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Artificial Intelligence Applications in Dental Diagnosis and Treatment Planning: A Review

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Abstract:

Artificial intelligence (AI) technology represents one of the promising technologies of the future in dentistry with a range of practical applications for diagnosis, treatment planning and decision making in clinical cases. The current literature review covers human-based AI applications in the management of dental caries, periodontal disease, endodontic diseases, oral lesions, orthodontics, prosthodontics, implant dentistry and oral and maxillofacial radiology. Machine learning, deep learning and convolutional neural networks use dental radiographs, cone-beam computed tomography scans, intraoral images, cephalometric images and clinical records for the purpose of detecting the diseases, interpreting the images, evaluating anatomy and planning the treatment. There is evidence that AI can improve the efficiency and consistency of diagnoses and make personalization of dental care possible, especially when it comes to image-based application. However, there are limitations in form of small sample sizes, lack of external validation, inconsistencies in the use of imaging techniques, bias in algorithms, lack of explainability of results and data protection issues. Therefore, AI should serve more as the aid for dentist in decision-making rather than substitute for him/her.

Keywords: Artificial Intelligence; Dental Diagnosis; Treatment Planning; Machine Learning; Deep Learning; Dental Imaging

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1. INTRODUCTION

Introduction of artificial intelligence (AI) is regarded as one of the most significant technological breakthroughs in contemporary medicine due to the capability of this technology to process enormous amounts of complex medical data, identify patterns, diagnose diseases, and aid in making clinical decisions. With regards to dentistry, fast advancements in digital radiography, CBCT

scanning, intraoral photographs, digital dentistry models, cephalometric radiographs, and electronic medical records provide new perspectives for applying AI in diagnostics and treatment planning[1]. Machine learning, deep learning, and convolutional neural networks (CNNs) are able to process data obtained from humans and help identify dental caries, loss of periodontal bone, periapical pathology, oral potentially malignant disorders, and many other pathologies. They can be applied to orthodontic diagnostics, implants planning, endodontics, prosthodontics, and oral and maxillofacial surgery as well. Consequently, artificial intelligence is becoming an increasingly important technological support for modern dentistry[2].

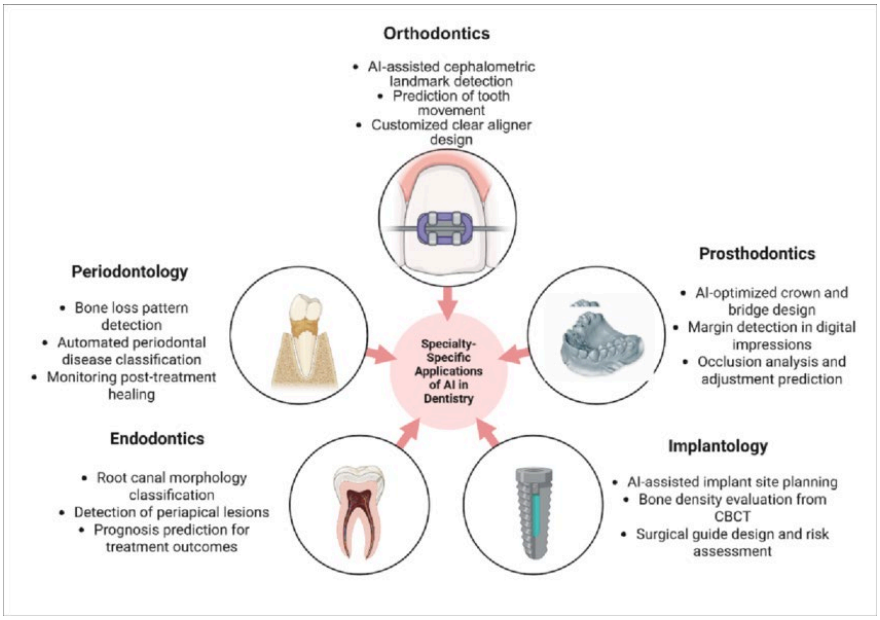

Figure 1: Applications of AI in dentistry[3]

The recent advancements in artificial intelligence technology have not only increased its applicability from basic image classification but to more sophisticated applications such as diagnostic and planning processes. AI systems can automatically classify teeth, detect pathologic changes, calculate alveolar bone loss, detect cephalometric points, segment anatomical structures from CBCT images, and predict treatment outcomes[4]. A variety of applications have shown promising results in human-based research especially in radiographic diagnostics and orthodontic imaging, but the clinical use of AI presents numerous issues such as lack of data and heterogeneity in the data, inconsistency in imaging protocols, insufficient external validation, algorithmic bias, lack of explainability, issues related to data privacy, and unclear clinical accountability. Hence, it is imperative that an evaluation of the available evidence be conducted to comprehend the advantages and limitations of AI in dentistry.

