospital, while 28% only advise parents to consult a dentist.

Conclusion: The current level of oral health knowledge among physicians in Saudi Arabia is not satisfactory to effectively refer pediatric patients to dentists. The integration of oral health in medical undergraduate and specialty training programs is vital for achieving disease prevention goals.

Key words: Oral health, Prevention, Pediatrician, Pediatric dentist, Children, Referral

HOW TO CITE THIS ARTICLE: Latifa Alhawaish, Aziza Aljohar, Mostafa Arafa, et al. Referral Patterns of Pediatricians and General Medical Practitioners to Pediatric Dental Clinics and Oral Health Information in Riyadh, Saudi Arabia: A cross-sectional study, J Res Med Dent Sci, 2021, 9(S1): 10-18.

Corresponding author: Latifa Alhawaish

e-mail ✉: Lalhawaish@ksu.edu.sa

Received: 01/03/2021

Accepted: 15/03/2021

INTRODUCTION

The single most chronic disease impacting children on an international scale is dental caries [1]. Complications caused by dental caries could be contributing factors to deaths among children [2,3] although this disease is completely preventable. Over the last decade, there has been an increasing emphasis on the integral nature

of oral health to overall health, and such awareness paves the way for attention toward the role of medical providers in oral health. Since pediatricians treat young children regularly, often within the first three years of life [4], they are well-suited for incorporating oral health knowledge into their practice; moreover, oral health anticipatory guidance adheres with pediatricians' emphasis on prevention and early establishment of lifelong healthy habits.

The role of a pediatrician in oral health was formalized with the 2003 American Academy of Pediatrics (AAP) policy statement which recommended that pediatricians and other primary care providers should incorporate

preventive oral health education into their practices, and that oral health risk assessment by a pediatrician or a primary care provider is needed by the time the children are 6 months of age [4].

There are also other reasons as to why pediatricians include oral health within their practice; however, children face obstacles in gaining access to professional dental care for various reasons, including a limited dental workforce to deliver preventive oral health services to young children. Further, international data indicate that few general dentists treat children under four years of age [5]. Such a limitation results from inadequate dental school training concerning the care of infants and toddlers, poor Medicaid reimbursement, and maldistribution of the workforce. However, access to medical care is not fraught with these same challenges; even children who do not have access to a dentist almost always have access to pediatric well-child care; thus, pediatricians' involvement in oral health is motivated by young children not having any alternative source of preventive dental attention [6].

Remarkably, the past few decades have witnessed an increased focus on oral health as well as the social, psychological, and developmental consequences of untreated oral diseases [7] in Saudi Arabia; undeniably, dental caries is the most prevalent chronic childhood disease in Saudi Arabian children [6]. Several recent studies have demonstrated a high prevalence of caries in children under 5 years of age [8,9] with most of the parents, on an average, stating that their children did not visit a dentist until the fifth year of life [7-10].

A medical check-up is a common practice for children from birth to adolescence [11]; however, children and their parents would usually visit a dentist only "when there is a problem." Moreover, the correlation between systemic conditions and oral health is still being underestimated, leading to the undesired, avoidable medical consequences of untreated dental disease [12].

Dental caries is a multifactorial infectious disease caused by the bacteria in the dental plaque [12]; it critically influences the health and development of children, and poor oral health has been associated with chronic diseases such as childhood obesity [13,14].

A review of [27] published surveys, conducted between 1988 and 2010, on childhood caries in Saudi Arabia reported that the prevalence of dental caries and its severity was approximately 80% for primary dentition and 70% for children with permanent dentition [15]. Oral health conditions impact approximately 3.9 billion people globally [16], and childhood caries represents a serious public health problem worldwide as well as in Saudi Arabia.

The Royal Australian College of Physicians (RACP) released a position statement in 2012 highlighting the fact that pediatric oral health is one of the greatest areas of health inequity, and that large number of children do not visit dentists before starting school. In this regard, it

is important for the other relevant health professionals to feel sufficiently equipped to examine the mouth, provide appropriate advice, and refer patients as necessary [17,18]. From this perspective, it seems prudent to state that pediatricians, as well as GPs, should be aware of the emerging and increasing oral health issues among the pediatric population, particularly, considering the association between dental caries and comorbid chronic diseases [19].

