

ORIGINAL RESEARCH

Oral health in pediatric care: a monocentric study on pediatricians' knowledge and attitudes

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Abstract

Background: In France, despite a gradual decline in the prevalence of oral diseases over the past decades, significant disparities remain, particularly in pediatric populations.

Methods: This descriptive observational study, conducted among pediatricians in the Hérault department, in France, aimed to evaluate their knowledge and attitudes regarding children's oral health. An online survey, conducted by both the dental department and the pediatric department of Montpellier University Hospital, was distributed between May and December 2023. The questionnaire assessed socio-demographic characteristics, initial training, knowledge of oral and general health links, prophylaxis and nutrition, and preferences for preventive strategies. **Results:** The participation rate was 20.7%, based on 40 responses, two of which were excluded, revealing a good level of knowledge (83.9% correct answers). Knowledge gaps were noted in specific areas, including the systemic impact of oral bacteria, the timing and scope of dental care during pregnancy, and optimal preventive strategies for young children. Pediatricians expressed interest in continuing education, particularly through interprofessional sessions and online training, as well as public awareness initiatives, with a preference for field-based interventions.

Conclusions: These findings emphasize the importance of enhancing pediatrician training in oral health and implementing tailored preventive strategies to improve pediatric oral care. Strengthening interprofessional collaborations and developing targeted educational interventions could help reduce oral health disparities and promote lifelong healthy habits among children in France.

Keywords

Oral health; Pediatrics; Knowledge; Attitudes; Prevention

1. Introduction

Oral health, as defined by the World Health Organization (WHO) is a fundamental component of overall well-being, influencing both the physical and psychological quality of life. Oral diseases are a major global public health issue, affecting approximately 3.5 billion people worldwide [1]. In France, despite a gradual decline in the prevalence of oral diseases over the past decades, significant disparities remain, particularly in pediatric populations. Social inequalities remain a major determinant of pediatric oral health, with lower socioeconomic status being strongly associated with less access to dental care, delayed initiation of preventive visits, and a higher prevalence and severity of caries [2]. A primary school prevention initiative led by the French Union for Oral Health (UFSBD) during the 2011–2012 school year, targeting 2nd-grade children (CE1) in schools located in priority education zones (ZEP) in three municipalities of Île-de-France, revealed that 53% of children had dental caries, with 78% of lesions remaining untreated, thus highlighting major gaps in early dental care provision [3]. However, more recent studies report that, in

2022, the prevalence of dental caries in deciduous teeth among children aged 1 to 9 years in France was 29.2% [1]. This figure clearly illustrates that social and geographic inequalities in access to oral healthcare continue to persist across the country.

To address these challenges, various national initiatives have been introduced. Notably, the M'T Dents program, launched in 2007, aims to reduce barriers to dental care for children and young adults by providing full coverage for individuals aged 3 to 24 under the national health insurance system [4]. However, despite its noble intentions, the program has faced participation challenges, with only 35% of eligible individuals participating in 2012. More recently, the 2023–2028 national dental convention has aimed to further advance oral health by introducing annual oral examinations, with the ambitious goal of achieving a “Cavity-Free Generation”.

In this context, healthcare professionals, especially pediatricians, are pivotal in preventing oral diseases. As primary caregivers responsible for overseeing children's overall health and development, pediatricians are uniquely positioned to influence oral health outcomes [5–7]. By promoting preventive measures and raising awareness around oral hygiene, they

can help mitigate the early onset of oral diseases and their associated consequences. International literature consistently reports that pediatricians' knowledge and practices regarding infant oral healthcare remain suboptimal, particularly concerning key preventive recommendations such as the timing of the first dental visit and appropriate fluoride use [8, 9]. Deficiencies have also been noted in developmental oral health knowledge [10]. In Spain, a study found that only 9.2% of pediatricians received training in pediatric dentistry during their specialty training, and almost all respondents (98.1–98.3%) acknowledged the need for oral health training both during medical school and after graduation [9]. Scoping reviews and national surveys have further confirmed that such gaps are widespread [6–11]. In France, although progress has been made in reducing the prevalence of early childhood caries, significant gaps remain in preventive behaviors and oral health promotion among families [11]. Furthermore, research has demonstrated that untreated oral diseases can have far-reaching medical and psychosocial effects, affecting children's growth, nutrition, speech, self-esteem, and overall quality of life [12, 13].

