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ChatGPT in Dentistry: Current Applications, Clinical Implications, Challenges, and Future Perspectives

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Abstract

The growing interest in artificial intelligence in dentistry has highlighted the potential applications of ChatGPT (OpenAI, San Francisco, CA, USA), a conversational AI tool, in clinical practice, dental education, research, and patient communication. It can be useful for academic writing, clinical case discussions, scientific research summaries, and the development of patient education resources. However, in order to guarantee correct references, trustworthy information, and patient data protection, ChatGPT needs clinical validation, responsible use, and suitable safeguards. This review aims to provide an overview of ChatGPT applications in several dental specialties, highlighting potential benefits, limitations, and associated practical and therapeutic issues.

Categories: Dentistry
Keywords: ai, chatgpt, dental education, dental practise, dentistry

Introduction And Background

ChatGPT (OpenAI, San Francisco, CA, USA) has garnered increasing attention due to its potential to facilitate information retrieval, knowledge sharing, and the understanding of intricate dental ideas. Artificial intelligence has been applied in many aspects of dentistry [1]. While recent developments in AI have made it possible for users to ask questions and obtain contextually appropriate answers, machine learning and deep learning algorithms can identify patterns in clinical and radiographic data to support specific diagnostic tasks [2]. ChatGPT, an OpenAI conversational AI tool built on a large language model (LLM), is one example. ChatGPT allows users to obtain explanations of concepts in various ways according to their needs [3]. ChatGPT can facilitate patient communication in addition to helping with academic writing and clarifying difficult concepts. These resources could help with patient communication, clinical discussions, research projects, dental education, and dental practice administration. Before being used in clinical practice, ChatGPT's responses should be thoroughly assessed for accuracy and clinical relevance, notwithstanding its potential applications [4].

Although reviews exploring artificial intelligence in dentistry have been published previously, this narrative review explores the use of ChatGPT, its advantages and disadvantages, ethical issues, and implications in various areas of dentistry. Evidence specific to ChatGPT has been identified in comparison with other AI systems. Most available evidence is based on question-answering tasks and scenario-based testing; therefore, this should not be considered evidence that ChatGPT has been proven effective and accurate in a clinical setting. As ChatGPT is also evolving rapidly, it is important to consider that findings may vary depending on which version of ChatGPT was used.

Review

Literature search

A narrative literature search was carried out to identify relevant literature on the application of ChatGPT in dentistry. Searches were performed across different databases (PubMed/MEDLINE, Scopus, Embase, Web of Science, and Google Scholar) from their inception through October 15, 2026. Keywords were used in combination to search for articles, including "ChatGPT," "artificial intelligence," "large language models," "dentistry," "dental education," "oral medicine," "prosthodontics," "oral and maxillofacial surgery," "pediatric dentistry," "endodontics," "patient communication," and "dental research." Only publications focusing on the application of ChatGPT and LLMs in dentistry were included. Publications that did not relate to dentistry or

had insufficient relevance to the aims of the review were excluded. Duplicates were also excluded. Reference lists were manually searched to identify additional relevant studies. As this article is a narrative review, no formal selection process, risk-of-bias assessment, or data synthesis was performed.

Understanding ChatGPT

OpenAI created ChatGPT, a conversational AI tool built on an LLM. By predicting token sequences based on patterns learned during training and the surrounding context, it generates responses to prompts. The model can process text and identify relationships between words and other tokens through its transformer architecture [5]. ChatGPT uses natural language interaction to generate text for various applications in dentistry, such as academic writing, patient education materials, scientific literature summaries, and patient communication. Prompt formulation, or prompt engineering, influences the appropriateness and relevance of ChatGPT's responses. More relevant answers can be generated by providing clear instructions, defining the context, and specifying the intended audience. However, well-crafted prompts do not guarantee accurate or clinically relevant results [5-7].