A study led by Long et al. [20], conducted in 2008, highlighted the fact that the disparity between the number of medical visits to that of dental visits was 250 to 1 for infants and toddlers. The American Dental Association (ADA) and the AAP recommend that the first dental assessment should be conducted before the child is 1 years old, which marks the time when the first tooth erupts. However, not all children have access to professional dental care; therefore, we should take advantage of the fact that children typically have contact with a general medical practitioner (GMP)/pediatrician before they visit a dentist [21]. Thus, pediatricians could initiate the first step toward the prevention of dental caries in children by referring them to dentists once they reach an age where preventive measures are particularly effective [22]. Existing studies conducted within Saudi Arabia on pediatricians and GMPs, in terms of the extent of their oral health education, dental knowledge, and the preventive aspects, indicate that during medical school and training, they receive was scarce and limited information on oral health. Thus, it is evident that a lack of dental knowledge and training appear to limiting pediatricians and general physicians from playing a more active role in pediatric oral healthcare [21,23,24].

A survey conducted in Jeddah, Saudi Arabia, confirmed that, although the attitude and behavior scores of pediatricians indicate their willingness to participate in oral care [25], the knowledge required is still lacking. In 2013, a study assessing the oral health-related knowledge and attitudes in Saudi medical students was conducted; the authors concluded that more oral health-related training is warranted among medical students to improve pediatric oral health screening and referrals in practice [26].

Another study conducted in Saudi Arabia, published in 2019, revealed that a majority of the pediatricians and family physicians consider themselves knowledgeable in oral health issues, agreeing that they play an important role in oral health promotion. However, there remained a deficit in the knowledge of the associated oral health practice and provision of oral health assessments [27].

In contrast, a study conducted in the USA in 2000 recommended the addition of a module on oral health and dental care to the undergraduate medical school physical examination skills courses, as well as a clinical rotation in oral health within the pediatric residency curriculums [28].

This study aimed to assess the current state of pediatric dental health knowledge, potential participation within

oral preventive measures among pediatricians and GMPs, and referral from the medical team to the dental team within Riyadh, Saudi Arabia.

MATERIALS AND METHODS

The current study was conducted in Riyadh City, the kingdom of Saudi Arabia, over a period of 5 months. The study participants included a range of certified pediatricians (residents, specialists, and consultants) within different subspecialties, as well as GMPs from government, private, and academic health sectors. Based on 50% prevalence of knowledge level, 20% degree of precision, and 95% confidence interval, the sample size needed was calculated to be 400 participants. The dental research ethics committee of the College of Dentistry, King Saud University, approved the study and its research protocol before the initiation of the survey. Additionally, the research ethics committee approved the acquisition of verbal consent from each participant.

- Section One: Demographic data and practice information (age; gender; years in practice; specialty; type of practice; questions regarding oral health information).
- Section Two: Five questions were constructed, with a score of 1 assigned to the correct answer and a score of 0 assigned to the wrong answer to assess the present dental knowledge. All the scores were combined for a maximum total knowledge score of 5.
- Section Three: Four questions were provided to evaluate the participation of pediatricians and general practitioners (GPs) in oral preventive measures, with the answers scored on a four-point Likert scale (the highest score of 4 indicating very likely to participate in oral preventive measures, and the lowest score of 1 indicating highly unlikely to participate in oral preventive measures).
- Section Four: Five case scenarios were designed to evaluate the willingness of pediatricians and GPs in referring patients to pediatric dentists, with the answers being scored on a scale of five measures (ranging from 5 (always) to 1 (never), with 5 being the highest score). This was then followed by two multiple-choice questions concerning the different factors potentially preventing pediatricians and GPs from referring patients to dental clinics.
- Section Five: A question was added regarding the participants' opinions on the implementation of oral health rotations within the pediatric residency program.

Statistical analysis was conducted using SPSS, version 22. Armonk, NY: IBM Corp. Simple frequency distribution was used to describe the distribution of different variables, and cross tables and chi-square tests were used to calculate the level of significance (determined at a 95% confidence interval). For non-parametric data, the Mann-Whitney U test and Kruskal-Wallis test were used for comparison; Z-test was additionally used to compare the proportions of different values.