The aim of this study is to assess pediatricians' current knowledge levels regarding children's oral health in the Hérault department, in order to design targeted educational material and training programs, inform public health policy, and improve preventive actions and clinical practice. The exploratory results will also guide the development of a larger, national-level study to further investigate and address these issues.

2. Materials and methods

From May to December 2023, a descriptive observational study was conducted using an anonymous online survey to evaluate pediatricians' knowledge and attitudes regarding children's oral health in the Hérault department. All pediatricians practicing in the Hérault department were invited to participate ($n = 193$). Recruitment was conducted via email, using the official list of pediatricians, with one follow-up reminder sent two weeks after the initial invitation. This initial study phase did not assess clinical practices.

This pilot study is part of a broader departmental public health initiative. Similar studies have been conducted with nurses and midwives [14, 15], and others are currently being analyzed for general practitioners, pharmacists, physiotherapists, and speech therapists.

The questionnaire was developed specifically for this study, based on a review of relevant literature concerning professionals' knowledge in oral health [16, 17]. As no internationally validated instrument exists for this topic, its content was reviewed by a panel of pediatric experts using a double-blind review process to ensure clarity, relevance, and content validity (**Supplementary material**).

The questionnaire followed a uniform structure across all healthcare professions, with a section specific to each group. The estimated completion time was less than five minutes. The questionnaire included both quantitative and qualitative questions, divided into five sections:

- Socio-demographic data and initial training;

- Knowledge of the relationship between oral and general health;

- Knowledge of prophylaxis and nutrition;

- Knowledge of the link between pediatrics and oral health;

- Preferences regarding preventive strategies.

The collected data will contribute to the development of training programs for pediatricians and preventive actions aimed at improving their patients' oral health.

The questionnaire was created using Google Forms and distributed via email by the Departmental Council of the Medical Association to all registered pediatricians in May 2023 ($n = 193$), continuing until 15 December 2023. It was also sent to the Mother and Child Health Unit at Montpellier University Hospital.

The Local Research Ethics Committee (IRB) of Montpellier University Hospital approved the study and the use of collected data under the approval number 2022 10 202201250. Participation was voluntary, and all responses were collected anonymously to ensure confidentiality and data protection in accordance with applicable regulations.

Participants had to be certified pediatricians practicing in the Hérault department. Incomplete questionnaires were excluded from the analysis. Data were analyzed using descriptive statistics (frequencies, means, standard deviations) in Microsoft® Excel® 2019 MSO (Version 2508 Build 16.0.19127.20192; Microsoft Corporation, Redmond, WA, USA).

3. Results

After an eight-month distribution period (May to December 2023), a total of 40 responses to the questionnaire were received, corresponding to a participation rate of 20.7%. By 15 December 2023, 193 pediatricians were registered with the Departmental Council of the Medical Association in the Hérault department. Two responses were excluded as they were found to be practicing outside the department, resulting in a final sample of 38 eligible and complete surveys included in the analysis.

3.1 Socio-demographic characteristics and initial training

Among the 38 respondents, 81.6% ($n = 31$) were female, and 18.4% ($n = 7$) were male. Participant ages ranged from 29 to 67 years, with a mean age of 43.71 years (SD: 11.22). Regarding their graduation year, 18.4% graduated before 2000, 31.6% between 2000 and 2010, and 50% after 2010. In terms of practice settings, 50% ($n = 19$) worked in private practices, 47% ($n = 18$) in hospitals, and 3% ($n = 1$) in health centers. Analysis of knowledge scores across practice settings, performed using the Kruskal-Wallis test, revealed statistically significant differences between the groups ($H = 9.50$, $p = 0.009$). Pediatricians working in hospital-based settings achieved the highest mean knowledge scores, those in private practice obtained intermediate scores, and participants classified in the "other" category recorded the lowest scores.

Pediatricians were asked about both initial and continuing education. A total of 87% reported no training on oral health during their initial pediatric training, while 13% had received

some education. Among those, only 3% were satisfied with it.