ChatGPT can accept non-textual inputs, including images, depending on the model and the features enabled. For some applications, it may assist in discussing clinical and dental radiographic images [8]. However, ChatGPT is not exclusively a text-based LLM, as its multimodal capabilities vary depending on the model. It differs from computer vision and diagnostic models specifically trained and validated for dental imaging. Although multimodal LLMs can assist with image interpretation and discussion, their outputs should never be considered a definitive diagnosis. Human oversight and review by a qualified dental professional are essential. ChatGPT should not be assumed to have the same level of validation as AI systems specifically developed for particular dental diagnostic or imaging tasks. Therefore, it should complement rather than replace validated diagnostic tools and professional dental judgment. It may also assist clinicians in discussing treatment options and organizing patient-related clinical information.

Application of ChatGPT in dentistry

ChatGPT in Oral Medicine

In oral medicine, ChatGPT could be used as an adjunct to clinical assessment and reasoning related to oral lesions, as well as to provide information on their diagnosis and management. AI-based applications have been explored for oral lesion assessment; however, findings from studies evaluating specialized AI applications should be distinguished from evidence specifically investigating ChatGPT [9]. Using 111 multiple-choice questions covering oral lesions, Hajibagheri et al. evaluated ChatGPT-4 and reported an overall accuracy of 87.4%. This finding reflects the performance of the specific model version under the study conditions and should not be generalized to other ChatGPT versions or interpreted as diagnostic accuracy in real-world clinical practice. Similarly, research evaluating ChatGPT in oral and maxillofacial pathology has demonstrated its potential to assist with differential diagnosis, although its responses require clinical verification. Overall, ChatGPT may serve as an adjunct for accessing clinical information and supporting diagnostic reasoning in oral medicine. However, these studies primarily assessed question-answering performance, and its accuracy in real-world clinical settings remains uncertain. Therefore, its responses should be critically evaluated against current evidence and clinical guidelines, with final diagnostic decisions remaining the responsibility of qualified clinicians [10].

ChatGPT in Prosthodontics

AI can support prosthodontics by assisting with clinical reasoning and providing treatment-planning recommendations. ChatGPT has been used to answer prosthodontic questions related to implant-supported prostheses, occlusion, and shade selection for dental restorations. A systematic review by Díaz-Flores García et al. identified eight studies published between January 2022 and August 2025 that assessed the use of ChatGPT in prosthodontics. The findings indicated that ChatGPT-4 generally demonstrated improved response coherence, clinical relevance, and reasoning quality compared with earlier versions [11]. Chain-of-thought prompting encourages LLMs to approach complex questions through intermediate reasoning steps. However, its effectiveness may vary depending on the model, task, and prompt design [5].

In addition to these uses, ChatGPT can help prosthodontists with clinical and academic tasks, such as analyzing patient histories, generating differential diagnoses, comparing treatment plans, selecting appropriate prosthetic options, and communicating with patients. Additionally, it might aid in creating test questions, case-based learning scenarios, patient education materials, summaries of clinical practice guidelines, research reviews, and scientific manuscripts. It might make learning about complete denture construction, partial denture design, and prosthesis maintenance easier in removable prosthodontics. Potential uses in fixed prosthodontics include comparing options for crowns and bridges, evaluating restorative materials, and discussing different treatment modalities. ChatGPT may assist in organizing information about prosthetic complications, implant-supported restorations, and maintenance procedures in implant prosthodontics [12].

However, ChatGPT could produce erroneous answers, especially in complex clinical scenarios that require

precise information and expert knowledge. Since most of the available evidence is based on simulated scenarios, further clinical validation is needed to confirm the reliability and safety of this technology in prosthodontic practice.

ChatGPT in Oral and Maxillofacial Surgery

ChatGPT could be useful in the assessment of facial trauma, interpretation of clinical findings, and treatment planning for the jaws and facial tissues in oral and maxillofacial surgery. It could assist in understanding a range of conditions, including maxillofacial infections, TMJ disorders, odontogenic cysts, and mandibular fractures. It could also assist in explaining surgical techniques, postoperative management, and the various issues that may arise in complex procedures. Additionally, it could help compare different treatment options and facilitate understanding of the surgical literature. As with any such tool, its recommendations would need to be checked against accepted surgical practices, radiographic findings, and clinical outcomes.