RESULTS

Among the 682 questionnaires distributed, 440 was returned, with a response rate of 64.5%; 34 questionnaires returned were incomplete and thus excluded from the study. The final analysis was performed on 406 participants; among them, 53.2% participants belonged to the young age group of 25–35 years, with 60% men, and more than two-thirds (68%) were pediatricians. More than half of our participants (57.1%) practiced in government hospitals, and 56% reported to have received oral health information (Table 1). The main source of oral health information for this group was the internet (15%), personal communication (12.1%), media (11.1%), continuous medical education (7.4%), and conferences and scientific journals (4.4%).

Table 2 illustrates the answers to the knowledge-based questions. Only 4.4% of the participants answered all knowledge-related questions correctly, and the mean score of correct knowledge was 2.95 ± 0.9937 out of 5 (58.96%). Notably, most of the physicians (82.5%) recognized the fact that the frequency of sugar intake was the most important factor for tooth decay. However, only over one-third (34.5%) of the participants knew that the correct age of the first dental visit should be at the time of the eruption of the first tooth, with nearly 60% stating that they would refer a child with neonatal teeth

Table 1: General characteristics of the study sample

Characteristic	Number (%)
Physicians Age in years	
25-35	216 (53.2)
36-45	107 (26.4)
46-55	59 (14.5)
56-65	24 (5.9)
Missing response	-
Gender	
Male	245 (60.3)
Female	159 (39.2)
Missing response	2 (.5)
Specialty	
GP	126 (31)
Pediatrician	278 (68.5)
Missing response	1 (.2)
Years of experience	
01-May	205 (50.5)
06-Oct	63 (15.5)
Nov-20	76 (18.7)
21-30	94 (12.1)
>30	12 (3.0)
Missing response	1 (.2)
Practice	
Private	49 (12.1)
Governmental	232 (57.1)
Academic	50 (12.3)
Missing response	-
Received Oral health information	
Yes	173 (42.6)
No	229 (56.4)
Missing response	3 (.7)

Table 2: Participants’ responses oral health-related knowledge questions.

Question	Number (%)
Causes of tooth decay	
Frequency of sugar intake	335 (82.5)
Amount of sugar intake	24 (5.9)
I do not know	46 (11.3)
Child Age when First dental visit is required	
6-12 month (when the first tooth erupts)	140 (34.5)
18 month	127 (31.3)
2–3 years	139 (34.2)
Management of neonatal teeth	
Reassure parents and recall in 1 month	47 (11.6)
Refer to pediatric dentist	246 (60.6)
Refer to pediatric dentist only if the tooth is mobile or there was feeding problem	106 (26.1)
Self-management (remove tooth)	6 (1.5)
ECC only affects bottle-fed babies	
TRUE	205 (50.5)
FALSE	199 (49)
Mother’s dental health affects her child	
True	271 (66.6)
FALSE	132 (32.5)

Table 3: Participants’ responses to the likelihood of participation in providing oral disease preventive measures.

Preventive measures	Response	Number (%)
Examining the child's oral cavity & teeth even if not medically required	Very likely	165 (40.6)
	Likely	175 (43.1)
	Unlikely	44 (10.8)
	Highly unlikely	21 (5.2)
Applying topical fluoride (i.e., gel, varnish)	Very likely	43 (10.6)
	Likely	104 (25.6)
	Unlikely	165 (40.6)
	Highly unlikely	90 (22.2)
Providing specific diet and oral hygiene advice to prevent dental caries	Very likely	148 (36.5)
	Likely	175 (43.1)
	Unlikely	57 (14)
	Highly unlikely	20 (4.9)
Advising all parents to visit the dentist for checkups every 6 months	Very likely	128 (31.5)
	Likely	184 (45.3)
	Unlikely	67 (16.5)
	Highly unlikely	24 (5.9)

Table 4: Significant differences regarding oral health related preventive measures across specialty and years of experience.