The overall percentage of correct answers across all items was 83.9% (SD: 14.6). Results are detailed in the following sections, showing both the number and percentage of correct responses per item.

3.2 Knowledge of the relationship between oral and general health

Regarding the relationship between oral and general health, the correct response rate was 85.7% (Table 1).

The lowest-scoring items in the questionnaire revealed persistent misconceptions among respondents. Only 68.4% correctly identified the statement “Oral bacteria can increase cardiovascular disease risk” as true, despite well-established evidence linking periodontal pathogens to cardiovascular conditions through systemic inflammation and bacteremia [18]. Similarly, 76.3% of participants believed that “Dental care during pregnancy is limited to emergencies”, a false statement that reflects a common yet outdated belief. Another item that caused confusion was “Oral bacteria can reach the amniotic fluid and cause focal infections in pregnant women”, which is a true statement supported by studies highlighting the potential impact of maternal oral infections on pregnancy outcomes [19].

The highest-scoring items demonstrate strong awareness among respondents of well-established associations between oral and general health. All participants correctly identified the following statements as true: “Oral bacteria can spread via the bloodstream and lungs” and “Smoking increases the risk of upper airway cancer”, reflecting a good understanding of the systemic pathways of infection and the impact of tobacco use.

3.3 Knowledge of prophylaxis and nutrition

In the domain of oral hygiene and nutrition, the correct response rate was 80.5% (Table 2). The lowest-scoring items included: “Electric toothbrushes are always more effective than manual ones, regardless of technique” (52.6%), “Children under six should not use fluoridated toothpaste” (55.3%), and “Two annual dental cleanings are reimbursed by social security” (57.9%).

The highest-scoring items included: “Frequent soda consumption causes dental erosion” (97.4%), “Baby teeth should not be cleaned when they first appear” (97.4%), and

“A four-year-old can develop cavities from prolonged bottle use” (97.4%).

3.4 Knowledge of the link between pediatrics and oral health

The overall percentage of correct answers for this section, which focused on pediatric knowledge, was 85.9% (Table 3). The items with the lowest rates of correct responses were: “A short lingual frenulum affects the facial growth of the child”—True, limited tongue mobility may have long-term consequences on craniofacial development, particularly during early growth stages (65.8%); “A child who breathes through the mouth has a higher risk of developing dental caries”—True, mouth breathing reduces salivary flow and oral hydration, increasing caries risk by impairing natural cleansing (68.4%).

The items with the highest rates of correct responses (100%) were: “Primary teeth serve as guides for permanent teeth”—True; “A child experiencing daytime fatigue may potentially present with OSAHS (Obstructive Sleep Apnea-Hypopnea Syndrome)—True; “Oral breathing does not impact chewing efficiency”—False, chronic mouth breathing can alter orofacial muscle function and impact masticatory efficiency, especially in young children.

3.5 Preferences regarding preventive strategies

Preferences regarding the type of actions to be implemented among healthcare professionals were quite varied. However, the most favored option was the organization of an interprofessional evening session, selected as the first choice by 15 respondents (39.5%), followed by the implementation of an online training course (34.2%). Informational text messaging was the least preferred method (10.5%). In contrast, for actions targeting the general population, field-based interventions were clearly preferred, receiving 24 votes (63%). This was followed by informational text messaging (18.4%) and the development of a digital platform with health-related content (15.8%).

TABLE 1. Lowest and highest-scoring items on the knowledge of the relationship between oral and general health: True/False statements and response percentages.

Item	% Correct Answers	Expected Response
Lowest-Scoring Items		
Oral bacteria can increase cardiovascular disease risk.	68.4%	True
Dental care during pregnancy is limited to emergencies.	76.3%	False
Oral bacteria can reach the amniotic fluid and cause focal infections in pregnant women.	76.3%	True
Highest-Scoring Items		
Oral bacteria can spread via the bloodstream and lungs.	100%	True
Smoking increases the risk of upper airway cancer.	100%	True

TABLE 2. Lowest and highest-scoring items on knowledge of prophylaxis and nutrition: True/False statements and response percentages.