The quality of ChatGPT's responses to questions in oral and maxillofacial surgery was assessed by Balel using 120 questions, divided into 60 patient-related and 60 technical questions. Thirty questions were asked in each of the following four areas: impacted teeth, dental implants, temporomandibular joint disease, and orthognathic surgery. Responses were scored by 33 oral and maxillofacial surgeons using a modified version of the Global Quality Scale (GQS). Patient-related questions received significantly higher scores (4.62±0.78) than technical questions (3.10±1.49; $p<0.001$). There were no statistically significant differences in the quality of responses across the four areas ($p>0.05$). This study suggests that ChatGPT can be used to provide general patient information in oral and maxillofacial surgery. However, its reliability as an educational tool or resource for professional training remains uncertain. ChatGPT should therefore be considered a supplementary resource for surgeons rather than a replacement for their clinical knowledge and experience [13].

ChatGPT in Pediatric Dentistry

ChatGPT has been shown to be a potentially useful tool in pediatric dentistry. A study was undertaken by Bayraktar NC et al. to evaluate how ChatGPT-3.5 performed when answering questions about dental trauma, fluoride, and tooth eruption/oral health. There were 60 questions for each topic, with 30 patient/parent-related and 30 academic questions. The ChatGPT responses were scored by 10 pediatric dentists using the modified GQS. The scale ranges from 1 (low quality) to 5 (high quality). The quality scores were significantly higher for patient/parent-related questions, with an average score of 4.3 (±0.7), compared with academic questions, with an average score of 3.7 (±0.8) ($p=0.005$). The lowest score was for academic dental trauma questions, with a score of 3.0 (±0.8) ($p=0.003$). Readability was analyzed using the Flesch Reading Ease and Flesch-Kincaid Grade Level tests. The Flesch Reading Ease score was significantly higher for patient/parent-related questions (41.5 (±12.5)) compared with academic questions (34.0 (±11.3)) ($p=0.017$). However, both scores indicated a college-level readability. The Flesch-Kincaid Grade Level scores were not significantly different (12.7 (±2.4) and 13.7 (±1.9)) ($p=0.091$). Similarly, the similarity scores were not significantly different (8.4% (±8.4) and 5.7% (±5.1)) ($p=0.383$). This suggests that ChatGPT-3.5 could provide useful information to parents/caregivers, but further improvements are needed in academic quality and readability to utilize ChatGPT in pediatric dentistry [14].

ChatGPT in Endodontics

ChatGPT may be used in endodontics to promote clinical learning, summarize scholarly papers, describe endodontic procedures, and explain root canal therapy. ChatGPT can offer general information regarding intracanal medications, root canal equipment and irrigation procedures, pulpal and periapical disorders, and postoperative care. Additionally, it might aid dental students in organizing pertinent clinical data and comprehending endodontic concepts. However, especially in complicated clinical situations, ChatGPT's answers could be erroneous or incomplete. It should therefore be used in conjunction with clinical examination, evidence-based treatment procedures, precise diagnosis, and expert clinical judgment rather than as a replacement for them. de Araújo et al. evaluated 11 LLMs using 60 questions based on AAE and ESE endodontic guidelines across five rounds (3,300 responses). ChatGPT-4o and Claude Opus 4 achieved the highest accuracy (95%), whereas DeepSeek showed the lowest (63.3%). Most models demonstrated over 90% response consistency. Despite promising performance, variability and potentially incorrect responses highlight the need for expert oversight and further clinical validation [15].

ChatGPT in Dental Education

ChatGPT can be utilized in dental education for a number of tasks, including evaluating student essays and assignments and offering comments on clarity, grammar, sentence structure, and word choice. Additionally, it might save teachers time when evaluating and commenting on students' work. Furthermore, ChatGPT can act as a virtual learning assistant by responding to students' inquiries and creating customized study schedules and resources based on their unique requirements, learning styles, and academic standing. Additionally, it can assist dental students in reviewing theoretical concepts, preparing for tests, and

investigating clinical situations to enhance their comprehension and critical-thinking abilities [7,16].

