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*RESEARCH ARTICLE*

# AI POWERED SMILE IN DENTISTRY - A REVIEW

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## *Abstract*

Artificial Intelligence (AI) has emerged as a revolutionary force in various sectors, particularly in healthcare, where its integration into dentistry is making a significant shift in clinical practice.As AI continues to grow,its use in dentistry could lead to major advancements bringing a new wave of technology to oral healthcarelooks are becoming a major concern in dentistry. Patients want beautiful smiles, no matter how complex their case.Dentists have relied on established esthetic principles for smile design, aiming for a pleasing patient outcome.This article tries to explores various applications of AI in dentistry, including diagnostic assistance, treatment planning, patient management, and predictive analytics, highlighting the benefits of improved accuracy and efficiency in clinical decision-making.



## Introduction:-

The advent of digital technology has instigated a transformative shift of dental practice enhancing better oral healthcare . The changeinclude Intraoral scanners, paired with CAD/CAM technologies, improved treatment outcomes, facialprofiling .This has experienced arevolutionary change fundamentally altering both clinicalprotocols and surgical interventions.The leap of digital human-centered automation significantly improved altogether the treatment strategies ,outcomes thereby improving the overall quality of patient life .A prominent domain where digital technology has leftan indelible mark is in the personalization of patientcare. This era of digitalization hasrevolutionized the way patients understand and engage with their oral health care. Digital imagelogyandsimulatio ns offer patients an insightful view into theirdental condition, thereby enriching the communicationbetween patient and practitioner. The surgical field of dentistry has embraced the transformative capabilities of augmented reality and virtualreality. Artificial intelligence (AI) is the process of training a computer in such a way that it starts thinking like human beings.[1,2,3 4,5,6]

The definition of AI according to Angus Stevenson is "the theory and development of computer systems capable of performing tasks typically requiring human intelligence, such as visible perception, speech recognition, decision-making, and language translation.British mathematician Alan Turing, demonstrated in 1936 that a common calculator known as the Turing system is feasible. The key discovery of Turing is that a computer like this can solve any problem as long as it can be modeled and resolved by an algorithm Alan Turing wrote in his paper “Computing Machinery and Intelligence” in the 1950.“I believe that at the end of the century (20th), the use of wordsand general educated opinion will have altered so much that onewill be able to speak of machines thinking without expecting tobe contradicted.”AI as “machines thinking”. He mathematically investigated thefeasibility of AI and explored how



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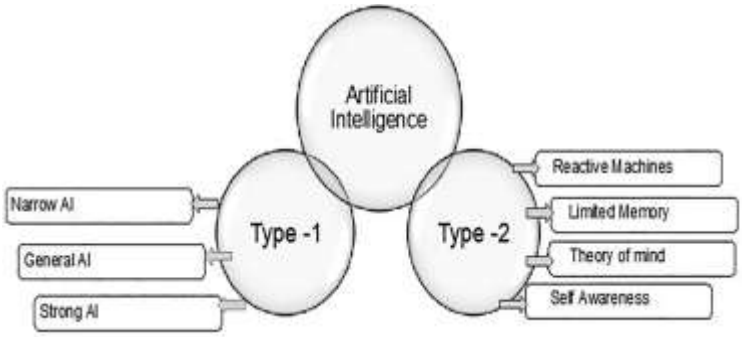
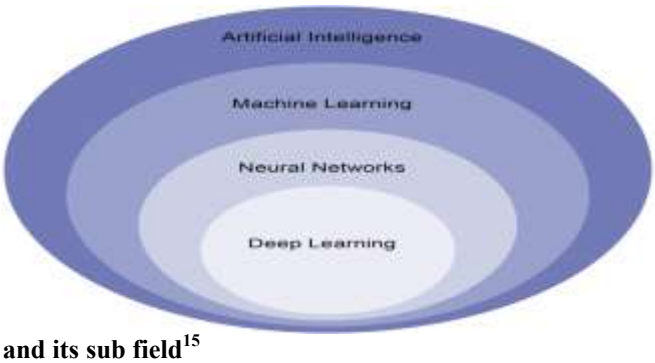
to construct intelligent machines and assess machine intelligence. He proposed that humans solve problems and make decisions by utilizingavailable information and inference, machines also can do the same thing. In 1955, the term AI was first proposed in a 2-monthworkshop: Dartmouth Summer Research Project on Artificial Intelligence led by John mccarthy, Marvin Minsky,Nathaniel Rochester, and Claude Shannon..With the advancement in technology,constant improvement in AI makes it an important constituent of almost every field. Aprominent advantage of this digital technology has left an indelible mark is in the personalization of patient. Our knowledge of disease etiology will grow,as to these of digital technology will help with risk assessment methods, diagnosis, disease prediction, and treatmentoutcomes care.