Preventive measure	Specialty	Number	%	Z	P	
Examining the child's oral cavity & teeth even if not medically required	GP	37	22.40%	3.159	0.0016*	
	Pediatrician	128	77.60%			
	Years of experience	1-5 years			3.075	0.0021*
		>30 years	65	39.40%		
			9	5.50%		
	Applying topical fluoride (i.e., gel, varnish)	GP	10	23.30%	1.232	0.2179
Pediatrician		33	76.70%			
Years of experience		1-5 years	19	44.20%	3.478	0.0005*
		>30 years	6	11.60%		
Providing specific diet and oral hygiene advice to prevent dental caries		GP	45	30.40%	0.361	0.7181
	Pediatrician	103	69.60%			
	Years of experience	1-5 years			1.877	0.0605
		>30 years	65	43.90%		
			7	4.70%		
	Advising all parents to visit the dentist for checkups every 6 months	GP	35	27.30%	1.182	0.2372
Pediatrician		93	72.70%			
Years of experience		1-5 years	59	46.10%	0.951	0.3416
		>30 years	5	3.90%		

to a pediatric dentist. It was established that only 1.5% of the participants would extract the tooth themselves, and no significant difference was detected in terms of participants' sex (Mann-Whitney U; $P=0.315$), specialty (Kruskal-Wallis test; $P=0.463$), and years of experience (Kruskal-Wallis test, $P=0.985$) when evaluating their knowledge scores.

Moreover, Table 3 shows the responses of the participants regarding the likelihood of GPs and pediatricians participating in the provision of preventive measures (*i.e.*, examining the child's oral cavity and teeth, even if not medically required; providing specific diet and oral hygiene advice to prevent dental caries; guiding parents toward dental visits and regular check-ups); the results indicate a very high likelihood by GPs and pediatricians to provide the aforementioned preventive measures (83.7%, 80%, and 76.8%, respectively). The other preventive measure, fluoride application, was far more unlikely to be done by physicians (62.8%).

A significant difference was detected only for the first and second preventives measures, whereby pediatricians were more likely to resort to such measures. This likelihood of their participation in the provision of oral disease preventive measures can be attributed to the influence of specialty and years of experience of the participants. Further, with regards to the application of topical fluoride, a significant difference was detected for years of experience; those with lesser than 5 years of experience were significantly more likely to apply fluoride in comparison with those with more than 30 years of experience ($P=0.0005$) (Table 4).

The responses by physicians regarding the patterns of referring patients with different case scenarios to pediatric dental clinics can be seen in Table 5. Of the five case scenarios, cases of oral or facial trauma and dental pain or swelling would always be referred (67%), followed by cases of dental caries (43.6%).

Notably, less than 60% of the respondents would refer children to any dentist within the same hospital, while only 28% stated that they would advise parents to consult a dentist. Further, 5% of the clinicians would not refer such patients to any dentist. The only significant factor found to influence the referral of pediatric patients was the specialty, whereby pediatricians referred pediatric patients more frequently than the GMPs in all the given case scenarios.

Among the factors mentioned by physicians, a factor potentially preventing them from referring pediatric patients to dental clinics was uninsured patients (14%), patients with limited/difficult access to dentists (7.2%), and dental referral not being a priority in a typical busy clinic of the current times (6.2%). Almost half of the participants (48.3%) had no issues in referring their patients to pedodontists. The last question of the survey aimed to assess whether physicians support the addition of a module on oral/dental health rotations to the current pediatric residency curriculums; the results of this query highlighted that most of them (82%) agreed that the inclusion of such a module would be beneficial.

A logistic regression model was built, whereby all independent variables, potentially determining the referral pattern of pediatricians and GMPs to a pediatric

Table 5: How likely pediatricians and GPs would refer the following cases?

Case scenario's	Response	Number (%)
A Child whom you examined and found dental caries	Always	177 (43.6)
	Often	111 (27.3)
	Sometimes	83 (20.4)
	Rarely	25 (6.2)
	Never	5 (1.2)
A child with a chronic medical condition (DM, asthma, adenoids...)	Always	51 (12.6)
	Often	103 (25.4)
	Sometimes	132 (32.5)
	Rarely	95 (23.4)
	Never	23 (5.7)
A child with a planned operation or in need of cancer therapy in the near future.	Always	84 (20.7)
	Often	88 (21.7)
	Sometimes	114 (28.1)
	Rarely	67 (16.5)
	Never	46 (11.3)
A child with history of oral or facial trauma, dental pain/swelling.	Always	272 (67)
	Often	84 (20.7)
	Sometimes	24 (5.9)
	Rarely	18 (4.4)
	Never	6 (1.5)
A child with a disability or learning difficulty	Always	83 (20.4)
	Often	84 (20.7)
	Sometimes	131 (32.3)
	Rarely	79 (19.5)
	Never	24 (5.9)

dentist, were added. None of the independent variables were found to be significantly associated with referral, and P was <0.05 for all variables.