1.1 Background Information and Context

Dental diagnosis usually makes use of clinical examination, medical history, and experience[5]. However, even though these techniques are efficient, interpretation of complex dental images is usually a time-consuming task that depends on the skills of different clinicians when it comes to early caries detection, periodontal bone loss, periapical lesion identification, and unusual oral lesions. Artificial intelligence (AI) could assist in performing such tasks because it can process human clinical data and detect patterns which are hard to notice when conducting a normal examination. Deep learning algorithms, especially convolutional neural networks (CNNs), have allowed increasing the application of AI in dental imaging through caries detection from bitewing and periapical radiographs, periodontal examination, CBCT implant planning, orthodontic examination, and oral lesion detection. AI is able to predict treatment success in dental care[6]. However, it all depends on the nature and variety of data used to train the model, as models created using limited or one-center data can underperform in different environments. Consequently, prospective validation, variety of human-based data, standardization of results reporting, explainability of AI, and professional supervision become crucial for the safe deployment in practice.

1.2 Objectives of the Review

The key aims of this review are:

- To give a general idea of the relevant uses of AI in human dental diagnosing and dental planning.
- To review significant clinical studies involving humans that have been conducted to assess AI in various dental specialties.
- To explore the use of AI in the following dental specialties: Caries, Periodontics, Endodontics, Oral Pathology, Orthodontics, Prosthodontics and Implant Dentistry.
- To assess the methodologies, diagnostic accuracy, benefits and drawbacks of AI-based dental systems.
- To evaluate the clinical and diagnostic performance of AI and personalized treatment planning, review clinical data and patient histories.Review clinical data and patient histories to evaluate AI's potential to enhance diagnostic accuracy, clinical efficiency, and personalized treatment planning.

1.3 Importance of the Topic

Oral disease is becoming more common, and the amount of information available digitally has increased, leading to a need for efficient, accurate and reliable technologies for diagnosis and treatment planning[7]. AI has the ability to help dental clinicians through better diagnosis of abnormalities, reduced repetition of clinical work, standardization of image reading, and clinical decision-making based on evidence. These uses of AI in early detection of carious lesions, periodontics, oral cancer screening, orthodontics, endodontics, and implantology could lead to an

earlier diagnosis and more personalized treatment. Nevertheless, the role of AI in dentistry is not just related to accuracy, because its implementation in dentistry requires considerations such as patient safety, data privacy, transparency, accountability, and access[8]. In this case, therefore, AI should be seen as a supplementary technology that assists and not competes with dentists. There is a need for a thorough review of the current scientific evidence on man-based knowledge to understand the possibilities, limitations, and ethical issues involved in using AI in the diagnosis and treatment of patients in dentistry.

2. ARTIFICIAL INTELLIGENCE IN DENTAL DIAGNOSIS AND TREATMENT PLANNING: APPLICATIONS AND CLINICAL PROPERTIES

Dental diagnosis and treatment have increasingly become revolutionized by artificial intelligence (AI) via machine learning, deep learning, and convolutional neural network models[9]. These algorithms are capable of analyzing human dental x-rays, CT scans, intraoral pictures, cephalometric radiographs, and medical history reports to aid in the diagnosis of diseases and treatment plans. Human studies have shown potential applications in the following areas of dentistry – dental caries, periodontitis, endodontics, oral cancer, orthodontics, and implants. The following section briefly discusses the applications of artificial intelligence in human dentistry[10].

2.1 Artificial Intelligence in Dental Caries Diagnosis

Dental caries is one of the most extensively researched applications of AI in dentistry. AI models have been designed to diagnose and categorize carious lesions through the use of bitewing, periapical, panoramic radiographs, and intraoral photographs[11]. Deep learning algorithms can detect radiographic patterns and help dentists to diagnose lesions.

