

Referral Patterns of Paediatricians and General Medical Practitioners to Paediatric Dental Clinics and Oral Health Knowledge in Riyadh, Saudi Arabia: A cross-sectional survey

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Abstract

Background: The single most chronic disease impacting children on an international scale is dental caries; there are alerts to deaths of children as a result of the complications caused by dental caries, despite the fact that this disease is completely preventable. This study aims to evaluate physicians' dental knowledge, preventive measures they would provide and their referral patterns to paediatric dentists.

Methods: A cross-sectional survey was conducted in Riyadh, Saudi Arabia. Certified paediatricians and general practitioners (GPs) from different sectors were invited to participate. The survey comprised 24 questions, distributed into 5 sections; demographic data, dental knowledge, participation in oral preventive measures, case scenarios and one question about participants' opinion in implementing oral health rotations in the paediatric residency program.

Results: 406 physicians participated in the study. Only 4.4 % of the participants answered all the knowledge questions correctly, the mean correct knowledge score 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 and years of experience ($P= 0.463$ and 0.985 respectively). 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 only 28 % only advise parents to consult a dentist. Most physicians suggested the addition of an oral health rotation in the medical residency program.

Conclusions: The current level of oral health knowledge is not satisfactory to provide effective paediatric patients referrals to dentists, although their attitude towards providing oral preventive measures is good. Oral health knowledge and engagement should be emphasized in medical schools. Early and correct referral can be effective in preventing oral disease. The integration of oral health in undergraduate and specialty training curricula is vital to achieve disease prevention goals.

Background

The single most chronic disease impacting children on an international scale is dental caries¹; there are alerts to deaths of children as a result of the complications caused by dental caries^{2,3}, despite the fact that this disease is completely preventable. Over the course of the last decade, there has been an increasing emphasis on the integral nature of oral health to overall health, such an awareness lending the way to attention to medical providers' role in oral health. Certainly, due to the fact that they see young children regularly and often within the first three years of life⁴, paediatricians are well-appointed in incorporating oral health into their practice, and oral health anticipatory guidance fits in nicely with paediatricians' emphasis on prevention and early establishment of lifelong healthy habits.

The paediatrician's role in oral health was formalised with the 2003 American Academy of Paediatrics (AAP) policy statement, which recommended that paediatricians—as well as other primary care providers—should incorporate preventive oral health education into their practices, as well as oral health risk assessment by a paediatrician or a primary care provider by the time they are six months of age⁴.

Indeed, there are also other reasons as to why paediatricians include oral health within their practice; however, children face obstacles in accessing to professional dental care for reasons including a limited dental workforce to deliver preventive oral health services to young children. Further, international data indicates that few general dentists treat children under four years of age⁵, such a limitation resulting from inadequate dental school training within the care of infants and toddlers, poor Medicaid reimbursement, and maldistribution of workforce. Saying this, access to medical care is not as fraught with these same challenges; even children who cannot find a dentist almost always have access to pediatric well-child care, paediatrician involvement in oral health thus also being motivated by the possibility that young children not having any other alternative source of preventive dental attention⁶.

Remarkably, the past few decades have witnessed an increased focus on oral health and the social, psychological, and developmental consequences of untreated oral diseases in Saudi Arabia; undeniably, dental caries is the most prevalent chronic childhood disease in Saudi Arabian children⁶, several recent studies demonstrating the caries rates as being highly prevalent in children under the age of five⁷⁻⁹, the majority of parents stating that their children did not visit a dentist until the fifth year of life on average⁷⁻¹⁰.

A common practice for children from birth to adolescence is that of a medical check-up¹¹; however, children and their parents would usually seek a dentist '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 disease¹².

Dental caries is a multifactorial infectious disease caused by bacteria in dental plaque¹², critically influencing the health and development of children; poor oral health also having been associated with chronic diseases such as childhood obesity^{13,14}.

In Saudi Arabia, between 1988 and 2010, a review was completed on 27 published childhood caries surveys, the results indicating the prevalence of dental caries and its severity as being approximately 80% for the primary dentition and 70% for children with permanent dentition¹⁵; in the same vein, oral health conditions impact approximately 3.9 billion people globally¹⁶, childhood caries by the same token representing a serious public health problem worldwide and in our country specifically.

