

The University of Texas Health Science Center at San Antonio

Introduction

- The integration of artificial intelligence (AI) in healthcare is reshaping clinical practice, promising enhanced diagnostic accuracy, personalized treatment options, and optimized patient care pathways.
- Pediatric dentistry, as a specialized field focusing on the unique dental needs of children, stands to benefit significantly from AI innovations.
- Research into AI applications in this field is not only crucial for clinical advancements but also for establishing evidence-based practices that prioritize patient-centered care.
- Understanding the trends in AI-related publications within pediatric dental journals is essential for identifying areas of growing interest, technological advances, and research gaps that could influence clinical applications and future studies.
- The PubMed database, a central repository for biomedical literature, serves as an invaluable resource for analyzing publication trends and assessing the progression of AI research within pediatric dentistry.
- By examining publication patterns and areas of focus, we can gain insights into how this technology is evolving and shaping pediatric dental care.

METHODS

- This review examines available publications on PubMed focusing on the intersection of pediatric dentistry and artificial intelligence. Relevant dental journals were identified through targeted keyword searches such as "pediatric dentistry," "artificial intelligence," "machine learning," and "children."
- Each of the three investigators independently assessed the articles, evaluating them based on relevance to Al applications in dentistry, along with details such as the study subject, publication date, journal, country of origin, and funding information, where available.
- Results and conclusions will be by consensus agreement of all reviewers. The cumulative total of publications across all included journals was calculated, providing a comprehensive overview of Al's role in pediatric dental research.

- journals.

- assessment.
- TPOT.



Trends in Research on Artificial Intelligence in Pediatric Dentistry Angelo Cacciatore, DMD, Leticia Gutierrez, DDS, Shireen Khan, DMD The University of Texas Health Science Center at San Antonio, San Antonio, TX 78229

RESULTS

Between 2000 and 2023, a total of 142 publications were recorded in over 30 different

Eighty-six articles were included in this study, of which over two-thirds of the articles were supported by research grants.

 Our study reveals a general upward trend and positive slope in the number of publications, with just eight articles published in 2020 and a nearly threefold increase to 22 articles in 2023.

• However, most articles were published in 2021, with a total of 25 articles, a slight decline in 2022, with only 23 articles appearing that year.

• The studies reviewed represented authors from 24 different countries from all over the world.

Over thirteen different topics were reviewed using machine learning. Most studies published focused on caries diagnosis and radiographic and image analysis with a focus on age

• The range of techniques identified within the generated artificial intelligence (AI) studies includes Convolutional Neural Networks (CNNs), Support Vector Machines (SVM), Decision Trees, Random Forest (RF), Deep Learning Models (e.g., YOLO, Faster R-CNN), AutoML, and



- Automated machine learning (AutoML) is a system that automates the process of building and optimizing machine learning models.
- A tree-based pipeline optimization tool (TPOT) explores all the different possibilities to find the best possible solution to maximize system accuracy.
- Support Vector Machines (SVM) is an aspect of machine learning to solve complex classification, regression, and outlier detection problems. Support Vector Machines (SVM) are used to classify features related to orthodontic diagnosis, evaluate periodontal health, and perform developmental analyses of craniofacial structures.
- Decision Trees is a supervised learning model that uses a tree-like structure to classify data or predict outcomes. In dentistry, decision trees help dentists make informed treatment decisions by analyzing patient data like medical history, radiographs, and clinical findings and predicting dental conditions based on radiographic data and demographic information.
- Random Forest (RF) combines multiple decision trees to make predictions to reach a single result. Random forests are often applied for caries risk prediction, assessing various predictors for early childhood caries based on environmental and biological factors.
- Deep Learning Models (e.g., YOLO, Faster R-CNN) are a subset of machine learning and a broader category of neural network architecture with multiple layers, while a conventional neural network is a specific type of deep learning model designed for analyzing special data.
- Convolutional neural networks (CNNs) are used in image processing to detect, classify, and segment dental structures, including age estimation, caries detection, and recognition of supernumerary teeth.
- YOLO is a real-time detection algorithm, often used for rapid object detection in panoramic radiographs, while Faster R-CNN models have been used for the automatic identification and localization of dental features such as caries or dental anomalies.



- The findings of this study highlight the increasing contribution of artificial intelligence research within pediatric dentistry and its impact on advancing patient care quality.
- The significant growth in artificial intelligence publications in the past years underscores the need for a greater understanding of how to utilize the technology to maximize efficiency and maximize the quality of patient care.
- The incorporation of AI will likely raise the standard of dental care, reduce errors, and enhance patient satisfaction.

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REFERENCES