In dentistry, AI is becoming an important constituent. This advancement in digital era along with applications and consequential effects of digital innovations on contemporary dental healthcare, including individualized treatment plans and cutting-edge surgical methods a better patient satisfaction level can be achieved. Dentists can rely on computer and AI software to make clinicaldecisions.[7,8]Artificial Intelligence (AI) for Healthcare.The fourth industrial revolution is opening a new era, one of the most important contributions of which is Artificial Intelligence (AI). With more and more electronic devices assisting people's life comprehensively, it has become possible to use and analyze the data from these devices through AI.The science of AI contains different branches, such as machine learning (ML) and deep learning (DL).mlis a system thatcan be trained by different problem-solving training and models to gain the ability to automate the process ofsolvingtasks. Emerging fields, including surgery, automatic disease diagnosis, and the recently established personalized medicine, can benefit fromai support




AI has tremendous potential for transforming the fields of disease diagnosis, personalizedmedicine, real-time health condition monitoring, and operational healthcare management.AI-driven diagnostic technologies are capable of to effectively evaluate medical images and regularly pick up on details that a human eye could have overlooked.AI algorithms are making major advances towards personalized medicine in the area of treatment individualization.[9,10,11,12]




**Artificial intelligence and its sub field[15]**

Artificial Intelligence in healthcare, greatly enhances diagnosis, accessibility, and patient careai applications in dental healthcare improve diagnostic services interms of effectiveness, accuracy, and accessibility. The potential benefits of AI applications are enormous: theycan enhance clinician decision-making, enhance healthcareprocesses and outcomes for patients, and lower healthcarecosts.Applications based on AI have enormous potential toenhance healthcare processes and outcomes for patients.[10,17]