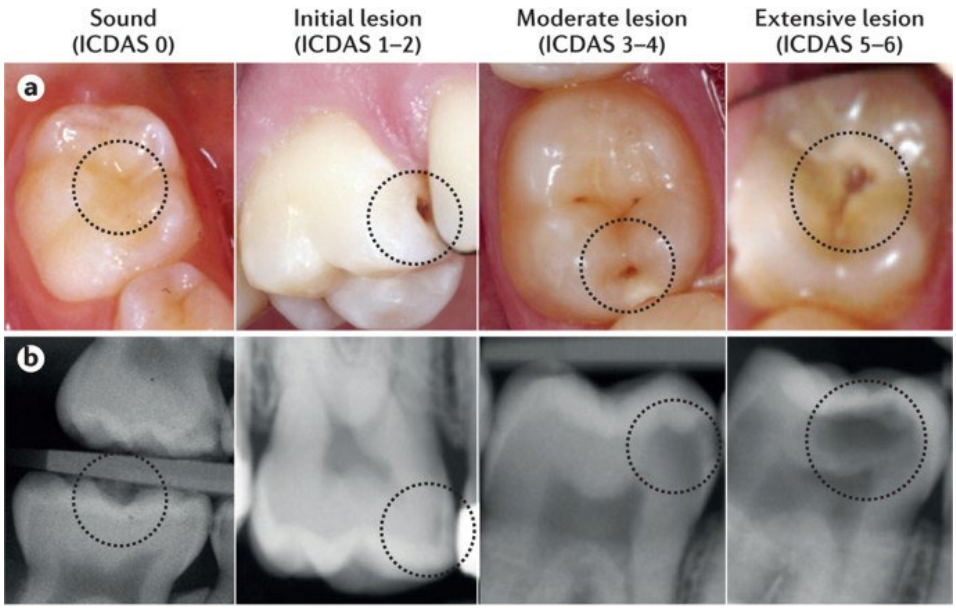

Figure 2: Dental Caries[12]

In most cases, the human image data set is categorized into training, validation, and test sets. The diagnostic performance of the models is often evaluated based on sensitivity, specificity, accuracy, F1 score, and AUC.

Strengths

- Rapid analysis of dental images
- Improved consistency of interpretation
- Detection of subtle lesions
- Potential for early and remote screening

Weaknesses

- Dependence on image quality
- Limited datasets in some studies
- Risk of false-positive and false-negative results
- Need for clinical validation

AI thus becomes a potential tool for caries detection, but the diagnosis itself still needs to be clinical in nature[13].

2.2 Artificial Intelligence in Periodontal Diagnosis

AI has found more applications in diagnosing periodontal diseases especially in relation to the detection of alveolar bone loss in human dental radiographs [14]. Models for deep learning may help identify teeth, level of bones, and periodontitis.

Figure 3: Periodontal Diagnosis[15]

Strengths

- Automatic identification of bone loss
- Uniform radiography evaluation
- Less interobserver variation
- Quick analysis of massive amounts of data
- Support for periodontal screening

Weaknesses

- Radiographic images do not fully represent the periodontal condition
- Probing and clinical attachment loss measurements may not be accounted for
- Low levels of external validity
- Potential sample biases

AI thus should be utilized along with periodontal assessment, probing values, medical history, and other clinical parameters.

2.3 Artificial Intelligence in Periapical and Endodontic Diagnosis

AI has also been studied for its application in detecting periapical lesions, studying root form, and determining outcomes of root canal treatments[16]. AI systems can incorporate both human patient and treatment parameters for prognosis purposes.

Strengths

- Rapid identification of periapical problems
- Anatomical diagnosis
- Comprehensive assessment of treatment complexity
- Treatment result prediction

Weaknesses

- Only radiographs do not help in assessing the pulp condition
- Possible neglect of clinical signs
- Scanty prospective studies
- Necessity of combining with clinical examination

AI should thus help in diagnosing cases rather than determining what treatment is needed on its own.

3. THEMATIC APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN DENTAL DIAGNOSIS AND TREATMENT PLANNING

Artificial intelligence has greatly contributed to the diagnosis and treatment planning in dentistry through the fast and standardised analysis of human data. AI technology is capable of analysing radiographs, CBCT scans, intraoral photos, cephalometric images, and patient records for disease diagnosis, treatment selection, and decision-making[17]. Such applications can be helpful in enhancing the accuracy of diagnostics, decreasing the workload, and tailoring dental care to the needs of individual patients. At the same time, professional guidance is necessary since AI results depend on various factors.