DISCUSSION

The World Health Organization's first goal for oral health in 2020 is to minimize the impact of oral diseases on health and psychosocial development, as well as to emphasize the promotion of oral health and the reduction of oral diseases [29]; cooperation between healthcare providers (*i.e.*, GMPs, pediatricians, and pedodontists) to improve children's oral health would aid in attaining such a goal.

Despite all the efforts made to reduce the prevalence of caries among the children in Saudi Arabia, it seems nothing is particularly effective to date; this is likely spurred by the fact that children are typically not seen early enough by dentists within the community as compared with pediatricians and GPs [27]. A minimal number of studies have investigated this aspect alongside the attitude of the pediatrician toward pediatric oral health; however, none were similar to the present study, which considered the referral patterns.

The current study sheds light on a crucial health care issue: the degree of knowledge and preventive awareness present within GMPs and pediatricians in terms of the dental diseases of children. Such an understanding would be guaranteed to wield a positive influence over the overall healthcare provided to children.

The main finding of the current study is the absence of adequate dental knowledge; this may be a primary barrier to effective dental referral among children. Oral health knowledge among physicians is currently not sufficient for effective referral (only 4.4% of the physicians answered all oral health knowledge-related questions correctly, with the percentage of correct mean knowledge score being 2.95%). These results correlate with those reported in the study conducted by Sabbagh et al. in Jeddah [25], Saudi Arabia. Alshunaiber et al. similarly reported an acceptable level of knowledge among their sample of pediatricians in Riyadh, Saudi Arabia, despite there being a discrepancy between their practices [27]. In Turkey, Sezer et al. found a lack of dental knowledge among physicians, with only 13.9% of the participants stating that they would refer a 1-year-old or younger patient to a dentist [30]; conversely, a sample of Indian physicians was found to possess a higher level of knowledge and willingness to provide oral health advice [31].

Adequate children's oral health knowledge is of high importance when it comes to the prevention of dental caries, as well as its associated adverse effects [27]. Of note, Prakash et al. have reported the importance of the knowledge of caregivers and the vital influence of this knowledge on the oral health of children [21].

The knowledge score was not significantly impacted

by discrepancies between participants' sex or years of experience; however, the results were impacted by differences between GMPs and pediatricians. This finding correlates with that of Nassif et al., who conducted their study in Lebanon [32].

The basic knowledge needed for referral should be adequate, particularly among specialized physicians, and yet the presence of several glitches and gaps in the knowledge of the physicians within the current study would have impacted their referral practice, particularly among GMPs. This could also be influenced by the wide spectrum of treatment and management they provide in a shortage of time.

Respondents were asked to report the likelihood of performing some oral health-related activities during well-child visits, and a majority of the pediatricians and GMPs (83.7%) stated that the examination of the oral cavity and teeth would likely be done, with similar findings reported by previous studies [21,25,33]. The majority of the participants additionally mentioned that they would be more likely to provide dietary counseling to parents (as recommended by the APA, which is considered as an essential part of general health counseling). Furthermore, a similarly high percentage of participants responded positively toward advising the parents about dental visits, demonstrating the fact that pediatricians and GMPs agreed upon the importance of oral health education and guidance during child visits. Over one-third of the respondents (36%) were willing to incorporate fluoride application in their practice. A study conducted by Ditto et al. (2009) reported that only 7% of the physicians believed that the application of fluoride should be part of a sufficient childcare visit [23]. Lack of knowledge on preventive dentistry, interest, and time, as well as the cost of the dental materials, may additionally act as a contributing factor to such findings, suggesting a lack of awareness on the positive effects of fluoride [34].

Cases of dental pain and oral/facial trauma/swelling were always referred to pediatric dentists, thus reflecting the concern of pediatricians and GMPs regarding any visible problems. To a lesser extent (71%), children with dental caries would be referred often and/or always. Unfortunately, this is considered insufficient in preventing the consequences reported by Kagihara et al. (2009), who stated that when dental caries is left untreated, pain, bacteremia, and high treatment costs are anticipated, and this can additionally impact the growth and development of a child's speech, leading to premature tooth loss and compromised chewing and self-esteem [35].