Item	% Correct Answers	Expected Response
Lowest-Scoring Items		
Electric toothbrushes are always more effective than manual ones, regardless of technique.	52.6%	False
Children under six should not use fluoridated toothpaste.	55.3%	False
Two annual dental cleanings are reimbursed by national health insurance.	57.9%	False
Highest-Scoring Items		
Frequent soda consumption causes dental erosion.	97.4%	True
Baby teeth should not be cleaned when they first appear.	97.4%	False
A four-year-old can develop cavities from prolonged bottle use.	97.4%	True

TABLE 3. Lowest and highest-scoring items on knowledge of the link between pediatrics and oral health: True/False statements and response percentages.

Item	% Correct Answers	Expected Response
Lowest-Scoring Items		
A short lingual frenulum affects the facial growth of the child.	65.8%	True
A child who breathes through the mouth has a higher risk of developing dental caries.	68.4%	True
Highest-Scoring Items		
Primary teeth serve as guides for permanent teeth.	100%	True
A child experiencing daytime fatigue may potentially present with OSAHS (Obstructive Sleep Apnea-Hypopnea Syndrome).	100%	True
Oral breathing does not impact chewing efficiency.	100%	False

4. Discussion

This discussion outlines the main results of our study and addresses their implications for assessing the oral health knowledge of pediatricians in the Hérault department, with the goal of improving preventive actions and clinical practice.

4.1 Socio-demographic characteristics and initial training

National data from 2020 shows that pediatrics is a feminized profession, with 71% of practitioners being female. In this study, 81.6% of respondents were women, with a slightly higher percentage of female respondents [20]. The average age of pediatricians in France is 48.9 years, whereas the participants in this study were slightly younger, with an average age of 43.7 years, possibly due to the online format of the questionnaire, which is more accessible to younger individuals. This age difference may also influence awareness and attitudes toward preventive practices, as younger practitioners may have received more recent training about preventive care. A study has shown that younger healthcare practitioners tend to have greater awareness and more positive attitudes toward preventive care, likely due to more recent training in this area [21].

Regarding practice methods, the predominant forms of practice among respondents were private practice (50%)

and hospital-based practice (47%). National data from 2020 showed that 53% of pediatricians worked exclusively in hospitals, while 25% worked in private practices, suggesting a higher proportion of private practitioners in this study. Several factors may explain this overrepresentation. Firstly, the subject of the study may be more relevant or have a more direct impact on the day-to-day practice of private practitioners. Secondly, private practitioners may have more flexible working hours, making it easier for them to take part in surveys or studies, compared to the often demanding and restricted environment in hospitals. Finally, a possible sense of professional isolation among solo practitioners may have motivated them to contact peers and contribute to collective knowledge through this research. The vast majority (87%) of respondents reported no oral health training during their education. Among the 13% who received training, only 3% were satisfied with it. Similar studies have reported limited oral health training among healthcare professionals, with many expressing dissatisfactions with the quality of education received [22, 23].

This highlights a clear gap in pediatric education regarding oral health, indicating that oral health training is underrepresented in medical curricula. Implementing structured oral health modules during pediatric training could improve knowledge, and also enhance preventive practices in clinical settings. From our observation, pediatricians had the lowest rate of

initial oral health training compared to other healthcare professions, with midwives (30%), and nurses (35.82%) reporting higher rates of training. Since the end of the study, we have begun to incorporate an introductory course on oral health into all of the professions studied. We hope to be able to replicate this study in a few years to assess the impact of this training.

4.2 Knowledge of the relationship between oral and general health

The study revealed a high level of awareness regarding the connection between oral health and general health (85.7%). Some topics, such as the transmission of oral bacteria and the link between tobacco use and upper airway cancer, achieved a 100% correct response rate. However, the link between oral bacteria and cardiovascular disease was less well known, with only 68.4% of pediatricians answering correctly. This is noteworthy given that the association between oral health and cardiovascular diseases is increasingly being documented and supported by scientific literature. Similar trends have been observed internationally: while awareness of the general relationship between oral and systemic health is high, recognition of the specific connection with cardiovascular diseases remains lower [24, 25]. Studies have also consistently reported strong knowledge regarding tobacco as a risk factor for oral cancer [21], whereas awareness of bacterial transmission varies widely across countries [24].