3.1 AI as a Diagnostic Support System

AI for diagnostic purposes is perhaps the most important application in contemporary dentistry. The use of AI models has already shown its promise in the detection of dental caries, bone loss in periodontal tissues, periapical pathologies, lesions in the oral cavity, etc., based on human dental images. With the help of pattern recognition, which may be challenging in the process of image evaluation, AI will help dentists enhance their diagnostics and reduce observer variability[18].

The greatest strength of AI is that it is capable of analysing numerous clinical images quickly and offering a standard preliminary interpretation of them. However, accuracy of the diagnosis does not necessarily mean the correctness of the final diagnosis, as other factors such as symptoms of patients, their history, and examination should also be taken into account. Therefore, AI should serve as an assisting technology.

3.2 AI in Dental Treatment Planning

Treatment planning using artificial intelligence is becoming more common in such fields as orthodontics, implants, and endodontics. In contrast to disease detection, treatment planning involves choosing a suitable treatment approach out of many possible ones.

Figure 4: AI in Dental Treatment Planning[19]

AI may aid in the identification of anatomical landmarks, bone measurement, assessment of skeleton relationship, prediction of extraction needs, and difficulty of treatment. Nonetheless, treatment planning relies not only on imaging but also on other parameters such as the clinical findings, the patient's preference and aesthetic considerations, prognosis, and success of treatment. Treatment planning AI would then benefit from human multi-modal data integration[20].

3.3 AI for Improving Diagnostic Efficiency

AI could decrease the duration needed to perform various repetitive dental processes. They include automated tooth detection, tooth segmentation, cephalometric landmark detection, periodontal bone loss measurement, anatomical segmentation, and radiographic lesion detection[21].

These abilities could help lower the workload of dental professionals and ensure that there is consistency in performing the routine diagnostic processes. AI can also be used to analyze large quantities of data related to radiographic and clinical images in a very short while. Nevertheless, the increased efficiency should not lead to the reduction of diagnostic validation.

3.4 Human-AI Collaboration in Dentistry

The collaboration between human and AI is one of the approaches to the safe introduction of AI into the dentistry industry. Under this approach, AI is responsible for analyzing the clinical data and giving an initial interpretation while the dentist assesses the output of AI alongside clinical results[22].

Figure 5: Human-AI Collaboration in Dentistry[23]

The method integrates the data processing abilities of AI with human clinical thinking and expertise. AI is good at spotting patterns and working with huge data sets, while dentists can take into account symptoms, patient considerations, ethical concerns, prognosis, and other factors which might not be properly captured in the AI data sets.

Human guidance becomes especially vital in complicated dental cases when there are a number of viable treatment choices available.

3.5 Explainability and Transparency of AI

The ability to explain AI predictions is another important factor when it comes to the application of artificial intelligence in dentistry because the decision-making process of many deep learning systems is considered complex and hard to interpret.

The use of explainable AI techniques makes it possible to highlight specific image elements that affect the prediction of the AI system.

Future dental AI systems should focus on:

- Explainable predictions
- Confidence scores
- Identification of relevant image regions
- Clear information regarding model limitations
- Clinician override mechanisms

More transparency will go a long way to ensure that AI suggestions are evaluated properly before their implementation[24].

3.6 Generalizability and External Validation

Generalizability is one of the main problems impacting the implementation of dental AI in clinical practice. An AI system trained using radiographs taken at a particular dental institution may not show similar performance at another institution due to the difference in demographics of the patients, the prevalence of diseases, imaging systems, imaging quality, clinical protocol, and the geographic location of the population.

This problem is very important when talking about implant planning, periodontal diagnosis, and radiographic disease detection, which have been studied by many researchers using single-centred data. Thus, good performance in a research dataset cannot be regarded as proof of clinical efficacy[25].

Further research should be conducted using large and diverse human multicentre datasets and external validation. This will allow us to see if the AI is able to retain its diagnostic capabilities with other patient groups and dental settings.

4. CLINICAL APPLICATIONS OF ARTIFICIAL INTELLIGENCE ACROSS DENTAL SPECIALTIES

Artificial Intelligence (AI) is becoming more and more relevant in dentistry, being used for diagnostic, treatment planning, prognosis and decision-making purposes. The access to digital radiographs of human origin, CBCT images, intraoral images, cephalometric images, digital dental models and electronic medical records has allowed creating AI-driven applications[26]. In restorative dentistry and periodontology, AI applications have mostly included detection of dental caries, diagnosis of periodontal bone loss, disease classification and risk assessment. On the other hand, AI in endodontics includes detection of periapical lesions, identification of root canal morphology, assessment of case difficulty and prediction of treatment outcome. These applications could help in speeding up and standardizing the diagnostic process while decreasing repetitive tasks for the dentists.

