OPEN ACCESS
Saudi Journal of Oral and Dental Research
Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) | ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Review Article **Dental Practice**

Artificial Intelligence: A Paradigm Shift in General Dental Practice

Dr. Vishnu Govind Thekkumbad(BDS)[1], Dr. Mounica Pinnamaneni(BDS)[2]*, Dr. Sruthi Kalakota(BDS)[3], Dr. Krishma Pandoh(BDS)[4], Dr. Syeda Hussain(BDS)[5], Dr. Ridhi Bhola(MDS)[6], Dr. Sandeep Singh(MDS)[6]

[1]Yenepoya Dental College, Mangalore, India
[2]Gitam Dental College & Hospital, Rushikonda, Visakhapatnam, Andhra Pradesh, India
[3]Drs. Sudha & Nageswara Rao Siddartha Institute of Dental Sciences, Chinoutpalli, Gannavaram Mandal, Andhra Pradesh, India
[4]Maharishi Markendeshwar College of Dental Sciences and Research, Mullana Ambala, India
[5]Margalla Institute of Health Sciences, University of Health Sciences, Quaid-E-Azam Avenue Gulrez Phase 3, Gulrez Housing Scheme, Rawalpindi, Pakistan
[6]Post Graduate Institute of Dental Sciences, Rohtak, India

DOI: https://doi.org/10.36348/sjodr.2025.v10i05.002 | **Received:** 28.03.2025 | **Accepted:** 05.05.2025 | **Published:** 13.05.2025

***Corresponding author:** Dr. Mounica Pinnamaneni(BDS)
Gitam Dental College & Hospital, Rushikonda, Visakhapatnam, Andhra Pradesh, India

Abstract

AI is rapidly transforming the landscape of general dental practice by enhancing diagnostic accuracy, offering innovative treatment strategies, and streamlining administrative workflows. This descriptive review explores the latest advancements in AI within dentistry. Machine learning models, trained on extensive datasets of dental images, have shown remarkable accuracy in the early detection of dental conditions such as caries, periodontal diseases, and tooth structure anomalies. These tools enable timely interventions, improving clinical outcomes while reducing the burden on dental healthcare systems. Furthermore, AI facilitates the development of personalized treatment plans by integrating patient-specific data, including genetic markers and health histories. On the administrative front, AI-powered systems improve efficiency through automated appointment scheduling, billing, and electronic health record management, thereby allowing clinicians to devote more attention to direct patient care.

Keywords: Artificial Intelligence, Dentistry, Diagnosis.

1. INTRODUCTION

Artificial Intelligence I(AI) has rapidly transformed numerous aspects of modern life, from access media to how we drive vehicles. As its applications continue to evolve, AI is increasingly positioned to influence every dimension of human existence. The concept of AI, first introduced by John McCarthy in 1956, encompasses the development of systems capable of performing tasks typically requiring human intelligence. These systems simulate cognitive functions such as learning, problem-solving, and decision-making [1, 2].

Over time, AI has expanded into various domains including robotics, natural language processing, gaming, image recognition, and telecommunications. In recent years, its integration into healthcare especially medicine and dentistry has been particularly profound. Innovations such as online appointment scheduling, digital health records, automated reminders for follow-ups and vaccinations, and prescription systems have significantly enhanced patient care and operational efficiency [2, 3].

At the core of AI is the principle of emulating human cognitive processes to achieve outcomes that traditionally depend on human expertise. Machine learning (ML), a subset of AI, emphasizes the development of algorithms that learn from previous data and cases. This involves fine-tuning technical parameters like the architecture of neural networks or variables in genetic algorithms to optimize performance [4, 5].