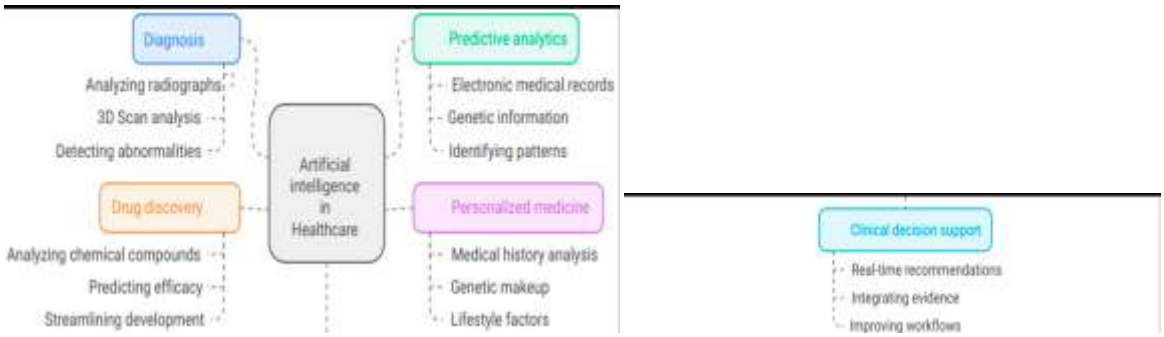



**Figure: Illustrates the uses of artificial intelligence in health care**

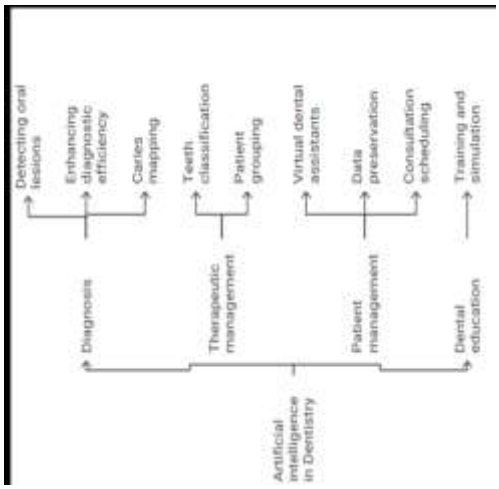



**Figure :Illustrates the use of artificial intelligence in dentistry.**

AI has a long history in health care, with early efforts dating back to the 1950s. The first AI systems in medicine were developed in the 1950s when researchers at Jack Whitehead's techniconcorporation built a computer program called the "MIT programmedautoanalyzer" to analyze blood and urine samples.[18] The influence of artificial intelligence (AI) on education and healthcare as itsimulates human behavior and cognition by effectively balancing the complexity of tasks and providingadvanced support for executing decisions. Artificial intelligence is developed to mimic human intelligencethrough artificial hardware and software systems.[19]In dentistry, AI is becoming increasingly prevalent as it contributes to the diagnosis of oro-facial diseases, offers treatment modalities, and manages practice in the dental operatory. Operativedentistry, Orthodontics, oral and maxillofacial surgery, prosthodontics are few major disciplines which use or are relying upon AI nowadays for better patient care and treatment outcomes .

AI applications in dentistry are also implied upon on imaging modalities ,diagnosis of various oral lesions. The majority of AI applications in dentistry are for diagnoses based on radiographic or optical images. In dentistry, clinicians collaborate with researchers to develop algorithms for measuring and analyzing clinical assessments, photographs, radiographs, and chart notes.aialso focuses on neural networks modeled after human brains, forming a data processing system to address precise issues.Dentistry has recently begun using AI, leading to exceptionalachiev ements in analyzing clinical dental data. . The best common examples are of using intraoral scanners and cameras has aided the evaluation and scheduling of care. Artificialintelligence offers innovative decision supporting technology in the field of dentistry.[20]Artificial intelligence involving diagnostics, virtual simulations, and machine learning algorithms assists cliniciansand academicians in training students to develop procedural skills, diagnose disorders, and strategically plan specific interventions. Javed et al. (2020),.Pauwels et al. (2021)., Adnan et al. (2023.,Mahrous et al. (2023, all these authors conducted study and showed a fruitful results in AI in dentistry at various levels .All these studies utilized a range of AI technologies, such as CNN , gamification tools , and virtual reality systems.[21]Scheduling and organizing appointments, before each appointment, informing the oral healthcare

provider of any pertinent clinical records, taking care of the paperwork, insurance, and patient data file are few worked handeled by AI. Assisting in the planning of the diagnostic and treatment for a favorable prognosis.Setting up daily reminders for patients to have checks on a regular basis.In dentistry, the utilization of AI bridges the gap between academic knowledge and practicalapplications along with the enhancement of the educational experience.[22,23] In an era defined by technological developments, artificial intelligence (AI) has emerged as a revolutionary force that is reshaping many industries affecting our day-to-day life activities.AI generally refers to developing computer systems or machines that mimic human intelligence in undertaking certain actions. Russel describes how AI includes creating intelligent agents that can observe their environment and reasoning and how, through learning from experience, they can make judgments to attain certain targets.

There are various subfields of AI, including machine learning (ML), computer vision, natural language processing and expert systems, which together allow machines to simulate and reproduce the cognitive abilities of a human being. Deep learning (DL) is afundamental subsection of ML which is capable of affording decision-making capacity and processing considerable data sets, wherein algorithms are organized to build artificial neural networks (ANN) with several hidden layers. AI has developed as a transformative technology in various fields of healthcare, improving disease diagnosis, treatment planning and patient management. Benefits of AI include allowing healthcare professionals to connect with their peers worldwide, reducing time-.consuming routine tasks, implementing a proper personalized management system of patientsand the potential of performing healthcare services at a remote distance. [15.,24]AI, machine learning and deep learning algorithms, have revolutionized diagnosing and treating oral diseases, enhancing accuracy, efficiency, and patient outcomes.Artificial Intelligence (AI) has made significant advancements in various fields, and oral medicine is no exception.One area where AI has made a substantial impact is in the diagnosis of oral diseases.[25,26]

**Applications Of Ai In Dentistry[41 ,42,43 ,61,62,63,64,65 ,66,67]**

Regularizing appointments according to the convenience of the patients and dentists. Managing the paperwork for insurance ,Supporting the clinical diagnosis and treatment planning. Making the dental healthcare provider vigilant about any relevant medical history. Setting up regular reminders for patients who are on tobacco or smoking cessation programs.Providing emergency tele-assistance in cases of dental emergencies when the dental health care professional cannot be contacted. Smile design concepts have evolved significantly over the past two decades. Initially, basic tools, such as pencils and markers, were used to create hand drawn and hand-painted patient drawings.Facial aesthetics, especially smiles, play an important role in expressing first impressions, social interaction, and self esteem. Achieving optimal facial aesthetics has become one of the main goals of modern dentistry.Smile design using digital technology, such as the Digital Smile Design (DSD) technique, is a technological tool used to digitally modify the smile of the patient, which is helpful in the selection and visualization of the proposed changes in advance.A thoughtful and ethical approach ca may improve patient outcomes, and enhance comprehension of orthodontic treatment .