Surprisingly, children with chronic medical conditions, planned operations, or necessary cancer therapy possess the least chances of referral; this could be ascribed to the participants' limited knowledge and awareness on the relevance of such medical problems to dental health. This result correlates with those of several previous studies whereby the oral-medical connection was not very clear to the participants [23,34].

It was reported that barriers to successful referral were mentioned by more than 50% of the respondents in a previous study, with a slightly higher percentage (57%) being detected among the respondents within the current study [23].

Perhaps the reluctance to carry out a dental examination in children lies in the fact that the responders felt it was difficult to refer the patients onwards to public and private dental clinics. In this regard, we can confirm that their concerns are well-founded; previous studies have shown that clinicians are more likely to refer children if they were confident of the referral environment [36].

In Saudi Arabia, like other countries worldwide, public dental practices have long waiting lists, thus adding to the pre-existing complexity of access caused by the issue of dental service availability [37,38]. This fact makes the collaboration with medical GPs and pediatricians even more essential; thus, early referral, detection of dental problems, and prevention should be the primary aim.

Considering nearly around half of the sample claimed that they had not received any oral health information during their studies, reflecting their care concerning dental health, correlating with the results of Prakash et al. [21], a majority of the pediatricians and GMPs supported the idea of adding oral health rotations to the pediatric residency curriculum; importantly, the existing literature suggests that medical healthcare providers generally possess a positive attitude toward the importance of oral health in children, and express willingness to perform oral health activities [21,28,39].

Oral health education has traditionally been rather far down on the priority scale in the education programs of medical students/postgraduate education for pediatricians globally [37,38]. In fact, oral health has mostly not been an element in the purview of medical practitioners, which is strangely disconnected from health and development [40]. Thus, to address this knowledge and practice gap, oral health education is vital among healthcare professionals, and pediatricians do not stand alone in their lack of comfort in addressing oral health issues [41]. Several medical school surveys have similarly showcased a lack of comprehensive instruction on dental topics, as well as an absence of standardized learning objectives, teaching methodology, and assessment [42-44].

It has been suggested that oral health and dental care modules are incorporated into the curriculum of pediatric training for general pediatrics. Further, a rotation with pediatric dental professionals within a hospital/community could additionally provide postgraduate specialist trainees with practical skills in assessing the oral health of children and the potential risk of dental diseases [24].

Notably, conferences, scientific journals, and continuous medical educations were the least common sources of dental information among the respondents, while a significant number of physicians (50.3%) received

their information from combined sources (e.g., media; the Internet; personal communications; continued education; conferences; scientific journals), which would significantly impact their knowledge levels.

A total of 80% of the young children in Saudi Arabia have caries in their primary teeth [15]; the efforts of members in healthcare teams, including those of pediatricians, should be coordinated to control such a preventable disease.

There are several limitations to this study. The modest response rate is one limitation that has the potential to impact the generalizability of the findings; the sample was a convenient one, and thus [45,46] could potentially result in selection bias. Notably, a difficulty that arose during the data collection phase was that of the long waiting time needed to gain approval from each hospital to survey pediatricians working there. The final issue is that of the answers all being self-administered, which paves the way for them being misleading and/or inaccurate in occasional cases [27].

CONCLUSION

The results of this study provide valuable motivations and perspectives for the initiation of appropriate oral health programs for future pediatricians. A high degree of willingness was demonstrated by the respondents when it came to participating in the improvement of dental health within the community through their highly essential role. Improving oral health in children is driven by several imperatives: primarily, economic prosperity depends on a radical upgrade of prevention within our healthcare systems, and this fits very well with the country's 2030 vision; secondly, children and young people have specific rights to health and wellbeing. Lastly, reducing health inequalities and improving access is a matter of social justice.

Within the arena of dentistry, prevention is much more effective and efficient than treatment, and the best group for targeting such preventive measures is that of children. Once our children are raised in an environment aiding such measures, a better quality of life would likely be achieved.

Fortunately, opportunities now exist to provide primary preventive strategies *via* the collaboration of medical and dental teams and thus seek to break down some of the traditional separations made between medicine and dentistry.

AUTHORS' CONTRIBUTIONS

All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

ACKNOWLEDGEMENT

This manuscript was presented as preprint in Researchsquare under the following link: <https://www.researchsquare.com/article/rs-57256/v1>.