AI has also shown its significant applications in the field of oral medicine, oral pathology, orthodontics and oral and maxillofacial radiology. AI can analyse images obtained from human intraoral photographs, clinical images and digital histopathological images for identification of suspicious oral lesions and potential malignant lesions in the fields of oral medicine and oral pathology. For the application of AI in orthodontics, there have been numerous studies for cephalometric landmark identification, skeletal classification, assessment of malocclusion, tooth extraction prediction and treatment planning[27]. Just like in other areas, AI can aid in the diagnosis of caries, periodontal bone loss, periapical lesions, impacted teeth, cysts, and other radiographic findings in oral and maxillofacial radiology.

AI is currently gaining ground in prosthodontics and implant dentistry where digital workflows are used. AI can help in tooth form analysis, digital smile design, designing of prosthesis, occlusion analysis, and treatment planning. AI systems that use cone beam computer tomography (CBCT) can help in determining the location of the mandibular canal, maxillary sinuses, edentulous areas, and available bone to help in planning for implants. AI is also being used in maxillofacial surgery[28]. These applications may help increase the efficiency of treatment and improve the accuracy of its planning; however, they can neither address all clinical, functional, aesthetic, and individual factors separately nor provide solutions to these problems without human intervention.

In general, the clinical applications of AI range across nearly all major fields of dentistry and have great potential to advance diagnostic accuracy, efficiency, standardization, and personalization of treatment plans. However, there is still a lack of evidence due to differences in datasets used, study designs, demographics of populations involved, and external validation of AI findings. The results obtained through AI should thus be considered in combination with clinical evaluation and experience of clinicians. The most rational option at this point in time seems to be the collaboration between humans and AI, where the latter takes care of data analysis, and dentists and specialists take the decisions about diagnoses, treatments, and patients[29].

Table 1: Summary of Selected Literature on Artificial Intelligence in Dentistry[30]

Author(s) & Year	Study Focus	Methodology/Model	Key Findings
Bonny et al. (2023)[31]	AI applications in dentistry	Comprehensive review	AI improved diagnostic support, treatment planning, and clinical decision-making, but required validation and professional supervision.
Patil et al. (2022)[32]	AI in oral disease diagnosis	Review of AI-based clinical and radiographic studies	AI showed promising diagnostic performance, but dataset variability and limited validation were major concerns.
Dhopte & Bagde (2023)[33]	AI in modern dental practice	Narrative review	AI improved diagnostic efficiency and personalized care, while privacy, cost, and technical challenges remained.
Khanagar et al. (2021)[34]	AI in oral cancer diagnosis and prognosis	Systematic review	AI showed potential for oral cancer detection and prognosis, but small datasets and limited

			external validation restricted application.
Shafi et al. (2023)[35]	AI and dental e-health	Comprehensive review	AI supported diagnosis, treatment planning, tele-dentistry, and personalized care, with ethical and data-security challenges.

5. DISCUSSION

This section discusses the findings which have been highlighted in this review with regard to the use of artificial intelligence (AI) for dental diagnosis and treatment planning for humans. From the reviewed literature, it is clear that there are various areas in dentistry where AI has great potential[36]. Application of AI has been evaluated for dental caries, periodontal diseases, endodontic problems, oral mucosal lesions, orthodontics diagnosis, implant planning, among other applications in dentistry. However, various challenges related to data quality, external validation, explainability, clinical adoption, patient confidentiality, and ethical issues have affected the practical use of AI in dentistry..

5.1 Interpretation and Analysis of Current Findings

It can therefore be deduced from the analysis above that AI is an emerging supportive technology in dentistry. The application of machine learning algorithms and deep learning methods, especially the convolutional neural networks, have been found to provide promising results in the diagnosis of various abnormalities such as dental caries, periodontal bone loss, periapical lesions, oral diseases, among others[37]. In addition, there has been success in using AI for orthodontic cephalometry, implant placement planning, anatomy segmentation, and treatment outcome prediction. This application reflects the capability of the AI technology to perform rapid processing of massive amounts of clinical data, generate standardized reports, and possibly minimize observer variation. Nonetheless, the application of AI in clinical dentistry depends on the integration of AI with clinical examination and history-taking, since AI imaging alone cannot fully account for the individuality of each case.