ChatGPT in Patient Outreach

To enhance patient communication, ChatGPT may assist dental offices in creating content for campaigns, marketing materials, and social media platforms. It can also be used to communicate in a patient-friendly manner to inform patients about treatment options, prevention, and dental hygiene. ChatGPT can also be used to create personalized follow-up messages, appointment reminders, and FAQs. It can also be used to create educational information regarding periodontal health, caries in children, and the importance of regular dental appointments. Overall, these applications can help provide information on oral health and encourage patients to become more involved. However, dental experts should examine all content produced by ChatGPT to guarantee accuracy and avoid misinformation [7,16].

ChatGPT in Dental Research

In addition to providing answers to research-related queries and summaries of scientific literature, ChatGPT can help with the creation of research outlines, reference lists, and study materials. Additionally, it can assist researchers in organizing data from published studies, creating presentations and conference abstracts, writing literature reviews, and drafting research submissions. Its capacity to condense the main conclusions of scientific articles could aid researchers in keeping up with the increasing amount of dental literature. Additionally, ChatGPT can help with organizing content for academic posters and presentations, creating research questions, and enhancing the clarity of scientific writing. By elucidating scientific vocabulary, statistical techniques, and research approaches, it could function as an additional learning resource for postgraduate students. It can also be used by researchers to identify possible knowledge gaps and develop preliminary study proposals. However, to guarantee scientific accuracy, research integrity, and proper citation practices, AI-generated references, interpretations, and study-related claims should be independently validated (Appendix) [3,7].

Advantages of ChatGPT in dentistry

By offering prompt feedback and demystifying difficult dental concepts, ChatGPT can promote interactive learning and help students grasp difficult subjects. Being able to quickly locate and categorize information can make academic and clinical documentation more efficient. Furthermore, it can adjust explanations to fit individual learning needs, encouraging dental students to study independently. While it can be helpful during clinical practice for exploring different treatment options and differential diagnoses, it is important to compare the chatbot's recommendations with existing evidence [3,7].

Limitations, ethical considerations, and reliability of ChatGPT

Although ChatGPT can be used in many ways within the dental field, there are limitations that need to be considered. One of the main problems is the accuracy and reliability of ChatGPT. It can produce false but plausible information, which is referred to as AI hallucination [17].

Confidentiality and security of patient data are major concerns when entering patient information into an AI system. De-identification of patient information, along with obtaining informed consent, should be done where necessary. It is important to ensure that dental professionals follow all relevant regulations, such as the General Data Protection Regulation (GDPR), the Health Insurance Portability and Accountability Act (HIPAA), and the Digital Personal Data Protection Act (DPDP Act) in India. Dentists should always maintain accountability for checking information provided by AI and making clinical decisions, as inaccurate advice from AI could have medico-legal implications.

Other issues include patient confidentiality and privacy, as personal data and medical records are entered into AI systems. Excessive reliance on ChatGPT in dental education can affect the ability of students to study independently and think critically. Using ChatGPT in academic writing raises ethical issues regarding the originality of student work, research integrity, and plagiarism. ChatGPT can also provide incorrect research information and fabricated references, meaning that any information generated by AI must be verified before publication [18].

ChatGPT lacks empathy and can struggle to understand complex situations that require careful consideration. Although it can help with clinical decision-making, it cannot replace the clinical knowledge, judgment, and communication skills of dental professionals. ChatGPT must still be supervised by humans to ensure ethical, reliable, and safe use within dental practice. It should therefore be viewed as an additional tool rather than a replacement for expert knowledge [19].