**Techniques of ai applied in oral medicine and radiology:-**

Artificial neural networks (ANN)
Clinical Decision Support System (CDSS)
Principal Component Analysis (PCA)
Data Mining technique
Fuzzy Logic
Belief Merging
Genetic Algorithms (GA)
Probabilistic and General Regression Neural Network
Dynamic Bayesian Networks
Atlas based techniques
Deep Learning (DL)
Machine Learning (ML)

**The Need for AI in Oral Medicine[45-50]**

Oral diseases, such as dental caries, periodontal diseases, and oral cancers, pose significant health challenges globally. Timely and accurate diagnosis is crucial for effective treatment planning and improved patient outcomes. Traditional diagnostic methods in oral medicine rely on visual inspection, radiographs, and histopathology. However, these methods have limitations in terms of subjectivity, variability, and time-consuming nature. The integration of AI technologies offers a promising solution to overcome these limitations.[25,29]In the field of oral

medicine, AI has emerged as a powerful tool with the potential to transform dental practice and improve patient outcomes. AI techniques, including machine learning and deep learning algorithms, have revolutionized diagnosing and treating oral diseases, enhancing accuracy, efficiency, and patient outcomes. AI is streamlining administrative tasks in oral medicine.

**Treatment Planning and Predictive Modeling:-**

AI-based predictive modelling also enables clinicians to forecast treatment outcomes and assess the effectiveness of different interventions. This assists in optimizing treatment strategies and enhancing treatment success rates.

**E-Learning In Oral Medicine [44]**

Clinical dentistry is a major part of dentistry for learning the skills and to enhance patient care. Traditionally, pre-clinical operative training for dental students is combination of theoretical teaching and practical learning. Augmented and virtual reality has been incorporated into tutoring intelligent education system and training in dentistry. These technologies enable simulation of the practical procedures in three dimensions and allow access to clinical and surgical techniques.The diagnoses and treatment of lesions of oral cavity can be screened and classified into suspicious altered mucosa undergoing premalignant and malignant changes with the help of AI.Genetic predisposition of oral cancer for a large population might be accurately predicted using AI . Anns (Artificial Neural Networks) may act as an adjuvant diagnostic tool for dentist in the diagnoses subtypes of temporomandibular disorders , predict the factors appearing to be related to the occurrence of recurrent aphthous ulcers , used to predict the occurrence of Bisphosphonate- related osteoradionecrosis of jaw associated with dental extraction in patients taking bisphosphonates for the management of osteoporosis ,to recognize and correctly diagnose patients with different facial pain syndromes , to classify morphological variations of the mandiblecondyle that define the exact location of the morphological changes on the condylar surface.

The interpretation of radiographic images is one of themost prominent fieldswhere AI is having an influence. Dental diagnosis and treatment planning depend heavily on radiographic images, but their interpretation can be laborintensive and arbitrary. In the field of oral radiology, AI can help in spotting anomalies or potentially dangerous locations in radiographs, CT scans, and other imaging studies.Radiographsmay be examined using AI technology to find signs of periodontitis, tooth decay, and other dental issues. AI is able to identify patterns in radiographic pictures that are related to certain diseases or situations by utilizing machine learning techniques.

**Applications In Oral Radiology.[51,52]**

Oral radiology is a sector where AI technology is anticipated to have a substantial influence. AI has the potential to enhance patient outcomes and lessen the need for invasive treatments by offering more precise and effective diagnosis. AI has already shown the ability to increase diagnostic precision in the diagnosis of oral cancer. Aisystems are able to recognize patterns that are suggestive of cancer with high sensitivity and specificity by examining vast databases of histopathology images.