In dentistry, the rise of digital technologies has led to greater accuracy, efficiency, and patient comfort. Tools such as intraoral scanners, 3D printing for prosthetics, robotic-assisted surgeries, and regenerative approaches have reshaped clinical workflows [6]. AI, in particular, is making notable strides in areas like dental imaging, pathology detection, radiographic interpretation, caries identification, electronic health records, and robotic interventions. Most dental AI applications utilize supervised learning models trained on datasets that include diverse patient characteristics and clinical parameters to draw reliable conclusions [7]. This review explores the emerging role of AI in dentistry, highlighting its transformative potential and evaluating how it addresses key clinical challenges in the field.

2. HOW DOES AI WORK? (FIGURE 1)

AI operates through the use of algorithms and large datasets. Initially, vast amounts of data are gathered and processed using mathematical models designed to identify patterns and make predictions—this phase is known as training. After this training period, the algorithms are implemented into different applications where they continue to improve by learning from new information. This ongoing learning process enables AI systems to carry out complex functions such as analyzing data, understanding language, and recognizing images with increasing precision and speed [8].

2.1 Machine Learning

Machine learning (ML) is a fundamental method used in developing AI systems. It enables computers to improve their performance on specific tasks by analyzing vast amounts of data to recognize patterns and correlations. Instead of being explicitly programmed for every task, machine learning models employ statistical methods to continuously enhance their accuracy. These models typically use historical data to forecast or generate new outcomes. ML encompasses different approaches, including supervised learning, where models are trained using labeled data with known outcomes, and unsupervised learning, which involves analyzing unlabeled data to uncover hidden structures or groupings without predefined outputs [9, 10].

2.2 Neural Networks

Neural networks are a widely used framework in machine learning, inspired by the way the human brain processes information. They consist of multiple layers made up of interconnected units called "neurons" that transmit and transform data. As information passes through these layers, the network adjusts the strength of the connections between neurons—also known as weights—to improve its ability to identify intricate patterns, generate predictions, and refine its performance through feedback. This adaptability makes neural networks particularly effective for tasks such as image recognition, speech interpretation, and language translation [10].

2.3 Deep Learning

Deep learning is a specialized branch of machine learning that relies on deep neural networks—networks with multiple hidden layers—to process data. As information moves through these layers, the system is able to identify intricate and abstract patterns, assigning different weights to inputs to improve accuracy and outcomes. This deeper level of analysis allows the model to handle complex tasks such as image classification, voice recognition, and language understanding. As a result, deep learning plays a foundational role in powering advanced AI technologies [11, 12].

2.4 Natural Language Processing (NLP)

Natural Language Processing enables machines to comprehend, interpret, and generate human language in both written and spoken forms. It integrates principles from linguistics, computer science, machine learning, and deep learning to make sense of unstructured language data. NLP systems are designed to recognize speech, interpret meaning, and produce responses in natural language. This technology is widely used in applications like spam filtering, voice assistants, sentiment analysis, and automated translation [13, 14].

2.5 Computer Vision

Computer vision involves teaching computers to interpret and analyze visual information from the world, such as images and videos. Using deep learning techniques, particularly convolutional neural networks (CNNs), machines can break down images into pixels, detect patterns, and assign meaning to different visual elements. These capabilities are essential for tasks like object detection, facial recognition, and autonomous navigation. Computer vision is heavily utilized in areas such as surveillance, healthcare imaging, and self-driving vehicles [15].

3. AI APPLICATIONS IN DENTISTRY

AI is significantly transforming the field of dentistry, especially in diagnostics and treatment planning. With the capability to process extensive patient information, including medical histories, radiographic images, and clinical photographs, AI introduces new possibilities for dental care. Advanced image analysis tools powered by AI are now capable of identifying and categorizing dental conditions with remarkable precision. This technological support enhances the diagnostic process, allowing dental professionals to make well-informed decisions and tailor treatment strategies to individual patient needs, thereby improving overall clinical outcomes [16-18].