These results were more favorable than those of midwives (75.8%) and nurses (72.44%) in our previous studies [14, 15]. The seemingly higher awareness of oral health connections among pediatricians, despite it not being their primary specialization, could stem from their broad medical training, which emphasizes systemic health links. Their focus on child development also requires attention to oral health milestones and parental guidance. Furthermore, the specific aspects of oral health assessed in this study might align more closely with their practice and knowledge base compared to the focus of similar studies involving midwives and nurses.

4.3 Knowledge of prophylaxis and nutrition

Our study indicates that pediatricians possess a commendable understanding of nutrition-related oral health recommendations, such as the impact of sugar consumption, acidic foods, and bottle use. This aligns with findings from a national survey in Türkiye, where pediatricians demonstrated a high level of awareness regarding the relationship between nutrition and oral health [26].

However, knowledge gaps persist concerning certain preventive practices. For instance, only 57.9% of pediatricians were aware that dental cleaning is covered by health insurance, and approximately 50% knew the appropriate type of toothbrush and fluoride toothpaste for children under six. A scoping review encompassing 42 studies across 19 countries reported similar deficiencies, highlighting that pediatricians often lack knowledge about the recommended age for a child's first dental visit and the use of fluoride [6].

Regarding oral hygiene techniques, pediatricians exhibited strong knowledge, with a 100% correct response rate to certain questions. This is consistent with findings from a study in

Saudi Arabia, where healthcare workers demonstrated good knowledge and positive attitudes toward oral health [27].

Interestingly, pediatricians achieved an average score of 80.5% in hygiene and nutrition, surpassing other healthcare professionals. However, physiotherapists outperformed them with scores of 87.6% and 80.5% in terms of recognizing the connection between oral and systemic health and understanding the importance of hygiene and diet, respectively. Speech-language therapists (SLTs) also demonstrated substantial knowledge in oral-systemic health correlations, with 84.6% correct responses, which was consistent with international findings. In a study of speech-language pathologists in India, 93.2% were aware of the importance of oral health and hygiene (OHH), although confidence in assessment remained limited (42.6%) and the actual use of screening tools was very low (28.7%) [28].

Our study findings indicate that 76.5% showed an understanding regarding the importance of hygiene and nutrition. In contrast, midwives and nurses demonstrated lower levels of awareness. These findings are in line with international literature: for example, hepatology nurses' had inadequate knowledge of basic oral health, the equipment used for oral care, and medications' adverse effects on oral health [29, 30]. In France, only 35.8% of nurses reported specific oral health training, and nearly a quarter had never advised patients to see a dentist [14]. Similarly, although midwives in Virginia scored highly on general awareness (4.69/5), only 44.1% were familiar with oral health guidelines, despite 75.9% being aware of Medicaid dental benefits [31].

4.4 Knowledge of the link between pediatrics and oral health

For pediatric-specific knowledge, the overall correct answer rate was 85.9%, with lower rates observed for certain topics such as the impact of a short lingual frenulum (around 60%) and the connection between mouth breathing and caries (68.4%). In contrast, topics like mastication, ventilation, primary teeth, and conditions such as obstructive sleep apnea-hypopnea syndrome (OSAHS) and gastroesophageal reflux disease (GERD) showed higher correct answer rates. Literature reviews indicate that pediatricians generally lack sufficient oral health knowledge, a finding consistent across studies in countries such as Saudi Arabia and Croatia [32, 33]. The findings of our study align with other international research. For example, a study in Italy reported that 22.6% of children had a short lingual frenulum, which is associated with an increased risk of sleep-disordered breathing (SDB); however, awareness of this condition among healthcare professionals is often limited, which may explain the lower correct response rates observed in our study. Similarly, a study in Poland found a significant relationship between a short lingual frenulum and the risk of OSAHS in children, highlighting the role of mouth breathing in the development of oral conditions. Another Polish study assessing oral cavity morphology in children at risk of SDB showed that conditions such as a short lingual frenulum were more frequent among children with SDB symptoms, highlighting the need to improve pediatricians' knowledge in these specific areas for better prevention and early detection

[34–36].