Interpretation of radiographic lesions and automated interpretation of dental radiographs

- Using the radiologist's work as data, AI may enable programs to identify details of individual radiologists.
- Caries detection:
- Diagnosis of vertical root fractures on CBCT images of endodontic ally treated and intact teeth.
- To stage tooth development.
- Computer based digital subtraction imaging.
- Computer-assisted image analysis is useful to visualize and evaluate the bone architecture directly from the dental panoramic radiograph.
- 3-dimensional orthodontics visualization using patient models and opgs.
- Bone density evaluation to predict osteoporosis using opgs.
- Automatic segmentation of mandibular canal.
- Forensic dental imaging: Personal Identification System Using Dental Panoramic Radiograph .

**Advantages Of AI**

1. Accuracy in diagnosis .
2. Standardization of procedures.
3. Saves time.

**Disadvantages Of AI**
1. The complexity of the mechanism
2. The cost involved in the setup.

Tele dentistry is a form of telehealth in which dental care is offered via electronic communication across distances due to geographic and financial constraints. The application of AI in teledentistry has made remote diagnosis, treatment scheduling, and patient interaction easier than ever.The integration of Artificial Intelligence (AI) into teledentistry represents an unprecedented step towards increased accessibility in dental care, given India's diversity and vast population. This comprehensive review attempts to outline the practical applications of AI in teledentistry, from patient education, remote diagnosis, treatment planning, to follow-up care.[68 -71]

**Regulatory And Ethical Considerations.[52,53]**
The integration of AI in oral medicine raises regulatory and ethical concerns. AI systems must adhere to strict privacy and security guidelines to protect patient data.Quality of data and healthcare inequalitiesThe quality of training data input directly influences the quality ofthe resultant AI: AI algorithms learn from patterns and features presentin the data they are trained on. This means that the input of large sets of data, representative of diseases, is required to achieve an AI programme capable of diagnosing diseases with high levels of sensitivity and specificity.The choice of data included for training purposes will substantially influence theai's performance. AI is not completely independent, particularly in more advanced machine learning (ML) and deep learning (DL) systems. The decisions made by an AI system are strongly influenced by the initial training data..

**Data Ownership And Privacy:-**
Another ethical issue surrounding the use of AI in diagnosticsis the ownership of data and data protection. Privacy is amajor concern with the introduction of any technological healthcareaid.Most AI training data sets arenot consolidated for the specific purpose of developing AI modelsbut have been extracted from patients' personal health records. The need for gaining informed consent has been associated with a disproportionate imbalance between administrative burdens and quantity of training data.

**Corruption Of Data:-**
AI algorithms may be susceptible to data corruption.There is a risk that any artifacts in raw data, such as radiological and histological images, which would normally be identified and accountedfor by human practitioners, may be misinterpreted by AI, leading toincorrect diagnoses..

**Black-Box Decision Making:-**
In aisystems, the transparency and traceability of the decision-makingprocess is very limited. This becomes a particularissue in deep learning systems, where input data are processed viaan unknown number of network levels before reaching the finallayer. This is known as the 'black box' phenomenon, where the internal workings of an AI system remain opaque to the users and, possibly even to the developers. The inability of an aisystem to provide rationale for a decision made may also lead tofrustration from clinicians and patients who are unable to understandhow a particular outcome has been reached, especially in theevent that the decision made does not match expectations.

**Responsibility:-**
Dental and Medical practitioners are held responsible for their clinicaldecisions: they must adhere to the criteria established by their professional registration and exhibit evidence of ongoing training and development throughout their careers. AI systems should be subject to the same scrutiny: their performance must be in line with the same professional standards their clinical counterparts are subject to, and they must be able to adapt to new information and developments within the field of medicine in which they are used. This issue is further compounded by the previously discussed black-box phenomenon: the opaque nature of AI algorithms could also affect clinicians' liability. Clinicians have a moral and legal duty to ensure that patients are fully informed about their care and the decision-making process that surrounds it.

**Cost Of AI Misdiagnosis:-**
Unlike human clinicians, AI algorithms are not trained to considerthe cost and possible repercussions of an incorrect diagnosis. The human tendency to eror on the side of caution comes from the understanding of the serious consequences of a misdiagnosed malignant lesion (i.e. Precautionary principle),which however may result in

perceived poorer statistical performance compared to AI technology. The ethical principle of nonmaleficence: to prevent harm, is inextricably tied to the AI validation process, with clinical validation
Being the most critical level of validation for clinicians usingai models.