5.2 Clinical Implications and Significance

In addition, the increasing use of artificial intelligence in the field of dentistry carries great significance in the context of clinical applications due to the ability of AI-based techniques to save time on interpreting images repetitively, maintain consistency and help clinicians spot problems that are hard to detect in the course of routine examination. This may especially apply to caries diagnosis, periodontal disease assessment, oral pathology screening, orthodontic diagnosis and dental implants placement. Personalized dental care may benefit from AI as well[38]. Nevertheless, AI must be kept

only as a supporting tool but not as an independent one, since the final decision in dentistry requires taking into account many aspects including patient needs, clinical findings, aesthetic factors, and experience.

5.3 Research Gaps and Limitations

In spite of all the positive results that have been discovered, there are several limitations in the existing literature. The vast majority of AI research papers make use of retrospective data acquired from just one organization or rather a small number of humans. Differences in imaging devices, image quality, patients' health, etc., can influence the work of AI algorithms[39]. Moreover, external and future validations are not sufficient for many purposes, and the explainability of some deep-learning models is not sufficient for clinicians to comprehend the foundation of the prediction made by them. Patient privacy, data safety, algorithmic bias, professional accountability, and legal approval are other issues that need to be considered. Thus, based on the current evidence, there is a need for the use of AI, but not autonomous dental diagnostics and treatment planning.

5.4 Future Research Directions

Future research should concentrate on larger, longitudinal, and multicentric studies that would assess reliability, safety, and generalization of the AI-based dental system in various human populations. Future studies should give special attention to independent external validation, standardized reporting, uniform diagnostic criteria, and performance evaluation. Also, research should pay more attention to explainable AI and multimodal systems combining radiographs, CBCT images, clinical data, patient history, treatment data, and patient-reported outcomes. The focus should not be on the technical aspects such as accuracy and AUC but rather on patient-centered outcomes like improvements in diagnosis, treatment outcomes, and patient satisfaction[40]. The integration of AI into digital dentistry, remote dental care, and personalized medicine can further increase the clinical applications of AI technology, whereas cooperation between dental practitioners, AI experts, data scientists, and regulatory agencies is crucial for safe application.

6. CONCLUSION

In summary, this review finds that there is great potential for AI technology to contribute to dental diagnosis and treatment planning in different types of dentistry. There are many beneficial uses of AI in dental caries detection, periodontal and periapical lesions detection, oral disease detection, orthodontic evaluation, anatomical segmentation, dental implant planning, and treatment planning based on human clinical data. It seems that AI technology may be able to increase efficiency, consistency, image analysis ability and help in personalized treatment planning. However, such issues as small sample size and heterogeneity, lack of external validation, prospective studies, biases in algorithms, lack of explainability and data privacy are some limitations that should be considered when evaluating the application of AI. In conclusion, it can be stated that AI should only act as an

auxiliary tool of the dental specialist. Further prospective human-based studies in different centers are needed in order to prove the reliability, safety, generalizability and effectiveness of AI.