DECLARATIONS

- a. The research was reviewed and approved by the local research ethics committee in the college of dentistry, King Saud University with number (IR 0111), 13 October 2017. All participants consented to participate in the questionnaire following reading the study's invitation.
- b. Consent for publication: Not applicable
- c. The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.
- d. Competing interests: the authors declare no financial and/or non-financial competing interests.
- e. Funding: No funding was obtained for this study.

REFERENCES

1. US Department of Health and Human Services. Oral health in America: A report of the surgeon general. Rockville, MD: US Department of Health and Human Services. National Institute of Dental and Craniofacial Research, National Institute of Health. 2000.
2. Satcher D, Kaczorowski J, Topa D. The expanding role of the paediatrician in improving child health in the 21st Century. *Pediatrics* 2005; 115:1124-1128.
3. Satcher D. Children's oral health: The time for change is now. *Acad Paediatr* 2009; 9:380-382.
4. Lewis CW, Boulter S, Keels MA, et al. Oral health and paediatricians: Results of a national survey. *Acad Paediatr* 2009; 9:457-461.
5. Seale NS, Casamassimo PS. U.S. predoctoral education in pediatric dentistry: Its impact on access to dental care. *J Dent Educ* 2003; 67:23-30.
6. AlYousef Y, Damiano P, Weber-Gasparoni K, et al. Medical students' child oral-health-related knowledge, practices and attitudes. *Eur J Dent Educ* 2013; 17:218-224.
7. Amin TT, Al-Abad BM. Oral hygiene practices, dental knowledge, dietary habits and their relation to caries among male primary school children in Al Hassa, Saudi Arabia. *Int J Dent Hyg* 2008; 6:361-370.
8. Al-Malik MI, Holt RD, Bedi RJ. Prevalence and patterns of caries, rampant caries, and oral health in two- to five-year-old children in xSaudi Arabia. *Dent Child (Chic)* 2003; 70:235-242.
9. Paul TR. Dental health status and caries pattern of preschool children in Al-Kharj, Saudi Arabia. *Saudi Med J* 2003; 24:1347-1351.
10. Al Ayyan W, Al Halabi M, Hussein I, et al. A systematic review and meta-analysis of primary teeth caries studies in Gulf Cooperation Council States. *Saudi Dent J* 2018; 30:175-182.
11. Sischo L, Broder H. Oral health-related quality of life: What, why, how, and future implications. *J Dent Res* 2011; 90:1264-1270.
12. Preventive oral health intervention for paediatricians. *Pediatrics* 2008; 122:1387-1394.
13. Li W, Hussein Musa T, Gao R, et al. Association between BMI and Dental caries among school children and adolescents in Jiangsu Province China. *Biomed Environ Sci* 2017; 30:758-761.
14. Tubert-Jeannin S, Pichot H, Rouchon B, et al. Common risk indicators for oral diseases and obesity in 12-year-olds: a South Pacific cross sectional study. *BMC Public Health* 2018; 18:112-124.
15. Agili A, Ebrahim D. A systematic review of population-based dental caries studies among children in Saudi Arabia. *Saudi Dent J*. 2013; 25:3-11.
16. Richards D. Oral diseases affect some 3.9 billion people. *Evid Based Dent* 2013; 14:35.
17. Goldfeld S, Cameron A, Doyle K. Oral Health in Children and Young People Position Statement. Sydney: Royal Australian College of Physicians 2012.
18. Do Loc G, Spencer John A. Oral Health of Australian Children: The National Child Oral Health Study 2012-2014. Adelaide: University of Adelaide Press 2016.
19. Koirala A, O'Connor E, Widmer R, et al. Oral health care: The experience of Australian paediatricians. *J Paediatr Child Health* 2019; 13:1374-1380.
20. Long C, Quinonez R, Beil H, et al. Paediatricians assessments of caries risk and need for a dental evaluation in preschool aged children. *BMC Paediatr* 2012; 11:12-49.
21. Prakash P, Lawrence H, Harvey B. Early childhood caries and infant oral health: Paediatricians and family physicians knowledge, practices and training. *Paed child health* 2006; 11(3): 151-157.
22. Bader J, Rozier R, Lohr K, et al. Physicians' roles in preventing dental caries in preschool children: a summary of the evidence for the US Preventive Services Task Force. *Am J prev med* 2004; 26:315-325.
23. Ditto M, Jones J, Sanders B, et al. Pediatrician's role in children's oral health: an Indiana survey. *Clin Paediatr* 2009; 49:12-19.
24. Kalkani M, Ashley P. The role of paediatricians in oral health of preschool children in the United Kingdom: a national survey of paediatric postgraduate specialty trainees. *Eur Arch Paediatr Dent* 2013; 14:319-324.
25. Sabbagh H, El-Kateb M, Al Nowaiser A, et al. Assessment of paediatricians dental knowledge, attitude and behavior in Jeddah, Saudi Arabia. *J Clin Paediatr Dent* 2011; 35:371-376.
26. AlYousef Y, Damiano P, Weber-Gasparoni K, et al. Medical students' child oral-health-related knowledge, practices and attitudes. *Eur J Dent Educ* 2013; 17:218-224.
27. Alshunaiber R, Alzaid H, Meaigel S, et al. Early childhood caries and infant's oral health; paediatricians' and family physicians' practice, knowledge and attitude in Riyadh city, Saudi Arabia. *Saudi Dent J* 2019; 31: S96-S105.
28. Lewis C, Grossman D, Domoto P, et al. The role of the paediatrician in the oral health of children: A national survey. *Pediatrics* 2000; 106:e84-e84.