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 health inequity areas; a vast number of children do not visit the dentist prior to starting school. In this regard, it is important for the other relevant health professionals to feel sufficiently equipped to examine the mouth, provide advice, and refer patients as necessary^{17,18}. From this, it seems suitable to conclude that paediatricians—as well as general practitioners—should be aware of the emerging and increasing oral health issues amongst the pediatric population, particularly given the comorbidity between chronic diseases and dental caries¹⁹.

Conducted in 2008, a research led by Long *et al.* (2012)²⁰ pinpointed the fact, when compared to dental visits, the number of children's medical visits is 250 to 1 for infants and toddlers; the American Dental Association (ADA) and The American Academy of Paediatrics (AAP) recommend the child's first dental assessment to be before the age of one, which marks the time a child will get its first tooth at the eruption; saying this, not all children unfortunately have access to professional dental care, and it is for this reason that we should take advantage of the fact that children typically have contact with a GMP/paediatrician before they do with a dentist²¹. Thus, paediatricians could initiate the first step in prevention by referring them to dentists once they reach an age where preventive measures are particularly effective²². Information garnered from studies within Saudi Arabia concerning paediatricians and GMPs in terms of the extent of their oral health education and dental knowledge and the preventive aspects pinpoint that, during medical school and training, the information they received was scarce and limited. From this, we can see that lack of dental knowledge and training appear to be barriers limiting paediatricians and general physicians from playing a more active role^{21,23,24}

A survey in Jeddah, Saudi Arabia confirmed that, despite the fact that paediatricians' attitude and behaviour scores indicate their willingness to participate in oral care²⁵, the knowledge required is still lacking. A 2013 study assessing Saudi medical students' oral health-related knowledge and attitudes was conducted, concluding that more oral health-related training is warranted and could aid in the improvement of the interest in providing paediatric oral health screening and referrals in practice²⁶.

Another study conducted in Saudi Arabia and published in 2019 revealed the fact that the majority of paediatricians and family physicians consider themselves knowledgeable in oral health issues, agreeing that they play an important role in oral health promotion; saying this, there was still a shortage in knowledge of the associated oral health practice and provision of oral health assessments²⁷.

A study conducted in the USA in 2000, on the other hand, 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 paediatric residency curriculums²⁸

The aim of the current study was to assess the current state of pediatric dental health knowledge, potential participation within oral preventive measures amongst paediatricians and GMPs, and referral from the medical team to the dental team within Riyadh, Saudi Arabia.

Methods

The current study was conducted in the kingdom of Saudi Arabia, Riyadh City, over a five months period; it comprised of a range of certified paediatricians (residents, specialists, and consultants) within different subspecialties, as well as GMPs from governmental, private, and academic health sectors. Based on 50% prevalence of knowledge level, 20% degree of precision, and 95% confidence interval, the sample size was calculated as 400 participants, and ethical approval was obtained from the dental research ethics committee within the College of Dentistry, King Saud University, prior to the onset of the survey. Additionally verbal consent was granted from each participant based on approval from the ethical committee.

Based on the literature review, a predesigned, self-administered questionnaire, comprised of open-ended, multiple-choice questions was created, designed to take an average of 5–7 minutes with the presence of the researcher; the survey comprised of 24 questions divided into five sections, all of which being carefully structured. In order to test the questionnaire and evaluate its internal consistency, a pilot study was conducted on 15 participants who were not included in the main study's results, the cronbachs alpha being calculated at 75%:

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

SPSS Version 22 was utilised for statistical analysis, simple frequency distribution also utilised to describe the distribution of different variables, cross tables and chi square also 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 was used, Z test additionally used to compare the proportions of different values.

Results

Amongst the 682 questionnaires distributed, 440 returned with a response rate of 64.5%; further, when considering those returning, 34 were incomplete and thus excluded from the study. Final analysis was performed on 406 participants and, of the total sample, over 50% (53.2%) were in the young age group of 25 to 35 years, 60% were male, and more than two-thirds (68%) were paediatricians. In the same vein, more than half of our sample (57.1%) practised within governmental hospitals, 56% having received oral health information (see 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%) respectively.