REFERENCES

1. Carrillo-Perez, F., Pecho, O. E., Morales, J. C., Paravina, R. D., Della Bona, A., Ghinea, R., ... & Herrera, L. J. (2022). Applications of artificial intelligence in dentistry: A comprehensive review. Journal of Esthetic and Restorative Dentistry, 34(1), 259-280.
2. Ding, H., Wu, J., Zhao, W., Matinlinna, J. P., Burrow, M. F., & Tsoi, J. K. (2023). Artificial intelligence in dentistry—A review. Frontiers in Dental Medicine, 4, 1085251.
3. Shan, T., Tay, F. R., & Gu, L. (2021). Application of artificial intelligence in dentistry. Journal of dental research, 100(3), 232-244.
4. Ahmed, N., Abbasi, M. S., Zuberi, F., Qamar, W., Halim, M. S. B., Maqsood, A., & Alam, M. K. (2021). Artificial intelligence techniques: analysis, application, and outcome in dentistry—a systematic review. BioMed research international, 2021(1), 9751564.
5. Khanagar, S. B., Al-Ehaideb, A., Maganur, P. C., Vishwanathaiah, S., Patil, S., Baeshen, H. A., ... & Bhandi, S. (2021). Developments, application, and performance of artificial intelligence in dentistry–A systematic review. Journal of dental sciences, 16(1), 508-522.
6. Khanagar, S. B., Al-Ehaideb, A., Vishwanathaiah, S., Maganur, P. C., Patil, S., Naik, S., ... & Sarode, S. S. (2021). Scope and performance of artificial intelligence technology in orthodontic diagnosis, treatment planning, and clinical decision-making-a systematic review. Journal of dental sciences, 16(1), 482-492.
7. Batra, A. M., & Reche, A. (2023). A new era of dental care: harnessing artificial intelligence for better diagnosis and treatment. Cureus, 15(11).
8. Ossowska, A., Kusiak, A., & Świetlik, D. (2022). Artificial intelligence in dentistry—Narrative review. International journal of environmental research and public health, 19(6), 3449.
9. Araidy, S., Batshon, G., & Mirochnik, R. (2025). Artificial intelligence applications in dentistry: a systematic review. Oral, 5(4), 90.
10. Thurzo, A., Urbanova, W., Novak, B., Czako, L., Siebert, T., Stano, P., ... & Varga, I. (2022, July). Where is the artificial intelligence applied in dentistry? Systematic review and literature analysis. In Healthcare (Vol. 10, No. 7, p. 1269). MDPI.
11. Ghods, K., Azizi, A., Jafari, A., & Ghods, K. (2023). Application of artificial intelligence in clinical dentistry, a comprehensive review of literature. Journal of Dentistry, 24(4), 356.

12. Gao, S., Wang, X., Xia, Z., Zhang, H., Yu, J., & Yang, F. (2025). Artificial intelligence in dentistry: a narrative review of diagnostic and therapeutic applications. Medical science monitor: international medical journal of experimental and clinical research, 31, e946676.
13. Moeini, A., & Torabi, S. (2025). The role of artificial intelligence in dental diagnosis and treatment planning. Journal of Oral and Dental Health Nexus, 2(1), 14-26.
14. Nambiar, R., & Nanjundegowda, R. (2024). A comprehensive review of ai and deep learning applications in dentistry: From image segmentation to treatment planning. Journal of Robotics and Control (JRC), 5(6), 1744-1752.
15. Asiri, A. F., & Altuwalah, A. S. (2022). The role of neural artificial intelligence for diagnosis and treatment planning in endodontics: A qualitative review. The Saudi Dental Journal, 34(4), 270-281.
16. Alabdulkareem, M., Atieh, M., AbuMostafa, A., Aldalaan, K., & Alturki, N. (2026). Artificial Intelligence in Dental Treatment Planning and Diagnostic Decision-Making: A Systematic Review and Meta-Analysis. Clinical and Experimental Dental Research, 12(2), e70343.
17. Kaviandost, P., Barkhordar, S., & Asghari, M. (2025). Revolutionizing Dentistry: The Role of Artificial Intelligence in Diagnosis, Treatment Planning, and Patient Care. Saudi Journal of Oral & Dental Research, 10(6), 260.
18. Galdames, S. (2024). Applications of artificial intelligence in dentomaxillofacial diagnosis. Rev Cubana Estomatol, 61, e4934.
19. Macrì, M., D'Albis, V., D'Albis, G., Forte, M., Capodiferro, S., Favia, G., ... & Festa, F. (2024). The role and applications of artificial intelligence in dental implant planning: a systematic review. Bioengineering, 11(8), 778.
20. Albalawi, F., & Abalkhail, K. A. (2022). Trends and application of artificial intelligence technology in orthodontic diagnosis and treatment planning—a review. Applied Sciences, 12(22), 11864.
21. Kazimierczak, N., Kazimierczak, W., Serafin, Z., Nowicki, P., Nożewski, J., & Janiszewska-Olszowska, J. (2024). AI in orthodontics: Revolutionizing diagnostics and treatment planning—A comprehensive review. Journal of clinical medicine, 13(2), 344.
22. Boreak, N. (2020). Effectiveness of artificial intelligence applications designed for endodontic diagnosis, decision-making, and prediction of prognosis: a systematic review. The Journal of Contemporary Dental Practice, 21, 926-934.
23. Panahi, O., & Panahi, U. (2025). AI-powered IoT: Transforming diagnostics and treatment planning in oral implantology. J Adv Artif Intell Mach Learn, 1(1), 1-4.
24. Fatima, A., Shafi, I., Afzal, H., Díez, I. D. L. T., Lourdes, D. R. S. M., Breñosa, J., ... & Ashraf, I. (2022, October). Advancements in dentistry with artificial intelligence: current clinical applications and future perspectives. In Healthcare (Vol. 10, No. 11, p. 2188). MDPI.
25. Najeeb, M., & Islam, S. (2025). Artificial intelligence (AI) in restorative dentistry: current trends and future prospects. BMC oral health, 25(1), 592.