29. Martin Hobdell, Poul Erik Petersen, John Clarkson, et al. Global goals for oral health 2020. *Oral health* 2003; 53:285-288.
30. Sezer RG, Paketci C, Bozaykut A. Paediatricians' awareness of children's oral health: Knowledge, training, attitudes and practices among Turkish paediatricians. *Paediatr Child Health* 2013; 18:e15-e19.
31. Gupta SK, Gupta S, Gojanur S, et al. Pediatricians' view on early childhood caries and oral health in a north region of India: A cross-sectional study. *Family Med Prim Care* 2019; 8:220-224.
32. Nassif N, Noueiri B, Bacho R, et al. Awareness of Lebanese pediatricians regarding children's oral health. *Int J Clin Pediatr Dent* 2017; 10:82-88.
33. Sánchez OM, Childers NK, Fox L. Physicians' views on pediatric preventive dental care. *J Pediatr Dent* 1997; 19:377-383.
34. Ramroop V, Kowlessar A, Ramcharitar-Maharaj V, et al. Knowledge, attitudes and behaviour towards preventive oral care in early childhood among paediatricians in Trinidad and Tobago: Findings of a national survey. *Int Dent J* 2019; 69:67-76.
35. Kagihara L, Niederhauser V, Stark M. Assessment, management, and prevention of early childhood caries. *J Am Acad Nurse Pract* 2009; 21:1-10.
36. dela Cruz GG, Rozier RG, et al. Dental screening and referral of young children by pediatric primary care providers. *Pediatrics* 2004; 114:e642-e652.
37. Canadian Dental Association. The state of oral health in Canada. Ontario: The Association 2017.
38. Australian Institute of Health and Welfare. A discussion of public dental waiting time's information in Australia: 2013-14 to 2016-17. Canberra: The Institute 2018; Cat No. DEN 230.
39. Singhal S, Figueiredo R, Dupuis S, et al. Knowledge, attitude, willingness and readiness of primary health care providers to provide oral health services to children in Niagara, Ontario: A cross-sectional survey. *CMAJ Open* 2017; 5:E249-E254.
40. Otto M. *Teeth: The story of beauty, inequality, and the struggle for oral health in America*. New York, NY: The New Press; 2017.
41. Lim M, Riggs E, Shankumar R, et al. Midwives' and women's views on accessing dental care during pregnancy: An Australian qualitative study. *Aust Dent J* 2018; 63: 320-328.
42. Curtis JW Jr, Garrison RS Jr, Camp MG. Dentistry in medical education: Results of a comprehensive survey. *J Med Educ* 1985; 60:16-20.
43. Abbott B, Zybutz C, Scott KM, et al. A review of the hours dedicated to oral health education in medical programmes across Australia. *Intern Med J*. 2018; 48:1035-1040.
44. Ahmad MS, Abuzar MA, Razak IA, et al. Educating medical students in oral health care: current curriculum and future needs of institutions in Malaysia and Australia. *Eur J Dent Educ*. 2017; 21:e29-e38.
45. NHS England. Five year forward view. 2014.
46. Department of Education. United Nations Convention of the rights of the child-how legislation underpins implementation in England. 2010.