These studies collectively highlight a consistent global trend: pediatricians often lack comprehensive knowledge of preventive oral health measures, emphasizing the urgent need for targeted educational interventions in pediatric training curricula [37, 38].

4.5 Preferences regarding preventive strategies

Pediatricians preferred the implementation of multidisciplinary evening sessions or digital tools, such as online training platforms, for accessible and flexible learning. On-the-ground interventions were seen as the most effective method for population-targeted actions, such as interventions for children, pregnant women, or the elderly. Digital platforms or Short Message Service (SMS)-based information were also favored for population-level interventions. Preferences for action types among other healthcare professionals were similar, with digital tools being the preferred method, while SMS notifications and university diplomas in oral health were less attractive.

These findings are consistent with international evidence, highlighting the effectiveness and acceptance of digital tools in oral health education. For example, a study involving 150 children demonstrated that mobile applications significantly improved parental engagement and oral hygiene behaviors compared to traditional methods [39]. Similarly, WHO guidelines emphasize the utility of mobile technologies for training health workers, monitoring oral health conditions, and promoting public oral health [40, 41]. A systematic review also showed that social media platforms, such as YouTube, WhatsApp, Instagram, and Telegram, effectively support oral health promotion across populations [42]. Collectively, these studies reinforce the preference for flexible, digital, and interactive interventions to enhance oral health knowledge among healthcare professionals and the general population.

4.6 Strengths and limitations

The main strengths of this study lie in its comprehensive approach, which targeted all pediatricians in the Hérault department, and in the rigorous development and content validation of the questionnaire by a panel of experts in pediatrics and oral health. This process ensured the clarity, relevance, and suitability of all items included in the survey. However, several limitations must be acknowledged. The participation rate of 20.7% is modest and may introduce non-response bias, as pediatricians with greater interest in oral health may have been more likely to respond. This limits the generalizability of the findings and comparisons with other studies should be interpreted with caution. Despite this limitation, the data provides valuable insight into pediatricians' current knowledge and training needs, and can contribute to targeted preventive and educational initiatives.

Limited training and awareness regarding children's oral health among pediatricians, as reported in international studies may contribute to lower survey participation [7, 11]. The online format of the questionnaire may have posed a barrier to those less comfortable with digital tools. The absence of

psychometric analyses, such as internal consistency or item-total correlations, prevents a deeper assessment of the instrument's reliability. In addition, the lack of an "I don't know" response option may have led to forced answers, potentially overestimating or underestimating the actual level of knowledge. Some questions, particularly on dental prosthetics or whitening products, were also less relevant to pediatric practice. Finally, the exploratory and monocentric design restricts the generalizability of the findings to other contexts or populations. Follow-up studies involving larger, more diverse samples should be planned. Ideally, several French or international regions should be included to improve representativeness and generalizability.

5. Conclusions

In summary, this study confirms that pediatricians in the Hérault department demonstrate good overall knowledge of oral health and its links to systemic health, yet knowledge gaps remain in specific areas such as preventive care recommendations, and pregnancy-related oral health. Incorporating oral health into pediatric education and offering continuous professional development opportunities are essential steps toward improving oral health outcomes for children. Enhanced training would not only benefit pediatricians' practices but also lead to better prevention and early detection of oral health issues, ultimately benefiting patient care—a process that, however, requires time to implement effectively. Future studies with larger sample sizes and longitudinal designs would help validate these findings and evaluate the impact of educational interventions over time.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

CI and CS—designed the research study. CS, RB and CI—performed the research. CS, MP, MV, NG and CI—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved of the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Local Research Ethics Committee (IRB) of Montpellier University Hospital approved the study and the use of collected data under the approval number 2022 10 202201250. Consent was obtained for all participants.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at <https://oss.jocpd.com/files/article/2028745470153506816/attachment/Supplementary%20material.docx>.

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How to cite this article: Céline Sabourin, Marion Pouzenc, Romane Ballarin, Nicolas Giraudeau, Marie Vincenti, Camille Inquimbert. Oral health in pediatric care: a monocentric study on pediatricians' knowledge and attitudes. *Journal of Clinical Pediatric Dentistry*. 2026; 50(2): 113-120. doi: 10.22514/jocpd.2026.040.