26. Karobari, M. I., Adil, A. H., Basheer, S. N., Murugesan, S., Savadamoorthi, K. S., Mustafa, M., ... & Almokhatieb, A. A. (2023). Evaluation of the diagnostic and prognostic accuracy of artificial intelligence in endodontic dentistry: a comprehensive review of literature. Computational and Mathematical Methods in Medicine, 2023(1), 7049360.

27. Agrawal, P., Nikhade, P., & Nikhade, P. P. (2022). Artificial intelligence in dentistry: past, present, and future. Cureus, 14(7).

28. de Magalhães, A. A., & Santos, A. T. (2025). Advancements in diagnostic methods and imaging technologies in dentistry: A literature review of emerging approaches. Journal of clinical medicine, 14(4), 1277.

29. Bichu, Y. M., Hansa, I., Bichu, A. Y., Premjani, P., Flores-Mir, C., & Vaid, N. R. (2021). Applications of artificial intelligence and machine learning in orthodontics: a scoping review. Progress in orthodontics, 22(1), 18.

30. Dipalma, G., Inchingolo, A. D., Inchingolo, A. M., Piras, F., Carpentiere, V., Garofoli, G., ... & Inchingolo, F. (2023). Artificial intelligence and its clinical applications in orthodontics: a systematic review. Diagnostics, 13(24), 3677.

31. Bonny, T., Al Nassan, W., Obaideen, K., Al Mallahi, M. N., Mohammad, Y., & El-Damanhoury, H. M. (2023). Contemporary role and applications of artificial intelligence in dentistry. F1000Research, 12, 1179.

32. Patil, S., Albogami, S., Hosmani, J., Mujoo, S., Kamil, M. A., Mansour, M. A., ... & Ahmed, S. S. (2022). Artificial intelligence in the diagnosis of oral diseases: applications and pitfalls. Diagnostics, 12(5), 1029.

33. Dhopte, A., & Bagde, H. (2023). Smart smile: revolutionizing dentistry with artificial intelligence. Cureus, 15(6).

34. Khanagar, S. B., Naik, S., Al Kheraif, A. A., Vishwanathaiah, S., Maganur, P. C., Alhazmi, Y., ... & Patil, S. (2021). Application and performance of artificial intelligence technology in oral cancer diagnosis and prediction of prognosis: a systematic review. Diagnostics, 11(6), 1004.

35. Shafi, I., Fatima, A., Afzal, H., Díez, I. D. L. T., Lipari, V., Breñosa, J., & Ashraf, I. (2023). A comprehensive review of recent advances in artificial intelligence for dentistry e-health. Diagnostics, 13(13), 2196.

36. Vishwanathaiah, S., Fageeh, H. N., Khanagar, S. B., & Maganur, P. C. (2023). Artificial intelligence its uses and application in pediatric dentistry: a review. Biomedicines, 11(3), 788.

37. Semerci, Z. M., & Yardımcı, S. (2024). Empowering modern dentistry: the impact of artificial intelligence on patient care and clinical decision making. Diagnostics, 14(12), 1260.

38. Alqutaibi, A. Y., Algabri, R., Ibrahim, W. I., Alhajj, M. N., & Elawady, D. (2024). Dental implant planning using artificial intelligence: A systematic review and meta-analysis. The Journal of prosthetic dentistry.

39. Revilla-León, M., Gómez-Polo, M., Vyas, S., Barmak, B. A., Galluci, G. O., Att, W., & Krishnamurthy, V. R. (2023). Artificial intelligence applications in implant dentistry: A systematic review. The Journal of prosthetic dentistry, 129(2), 293-300.

40. Hung, K., Montalvao, C., Tanaka, R., Kawai, T., & Bornstein, M. M. (2020). The use and performance of artificial intelligence applications in dental and maxillofacial radiology: A systematic review. Dentomaxillofacial Radiology, 49(1), 20190107.