Perceptions of AI Based Software for Caries Detection Among Active Members of AAPD

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Introduction

Artificial intelligence (AI) has emerged as a transformative tool in pediatric dentistry, aiding clinicians in tasks such as detecting dental plaque, diagnosing early childhood caries, identifying mesiodens, assessing age, and analyzing radiographs. AI-based software, including Overjet, Pearl, and Denti AI, has shown promising accuracy in detecting caries and is being increasingly adopted to enhance diagnostic precision, reduce human error, and improve patient education through visual, evidence-based explanations. These tools support earlier intervention and promote preventative care, which is especially valuable for children's oral health. However, despite these advancements, adoption remains limited due to provider hesitancy, minimal formal research, and a lack of widespread familiarity, underscoring the need for further exploration of pediatric dentists' perceptions to guide future integration.

Objectives/Hypothesis

The objectives of this study are to assess among pediatric dentists 1) Their current knowledge and usage of AI based software used for caries detection, 2) Their current and future perceptions of AI based software used for caries detection, and 3) Determining differences in their perceptions based on demographics, time in active clinical practice, their work setting, and type of accepted reimbursement.

The working hypotheses of this study are: 1) Recent graduates or residents with less than 5 years in practice are more familiar with AI applications in pediatric dentistry, 2) Providers predominantly working in academia are more likely to have completed formal training or continuing education on AI applications in pediatric dentistry, 3) Providers who are majorly reimbursed in a fee for service model are more likely to incorporate AI applications into their practice for diagnosing and treatment of dental caries.

Study Methods/Design

This cross-sectional study surveyed active and post-doctoral members of the American Academy of Pediatric Dentistry (AAPD), following IRB approval. Data collection occurred over a period of 2 weeks in the month of March 2025. Study personnel then collected data for statistical analysis.

Results

Perceived Benefits of AI Based Software for Caries Detection

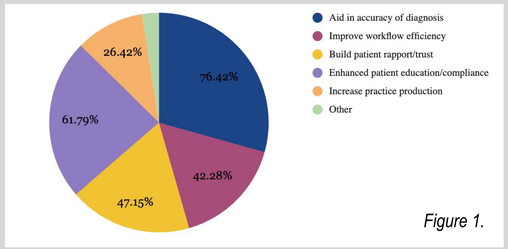

Figure 1.

Results

Perceived Limitations of AI Based Software for Caries Detection

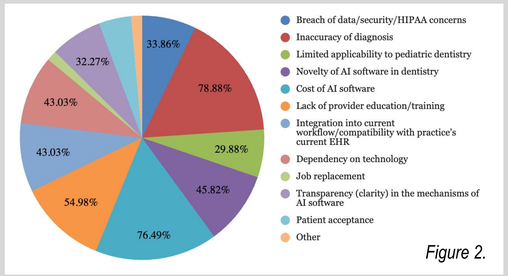

Figure 2.

Association Between Time of Residency and Familiarity with AI

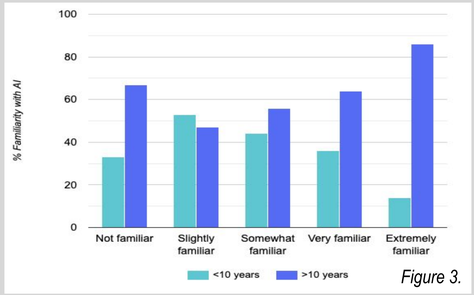

Figure 3.

Characteristic	N = 272[1]	95% CI[2]
Outlook on AI becoming standard practice		
Strongly agree	29 (12%)	(8.0%, 16%)
Agree	83 (33%)	(27%, 39%)
Neutral	76 (30%)	(25%, 36%)
Disagree	51 (20%)	(16%, 26%)
Strongly disagree	13 (5.2%)	(2.9%, 8.9%)
Likelihood of incorporating AI		
Very likely	28 (11%)	(7.7%, 16%)
Likely	73 (29%)	(24%, 35%)
Neutral	79 (31%)	(26%, 38%)
Unlikely	42 (17%)	(12%, 22%)
Very unlikely	29 (12%)	(8.0%, 16%)

[1]n (%)

[2]CI = Confidence Interval

Figure 4.