**Patient Access To AI Programmes Forself-Diagnosis.**[54,55]

AI in healthcare has so far been mostly deployed in high-incomecountries, and remains relatively unused in resource-poorsettings.Aikaterini Mentzou, and collegues found in their review that, from the literature on digital self-diagnosis tools, adopting an interdisciplinary approach. We identified gaps and critical areas for future research across all stages of these tools' lifecycles. The diverse challenges uncovered highlight the necessity for multiagency and multidisciplinary efforts.Youe You etal in their study found five features that consumer-facing diagnostic tools should provide for users when comparing with offline medical consultations: considering patient history in the diagnostic process, allowing users to input their symptoms at different levels, improving response speed of probing questions, providing support for diverse health conditions and user groups, and adding functions regarding follow-up treatments.Ćirković, a researcher has contributed to the literature his views regarding the use of AI : intensified efforts are necessary in both research and lawmaking to increase transparency and knowledge that are vital to a properly functioning healthcare. Research will have to determine which specific algorithms or combinations thereof are best suited to the knowledge humans utilize for their patient-history and pattern recognition-based way of finding a diagnosis.Acceptance of AI-powered dental diagnosis is influenced by multiple factors, as demonstrated by strong findings from this research. Realizing AI's potential in health care requires prioritizing systematic training, infrastructure development, and effective communication, all aligned with key adoption factors.[56 to60]

## Conclusion:-

AI has the potential to enhance dentistry by improving diagnostic capabilities, treatment planning, patient care, and administrative tasks. While there are challenges and limitations to consider, the future of AI in dentistry looks promising

## References:-


1. Digital technologies in dental practice: a paradigm shift. Arnaaz k., int. J. Adv. Res. 12(06), 384-391
2. Newer Technological Advances: A Step Towards Better Dental Care: A systematic review. Pasupuleti etal. The Open Dentistry Journal, 2024, Vol. 18.
3. Contemporary Role and Applications of Artificial Intelligence in Dentistry. Bonny etal . F1000Research 2023, 12:1179 Last updated: 13 NOV 2024
4. Newer Technological Advances: A Step Towards Better Dental Care: A systematic review.
5. Advances in digital dentistry: Impact of different technologies ,. Almoharibetal ,. International Journal of Health Sciences, 4(S1), 47–66.
6. Digital Dentistry: A Paradigm Shift in Clinical Practice ,. Bohnet etal,. RRJ Dental Sci. 2025.13.006.
7. Artificial intelligence in dentistry—A review. Din etal. DOI. 10.3389/fdmed.2023.1085251
8. History of AI .Artificial Intelligence and its Perspectives in Dentistry: A Review.Shrivastava, A Review. Saudi J Oral Dent Res, 10(1): 14-20.
9. Artificial Intelligence in Dentistry: A Descriptive Review.Mallinenietal. Bioengineering 2024, 11, 1267.
10. Role of artificial intelligence in healthcare settings: a systematic review. Ali. Etal . J Med artifintell2025;8:24.
11. Thetransformative Role of Artificial Intelligence in Dentistry: A Comprehensive Overview. Part 1: Fundamentals ofai,andits Contemporary Applications in Dentistry ,. Samaranayake ,.etal. Internationaldental journal75 (2025) 383−396.
12. The Use of Artificial Intelligence in Different Dental Applications,. Erkuetal,. Cyprus J Med Sci 2025;10(4):218-227.
13. he application of artificial intelligence in implant dentistry. Ghorbani etal. World Journal of Biology Pharmacy and Health Sciences, 2023, 15(02), 082–084.
14. Use of Artificial Intelligence in Dentistry: Current Clinical Trends and Research Advances,. Nguyen., J Can Dent Assoc 2021;87:l7
15. Applicationsofartificialintelligenceindentalmedicine:acriticalreview. Sitaras. Internationaldentaljournal75(2025)474 − 4 8 6.A
16. Artificial intelligence in oral medicine and oral radiology.Kale etal., SRM Journal of Research in Dental Sciences | Volume 14 | Issue 4 | October-December 2023.