3.1 AI in Diagnosis

Early detection and accurate diagnosis play a crucial role in improving the prognosis of oral disease. Some oral lesions may be indicative of precancerous or cancerous changes, highlighting the importance of timely and precise evaluation for appropriate intervention [19]. AI offers substantial potential in diagnosing and managing oral cancers and related conditions. With the integration of advanced imaging techniques like CBCT and MRI, AI can assist in the screening and classification of mucosal changes that may signal malignant transformation [20]. By detecting subtle abnormalities that might escape visual examination, AI enhances the clinician's ability to recognize disease in its earliest stages (Figure 2).

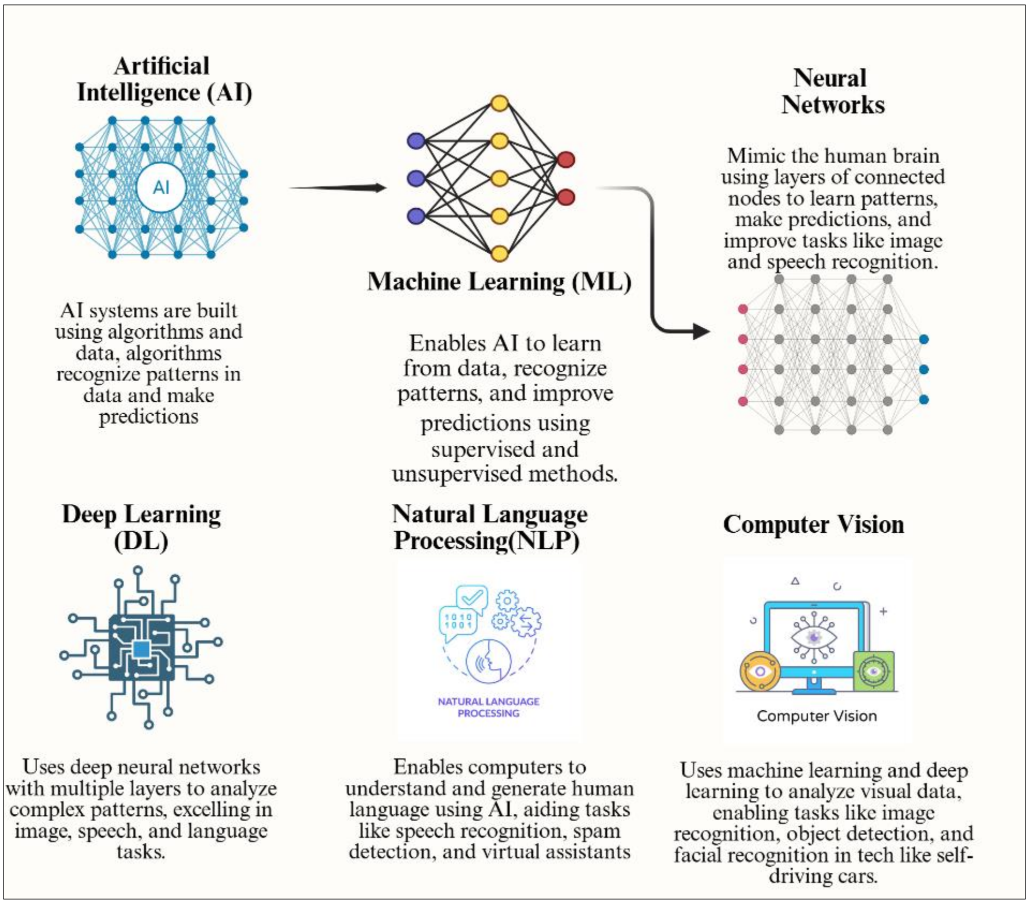

Figure 1: AI Model

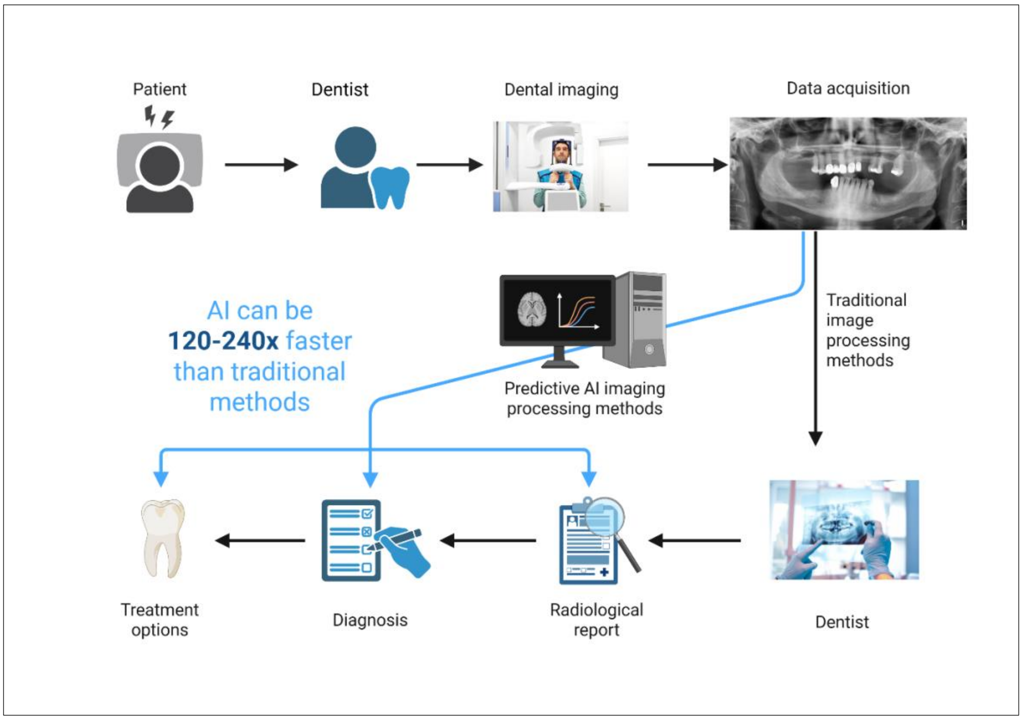

Figure 2: AI in diagnosis

3.2 AI in Periodontal Disease

Chronic oral inflammatory diseases like gingivitis and periodontitis involve long-term inflammation caused by infections, autoimmune conditions, or environmental factors. Early diagnosis is key to preventing complications and improving outcomes, but detecting periodontal disease remains complex, relying on clinical exams, radiographs, quantitative light-induced fluorescence (QLF), and DNA testing [21]. Each method has limitations, from subjectivity to limited availability. Integrating AI could enhance diagnostic accuracy and consistency. Revilla-León *et al*., reported AI models achieving up to 99% accuracy in detecting dental plaque and bone loss, highlighting AI's potential as a valuable tool in periodontal diagnostics [22].

3.3 AI in Oral and Maxillofacial Surgery

One of the most significant applications of AI in oral surgery is robotic-assisted procedures that replicate human movement and decision-making. Image-guided surgeries—such as dental implant placement, TMJ surgery, tumor removal, and biopsies—have shown clinical success with enhanced precision. Studies reveal that AI-assisted implant surgeries offer greater accuracy than freehand methods, regardless of the surgeon's experience. These systems also reduce operation time and improve safety near sensitive structures. Robotic surgery, guided by AI, is transforming surgical practice by enabling more precise resections and minimizing the need for revisions [23].

3.4 AI in Prosthodontics

Prosthodontics, a dental specialty dedicated to the restoration and maintenance of oral function, comfort, and aesthetics in patients with missing or deficient teeth and maxillofacial structures, has seen a significant transformation with the integration of AI. AI technologies have streamlined various aspects of prosthodontic care, including diagnosis, treatment planning, and the fabrication of both removable and fixed prostheses. Digital impression-taking and intraoral scanning powered by AI enable high-precision designs, while advanced tools like 3D facial tracking systems have emerged as efficient alternatives to conventional methods for creating dental prostheses. Despite these innovations, clinical judgment remains critical in evaluating AI-generated outputs [24, 25].