Discussion

A total of 272 responses were received. When asked about the completion of training, 37% of respondents finished over 20 years ago, 21% finished 10-20 years ago, 18% finished 1-5 years ago, 15% were still in residency, and 9% finished 5-10 years ago. When asked about their primary work setting, 69% practice in private practice, 30% practice in an academic setting, and 8% practice in a community setting.

The results showed low familiarity with AI based software used for caries detection, with 61% of respondents being slightly or not at all familiar. The results also showed that most providers (90.49%) have never received any formal training or continuing education pertaining to AI used for caries detection, and only about 8% of providers actually use AI for caries detection.

Of the 21 respondents that currently use radiographic caries detecting AI software, they have adopted it within the last year (81%). 95.24% use it as an adjunct tool for detection and diagnosis, 61.90% use it to enhance patient education, and no respondents use it as their primary detection tool. Most (59.09%) use it daily, while others use it weekly, monthly, or rarely (13.64%, 4.55%, and 22.73%).

The greatest perceived benefit of AI based software for caries detection were aiding in the accuracy of diagnosis (76%), enhancing patient education (62%), and building patient trust (42%) (Figure 1). The most significant perceived limitations were inaccuracy of diagnosis (79%), cost of AI software (76%), lack of provider training on AI softwares (55%) (Figure 2).

Descriptive statistics, frequencies and percentages were employed to summarize data. Proportions along with 95% confidence interval (CI) are presented for each treatment option. An exploratory analysis looking at association between the amount of time out of residency and overall familiarity with AI, the likelihood to incorporate AI, and the outlook on AI were carried out using Pearson's Chi-squared test or Fisher's exact test, in the case of sparse data. These analyses are exploratory and should be used with caution.

There was a borderline association noted between time out of residency and overall familiarity with AI. Those with greater than 10 years of experience reported to be less familiar with AI used for caries detection (p=0.052, where statistical significance is claimed at p≤.05) (Figure 3). This trend suggests that more recent graduates may have had greater exposure to digital tools or are more comfortable integrating emerging technologies into their workflows. However, despite this familiarity, there was no significant difference in future intent to adopt AI or in the belief that AI will become standard in the field. This could point to a broader uncertainty or lack of institutional or economic support for integration, regardless of provider age or experience. There was no statistical significance in the association between time out of residency and likelihood to incorporate AI based softwares in the future (p=0.2). There was also no statistically significant association between the time after residency and the outlook of AI as a standard in the field of pediatric dentistry (p=0.2).

Limitations of this study include the brief data collection period and the voluntary nature of survey participation, which may have introduced selection bias. Additionally, incomplete responses to some survey questions may affect generalizability of the findings.

Discussion (Cont.)

This study reveals a clear gap between the recognized potential of AI-based caries detection tools and their actual adoption in pediatric dentistry. While many respondents acknowledged AI's ability to enhance diagnostic accuracy, streamline workflow, and build patient trust, usage remains low. Most participants reported limited familiarity with AI tools, and few had received formal training, suggesting that the primary barrier is lack of exposure and education, rather than skepticism. Although over 40% of respondents believe AI will become a standard part of dental practice, only a small proportion expressed strong intent to integrate it into their own workflows. Among current users, AI is primarily employed as a supplemental tool, with nearly all having adopted it within the past year, emphasizing its early stage of clinical adoption. Common concerns included diagnostic inaccuracy, software unfamiliarity, and insufficient training, all of which highlight the need for validated clinical outcomes/additional research, software calibration, and structured education to build provider confidence. The recent surge in adoption points to growing interest, but broader integration may be slowed by limited awareness of successful real-world applications. At present, AI's most promising role may lie in enhancing communication with families through visual diagnostic tools that support trust, improve treatment acceptance, and reinforce preventive care which are key elements in pediatric dentistry. These findings emphasize the importance of continuing education and further clinical research to support the responsible and effective implementation of AI technologies in pediatric dental settings.

Conclusion

This study highlights a significant gap between the perceived value of AI-based caries detection tools and their current integration into pediatric dental practice. While most pediatric dentists recognize the potential benefits of AI, particularly in improving diagnostic accuracy and enhancing patient education, actual usage remains low, primarily due to limited exposure and lack of formal training. The findings suggest that increasing awareness and offering targeted educational programs could be pivotal in promoting broader adoption. As AI continues to evolve, further research and validation will be essential to ensure its responsible and effective implementation in pediatric dentistry. These insights can help guide curriculum development, clinical training, and technology integration strategies that ultimately improve patient care.

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