17. Systematic Review of the Impact of artificialintelligence (AI) on Dental Diagnosis. Shukla etal. DOI: 10.4018/979-8-3693-7165-7.ch002
18. A review of advancements of artificial intelligence in dentistry., Ghaffari .Dentistry Review 4 (2024) 100081
19. Integration of Artificial Intelligence in Dentistry: A Systematic Review of Educational and Clinical Implications. Kukreja etalk,. DOI: 10.7759/cureus.79350
20. Artificial Intelligence in Dentistry: A Descriptive Review. Mallinenietal. Bioengineering 2024, 11, 1267.
21. 21.Role of Artificial Intelligence (AI) in Dentistry: A Literature Review ,. Chakravorty,. Etal. J Pharm Bioall Sci 2024;16:S14-6.
22. The Role of Artificial Intelligence in Modern Dentistry: Transforming Diagnosis and Treatment Planning ., Ahmed., Premier Journal of Dentistry 2025;1:100001.
23. Application of Artificial Intelligence in Dentistry ,. Ragimova,etal. Health Leadership and Quality of Life. 2024; 3:.454.
24. AI in oral medicine: is the future already here? A literature review. Deligianni etal. Doi.org/10.1038/s41415-024-8029-9.
25. Artificial Intelligence in oral medicine.Moosa etal. .International Journal of Health Sciences, 7(S1), 1476–1488.
26. Artificial intelligence in oral and maxillofacial radiology: what is currently possible?,. Heo .etal,. Dentomaxillofacial Radiology (2020) 50, 20200375.
27. Artificial Intelligence in Diagnosis of Oral Diseases: A Systematic Review. Kolarkodi. Etal. The Journal of Contemporary Dental Practice (2023): 10.5005/jp-journals-10024-3465.
28. Artificial intelligence in oral medical radiology & clinical decision support systems (cdss) ,. Shuja,. IJNRD | Volume 8, Issue 3 March 2023.
29. Artificial Intelligence in Dentistry: A Descriptive Review ,. Mallineni,. Bioengineering 2024, 11, 1267.
30. Artificial intelligence in dental radiology: a narrative review ,. Ali, etal. Annals of Medicine & Surgery (2025) 87:2212–2217.
31. Artificial Intelligence in Oral Medicine and Periodontology from Basics to Future Insights. Ezzattetal., DOI: 10.32474/MADOHC.2023.05.000224.
32. Artificial Intelligence in the Diagnosis of Oral Diseases: Applications and Pitfalls. Patil etal., Diagnostics 2022, 12, 1029.
33. Artificial intelligence applications in implant dentistry: A systematic review., Revilla-León, etal,. J.prosdent.2021.05.008
34. The Role and Applications of Artificial Intelligence in Dental Implant Planning: A Systematic Review,. Macrìetal. Bioengineering 2024, 11, 778
35. The Impact of Artificial Intelligence on Dental Implantology: A Narrative Review ,. Altalhi,. Etal. Doi: 10.7759/cureus.47941
36. The application of artificial intelligence in implant dentistry,.Amiri ,etal. Wjbphs.2023.15.2.0330.
37. Knowledge, attitude, and perception of dentists regarding the role of Artificial Intelligence and its applications in Oral Medicine and Radiology: a cross sectional study ,. Murali etal,. J Oral Med Oral Surg 2023;29:22.
38. Artificial intelligence applications in dental implantology: A narrative review ,. Benakattietal. IP Annals of Prosthodontics and Restorative Dentistry 2024;10(2):118–123.
39. Artificial intelligence serving pre-surgical digital implant planning: A scoping review ,. Elgarbaetal,. Journal of Dentistry 143 (2024) 104862.
40. Transforming Prosthodontics and oral implantology using robotics and artificial intelligence . Karnik,. Etal. 0.3389/froh.2024.1442100.
41. Revolutionizing Dentistry: The Applications of Artificial Intelligence in Dental Health Care. ,Sharma etal,. PMCID: PMC11426822 .
42. A review of advancements of artificial intelligence in dentistry ., Ghaffari etal,. Dentistry Review 4 (2024) 100081.
43. Artificial intelligence in dentistry— A review ,. Ding,. Front. Dent. Med 4:1085251.
44. Effect of e-learning methods on Dental education: An observational study., Kumar etal ,. J Edu Health Promot 2020;9:235.
45. AI in oral medicine: is the future already here? A literature review ., Alotaibi etal,. British dental journal | volume 237 no. 10 | november 22 2024.
46. Applications of Artificial Intelligence in Dental Medicine: A Critical Review,. Sitaras., etal. Internationaldental journal75 (2025) 474−486.
47. Using AI in Optimizing Oral and Dental Diagnoses—A Narrative Review., Surdu,. Diagnostics 2024, 14, 2804.