See Table 2 for an illustration of the provided answers to the knowledge questions; indeed, only 4.4% of participants answered all knowledge questions correctly, the mean correct knowledge score being calculated at 2.95 ± 0.9937 out of 5 (58.96%); notably, the majority of the physicians (82.5%) recognised the fact that the frequency of sugar intake is the most important factor causing tooth decay. Saying this, only just over one third (34.5%) knew that the correct age of the first dental visit should be at the time of eruption of the first tooth, nearly 60% stating that they would refer a child with neonatal teeth to a paediatric dentist. It was founded that only 1.5% would extract the tooth themselves, and no significant difference was detected in terms of gender when evaluating the knowledge scores (Mann Whitney U, $P = 0.315$), specialty (Kruskal Wallis test, $P = 0.463$) and years of experience (Kruskal Wallis test, $P = 0.985$).

Meanwhile, Table 3 showcases the participants' responses regarding the likelihood of GPs and paediatricians 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; instructing parents to put in place dental visits and regular check-ups), pinpointing the fact that such percentages were very high (83.7%, 80%, 76.8%, respectively). The other preventive measure—applying fluoride—was far more unlikely to be done by physicians (62.8%).

A significant difference was detected for the first and second preventives measures only, whereby paediatricians were more likely to go to such measures, with regards to the influence of participants' specialty and years of experience on the likelihood of their participation in the provision of oral disease preventive measures; further, in regards to the application of topical fluoride, the significant difference was detected for years of experience, where those with less than five years of experience were significantly more likely to apply fluoride in comparison to those with more than 30 years of experience ($P = 0.0005$) (Table 4).

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

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

Amongst the factors mentioned by physicians, a factor potentially preventing them from referring paediatric patients to dental clinics is that of uninsured patients (14%), as well as that of patients with difficult access to dentists; this is closely followed by dental referral not being a priority in today's typical busy clinic (7.4% and 6.2% respectively). Almost half of the participants (48.3%) have no barriers in referring their patients to pedodontists. The last question of the survey aimed to assess whether physicians support adding a module on oral/dental health rotations to the current pediatric residency curriculums, the results of this query pinpointing that the majority of them (82%) agreed 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 paediatricians and GMPs to a pediatric dentist were added to the model. None of the independent variables were found to be significantly associated with referral, whereby p was < 0.05 for all variables.

Discussion

The World Health Organisation'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 diseases²⁹; cooperation between healthcare providers (i.e., GMPs; paediatricians; pedodontists) to improve the child's oral health surely would aid in attaining such a goal.

Despite all the efforts made to reduce caries prevalence in Saudi children, it seems nothing is particularly effective thus far; this is likely spurred by the fact that children are typically not seen early enough by dentists within our community compared to paediatricians and General Practitioners²⁷. A minimal number of studies have viewed this aspect alongside paediatricians' attitudes towards pediatric oral health, none similar to the present study considering 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 paediatricians in terms of children's dental diseases. 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 an adequate amount of dental knowledge; this may be a primary barrier to effective child dental referral, oral health knowledge is not currently sufficient enough for effective referral (only 4.4% of physicians answered all knowledge questions correctly, the percent of correct mean knowledge score being 2.95%). These results correlate with those founded in a study conducted by HJ Sabbagh *et al.* in Jeddah²⁵, Saudi Arabia. Alshunaiber *et al.* similarly reported an acceptable level of knowledge amongst their sample of paediatricians in Riyadh, Saudi Arabia, despite there being a discrepancy between their practices²⁷. In Turkey, Sezer *et al.* found there to be a lack of dental knowledge, only 13.9% of the sample stating that they would refer a one-year-old or younger patient to be seen by a dentist³⁰; conversely, an Indian sample was founded to possess a higher level of knowledge and willingness to provide oral health advice³¹.

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 effects²⁷; it is on this note that Parakash *et al.* have reported the importance of caregivers' knowledge and the vital influence of this knowledge on children's oral health.²¹

The knowledge score was not significantly impacted by discrepancies between gender or years of experience; however, the results were impacted by differences between GMPs and paediatricians. This finding correlates with that of Nassif *et al.*, who conducted their study in Lebanon³².

The basic knowledge needed for referral should be adequate, particularly amongst specialised physicians, and yet the presence of several glitches and gaps amongst physicians' knowledge within the current study would have impacted their referral practice, particularly amongst 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 child well visit, and the majority of the paediatricians and GMPs (83.7%) stated that the examination of the oral cavity and teeth would likely be done; indeed, similar findings were reported within previous studies on the topic^{21,25,33}. The majority of the sample additionally mentioned that they would be more likely to provide dietary counselling to parents (as recommended by the American Academy of Paediatrics, which is considered as an essential part of general health counselling); furthermore, a similarly high percentage was founded regarding advising the parents about dental visits, demonstrating the fact that paediatricians and general medical practitioners 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. In a study conducted by Ditto *et al.* (2009), reporting only 7% of physicians believing the application of fluoride to be part of a sufficient childcare visit²³. 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, those findings suggesting a lack of awareness on the fluoride positive effects³⁴.