Knowledge and attitudes of dentists about adoption of ChatGPT in dentistry

ChatGPT’s success will rely on various factors, such as the knowledge, awareness, and attitudes of dental

professionals. Having adequate awareness, knowledge of the limitations, and understanding of the correct use of ChatGPT, alongside a positive attitude, may help promote its implementation in dental education, research, and clinical practice. Understanding the knowledge and attitudes of dentists toward ChatGPT can help identify areas that may cause issues with its implementation [20,21]. The meta-analysis by Bagde et al. included 11 descriptive studies investigating the performance of ChatGPT-3.5 in medical and dental settings. Accuracy ranged from 18.3% to 100%. Pooled analysis of eight studies showed an OR of 2.25 (95% CI: 1.49-3.40; I^2=77%) and an RR of 1.47 (95% CI: 1.21-1.80; I^2=74%). However, significant heterogeneity, small or unclear sample sizes, different evaluation methods, and the use of only one model (GPT-3.5) limit generalizability [21]. Several studies have been conducted to understand the knowledge and attitudes of dental professionals toward ChatGPT. A survey was conducted by Belaldavar and Angadi to investigate the perceptions of 354 dental students and professionals. The results showed a positive perception of ChatGPT, especially in dental education and research. Knowledge of the technology, simplicity, and proper training were also important [22]. A further survey was conducted by Zope et al. involving 384 undergraduate and postgraduate students and teaching staff from Maharashtra, India. The results showed that 87.2% were aware that ChatGPT is an AI-based tool. Postgraduate students had more knowledge than teaching staff. However, participants also identified concerns about data privacy [23]. A cross-sectional study was conducted by Goswami and Padmanabh to understand knowledge and attitudes toward ChatGPT among dental students in Gujarat. The results showed high awareness and a generally positive attitude toward using ChatGPT in dental education. However, concerns were expressed about the impact on traditional learning and increased screen time [24]. Overall, these studies highlight that adequate knowledge, proper training, and awareness of limitations will help promote the use of ChatGPT in dentistry.

Future perspectives

There were a few limitations within this review. There was no systematic literature search, no quality assessment was performed, the versions of ChatGPT are changing rapidly, and some areas of dentistry received little coverage. Future work should focus on developing and validating models specific to dentistry to ensure the reliability of AI-generated data. Standardized methods of assessment are needed to identify how accurate, reliable, and generalizable ChatGPT is as a dental resource. Further work should also be carried out to understand how bias occurs in algorithms and to address patient confidentiality and data security to encourage the correct and safe use of ChatGPT within dentistry. Clinical validation, professional oversight, and independent peer review will be key before the widespread use of AI-generated data as a supplementary resource in clinical practice.

Conclusions

ChatGPT can help provide individualized patient treatment discussions, simplify complicated information, and make dental information more accessible. Using ChatGPT within different dental specialties can help with preventive and therapeutic strategies, clinical record-keeping, and diagnosis. ChatGPT will only be effective when accurate data are provided, particularly in complex scenarios, and with appropriate professional supervision. Therefore, ChatGPT should not be used to replace professional dental judgment but instead as an aid to enhance clinical knowledge.

Appendices

Author (Year)	Specialty	Model	Study objective	Sample	Key Findings
Hajibagheri P et al. (2025) [10]	Oral medicine	ChatGPT-4	Oral lesion-related questions	111 MCQs	Overall accuracy: 87.4%; lower accuracy for difficult questions
Díaz-Flores García V et al. (2026) [11]	Prosthodontics	ChatGPT models	Clinical applications in prosthodontics	8 studies	Reported potential benefits in clinical reasoning and response quality
Balel Y (2023) [13]	Oral surgery	ChatGPT	Patient-related and technical questions	120 questions	Higher scores for patient-related than technical questions
Nahir CB (2025) [14]	Pediatric dentistry	ChatGPT-3.5	Pediatric dentistry-related questions	60 questions per topic	Evaluated the quality of responses across pediatric dentistry topics
de Araújo LP et al. (2026) [15]	Endodontics	11 LLMs	Endodontic guideline-based questions	60 MCQs	ChatGPT-4o achieved 95% accuracy

TABLE 1: Summary of evidence on ChatGPT applications in dentistry

MCQs, multiple-choice questions; LLMs, large language models; GQS, Global Quality Scale; AI, artificial intelligence

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Jayesh Tiwari, Anjali Khatri, Aarif Khan, Harsha Hardiya, Sumit V. Bedia, Sameer Chauhan, Rituparnna Dhir

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Disclosures

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