AI models, such as convolutional neural networks (CNNs), have demonstrated the ability to classify implant systems from panoramic and periapical radiographs with accuracy comparable to or exceeding that of human experts. This technological advancement supports the growing acceptance and use of implant-supported prostheses in full and partial mouth rehabilitations [24].

Maxillofacial prosthodontics, a subspecialty that focuses on rehabilitating patients with facial defects due to trauma, disease, or congenital conditions, has also benefited significantly from AI. Traditionally, making impressions for facial prostheses was challenging and uncomfortable for patients. However, modern 3D scanning and CAD/CAM technologies now allow for non-contact data acquisition, resulting in more accurate and less invasive procedures. These advancements facilitate the digital design and fabrication of intraoral and extraoral prostheses, such as those for the nose, eyes, ears, maxilla, and mandible. Retention methods, crucial for patient comfort and function, have evolved with the use of adhesives, eyeglass-supported designs, and osseointegrated implants featuring bar-clip systems, magnets, and ball attachments. Overall, the integration of AI and digital workflows in prosthodontics is reshaping clinical practice, enhancing precision, efficiency, and patient satisfaction [26-29].

3.5 AI in Endodontics

Endodontics is a branch and specialty of dentistry that focuses on the morphology, physiology, and pathology of the dental pulp and periradicular tissues. Endodontic diseases, which involve damage or infection of these tissues, may result from factors such as dental caries, trauma, or systemic infection. Early detection of these conditions is essential, as timely intervention can preserve the affected tooth and prevent the spread of infection. Improved diagnostic capabilities, especially the identification of inflamed pulp, support the use of vital pulp therapies (VPT), which aim to maintain pulpal vitality and overall tooth health [30].

AI has shown considerable promise in enhancing the detection and diagnosis of endodontic diseases. Image classification tasks, such as identifying lesions in periapical radiographs, can be effectively automated using deep learning. While earlier machine learning models focused on diagnosing individual conditions, recent developments now support multi-disease detection, which aligns more closely with real-world clinical scenarios. For instance, Li *et al*., developed a deep learning model that utilized annotated periapical radiographs to detect both dental caries and periapical lesions, achieving an F1-score of 0.8288 and an accuracy of 86%, comparable to expert-level diagnosis [31].

During endodontic treatment, key challenges include determining the correct working length of the root canal and managing complex root canal anatomy. Accurate working length determination is crucial to the success of root canal therapy, as errors can lead to incomplete treatment and higher failure rates. Commonly used methods include radiographic examination, electronic apex locators, and manual measurements on radiographs. However, traditional radiographs offer limited accuracy due to their two-dimensional nature and the interference of surrounding anatomical structures. Cone-beam computed tomography (CBCT) provides greater precision in visualizing root canal morphology, but its use is limited in routine practice due to concerns over radiation exposure and accessibility [32, 33].

Machine learning models have been developed to enhance the accuracy of working length determination and manage complex anatomical variations. Notably, Jeon *et al*., applied a convolutional neural network (CNN) to identify C-shaped root canals in second molars using panoramic radiographs. The CNN model significantly outperformed human specialists, achieving an area under the curve (AUC) of 0.982, compared to 0.872 for radiologists and 0.885 for endodontists [34]. This highlights the growing potential of AI to support clinical decision-making and improve outcomes in endodontic treatment.

Orthodontics and dentofacial orthopedics focus on diagnosing, preventing, and correcting abnormalities in dentofacial structures. The use of AI in this field is growing, particularly for image analysis, diagnosis, and treatment planning [35]. AI tools like deep convolutional networks (DCNs) have been used to classify and archive orthodontic images with high accuracy, such as in a study by Li *et al*., which achieved 99.4% accuracy. However, these models rely heavily on large, manually annotated datasets, and future improvements could focus on automated image quality assessment [36].