Dental pain and oral/facial trauma/swelling cases were always referred to pediatric dentists, thus reflecting the concern of paediatricians and GMPs regarding any visible problems; to a lesser extent (71%), children with dental caries would be referred always and/or often. 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, bacteraemia and high treatment costs are anticipated; this can additionally impact the growth and development of the child's speech, leading to premature tooth loss and compromised chewing and self-esteem³⁵.

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 a number of previous studies whereby the oral-medical connection was not very clear to participants.^{23,34}

It was reported that barriers to successful referral were mentioned by more than 50% of the respondents in a previous study, a slightly higher percentage (57%) being detected amongst the respondents within the current study²³.

Perhaps at the heart of the reluctance to examine children in terms of a dental examination; lies in the fact that the responders felt it was difficult to refer 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 report confidence with the referral environment³⁶.

In Saudi Arabia—in a similar way to other countries around the world—, public dental practices possess long waiting lists, thus adding to the already present complexity of access already caused by the dental service availability issue^{37,38}. This fact makes the collaboration with medical general practitioners and paediatricians even more essential; undeniably, we can see that early referral, detection of dental problems, and prevention should be the primary aim.

Considering nearly around half of the sample claimed they had not received any oral health information during their studies—reflecting their care about dental health, such results correlating with those of Prakash *et al.*²¹, the majority of paediatricians 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 towards 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 within medical students/paediatricians' postgraduate educations globally^{37,38}; in fact, oral health has mostly not been an element of the purview for medical practitioners in a strange disconnect from the rest of health and development⁴⁰. Thus, in order to address this knowledge and practice gap, oral health education is vital across the health professions; paediatricians do not stand alone in their lack of comfort in addressing oral health issues⁴¹. Several medical school surveys have similarly showcased a lack of comprehensive instruction on dental topics, as well as an absence of standardised learning objectives, teaching methodology, and assessment⁴²⁻⁴⁴.

It has been suggested that oral health and dental care modules are incorporated in the curriculum for the pediatric training of general paediatrics; further, a rotation with pediatric dental professionals within a hospital/community could additionally provide postgraduate specialist trainees with practical skills in assessing children's oral health and the potential risk of dental diseases²⁴.

Notably, conferences, scientific journals, and continuous medical educations were the least common sources of dental information amongst the respondents, whilst 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 young children within Saudi Arabia have caries in their primary teeth¹⁵; healthcare team members' efforts—including those of paediatricians—should be coordinated to control such a preventable disease.

Referring to the limitations of the present study, the modest response rate is one limitation that has the potential to impact the generalisability of the findings; the sample was a convenient one, and so 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 in order to conduct a survey amongst the paediatricians working there. A final issue is that of the answers all being self-administered, lending the way to them being misleading and/or inaccurate in occasional cases²⁷.

Conclusions

The results of this study provide valuable motivations and perspectives for the initiation of appropriate oral health programs for future paediatricians; remarkably, 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 a number of 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^{45,46}.

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

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

Clinical Significance

Early and correct referral can be effective in preventing oral disease, the knowledge level demonstrated in the current study not being as sufficient as it should be for achieving such a goal; their attitude and practicing for particular oral preventive measures is promising. Further, despite the fact that physicians are occupied with tasks more relevant to their practice, their role within oral health is vital. Another essential aspect of achieving this goal is the focusing of the integration of oral health in undergraduate and specialty training curricula; similarly, local refresher courses can also be delivered in response to any local needs.

Declarations

a- The research was reviewed and approved by the local research ethics committee in the college of dentistry, King Saud University.

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.

f- Authors' contributions:

LA: study design, methodology, data analysis and presentation.

AJ: study conduct and presentation.

MA: data analysis and interpretation

LM: study conduct and data collection.

RB: study conduct and data collection.

SA: study conduct and data collection.

g- Acknowledgements:

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Tables

Due to technical limitations, all tables are only available as a download in the Supplemental Files section.

Supplementary Files

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