48. The risks of artificial intelligence: A narrative review and ethical reflection from an Oral Medicine group ,. Feng eta;,. DOI: 10.1111/odi.15100.
49. Healthy AI: balancing opportunity and danger., Dubuc,. J Oral Med Oral Surg 2025;31:E3.
50. The Role of Artificial Intelligence in Transforming Dental Public Health: Current Applications, Ethical Considerations, and Future Directiomns. Bamashmousetal,. DOI: 10.2174/0118742106363413250211053942.
51. Role of Artificial Intelligence in Oral Diagnosis and Dental Treatment,. Dashti etal. L. Eur J Gen Dent 2023;12:135–137.
52. Artificial Intelligence in Oral Medicine and Radiology- Heralding A New Era ., David etal. International Journal of Contemporary Medical Research. Volume 7 | Issue 12 | December 2020.
53. Dentistry and Artificial Intelligence ., Sangeetha etal,. Acta Scientific DENTAL SCIENCES (ISSN: 2581-4893) Volume 4 Issue 10 October 2020.
54. Self-Diagnosis through AI-enabled Chatbot-based Symptom Checkers: User Experiences and Design Considerations. You., etal. AMIA Symposium · January 2021.
55. Artificial Intelligence in Digital Self-Diagnosis Tools: A Narrative Overview of Reviews., Mentzouetal., Mayo Clin Proc Digital Health 2025;3(3):100242.
56. The Impact of Digital Imaging Tools and Artificial Intelligence on Self-Reported Outcomes of Dentists ., Dawa , etal. Appl. Sci. 2025, 15, 7943.
57. AI in self-diagnosis – history, theoretical foundations, potentials, and current status Aleksandar Ćirković etal., DOI: 10.13140/RG.2.2.33461.83684.
58. Patients' Acceptance and Intentions on Using Artificial Intelligence in Dental Diagnosis: Insights From Unified Theory of Acceptance anduseoftechnology 2 Model ,. Naik etal,. Avneesh Chopra: orcid.org/0000-0001-7706-3577.
59. Transforming Dental Diagnostics with Artificial Intelligence: Advanced Integration of chatgpt and Large Language Models for Patient care. Nia .
60. Integrating artificial intelligence in healthcare: applications, challenges, and future directions. Chongetal. Future Science OA 2025, VOL. 11, no. 1, 2527505.
61. Using Artificial Intelligence-Based 3D Smile Design: REBEL in Prosthetic Rehabilitation with Patient's Personal Preferences. Case-2 Soumia., Al-Maghreb etal,. Auctores Publishing – Volume 16(1)-372.
62. Impact of artificial intelligence-based digital smile design on patient and clinician satisfaction and facial esthetic outcomes: A systematic review and meta-analysis., S Sainetal., DOI: 10.1177/20552076251388392.
63. Revolutionizing Smiles: AI-Driven Innovation in Prosthodontics ., Punith etal., J Res Adv Dent 2025;16(4):1-4.
64. Smart Smile: Revolutionizing Dentistry With Artificial Intelligence., Dhoptetal., DOI 10.7759/cureus.41227.
65. Shaping smiles with AI: a comprehensive review of artificial intelligence in orthodontics., soman,etal., University J Dent Scie 2024; Vol. 10, Issue 4.
66. Smarter smiles: The role of AI in modern periodontics,. Joshi etal,. IP International Journal of Periodontology and Implantology 2024;9(1):13–15.
67. Shaping Smiles: The Evolution and Future of AI in Dentistry ., Kalra etal. International Journal Dental and Medical Sciences Research Volume 6, Issue 5, Sep - Oct 2024 pp 211-220.
68. Artificial Intelligence in Teledentistry ., Batra etal., DISCOVERIES 2022, Jul-Sep; 10(3): e153.
69. AI-driven evolution in teledentistry: A comprehensive overview of technology and clinical applications ., Kaushik etal., Dentistry Review 5 (2025) 100154.
70. The rise of artificial intelligence in teledentistry: A comprehensive review., Babu., Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology 2024;10(4):247–253.
71. A Patient-Centered Perspectives and Future Directions in AI-powered Teledentistry., Kaushik etal., DISCOVERIES 2024, Oct-Dec, 12(4): e199.