AI is also being used to automate cephalometric X-ray analysis, with studies showing results comparable to expert evaluations. Additionally, AI helps predict treatment outcomes such as final tooth position and treatment duration using methods like geometric morphometric analysis and deep learning [37]. These tools improve planning, reduce treatment time, and enhance patient satisfaction. AI applications have also expanded to include 3D modelling of teeth and jaws, digital impressions for appliance fabrication, and chatbots for patient communication and scheduling [38].

3.6 AI in Bioinformatics

AI has significantly advanced bioinformatics through the use of machine learning (ML), deep learning (DL), and natural language processing (NLP). These technologies are being applied across diverse areas, including genome sequencing, protein structure prediction, drug discovery, systems biology, personalized medicine, imaging, signal processing, and text mining. AI algorithms have proven highly effective in addressing complex biological problems, helping researchers decode genomes, model protein structures, accelerate drug development, and tailor treatments to individual patients (Figure 3) [39].

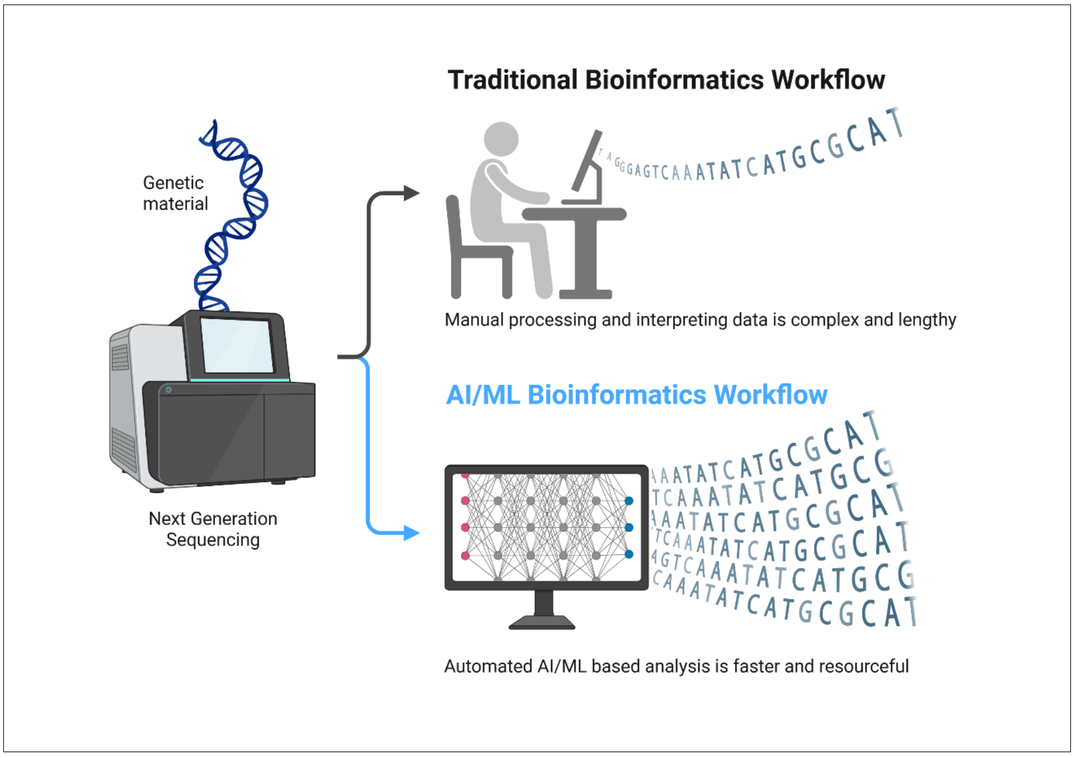

Figure 3-AI in Bioinformatics

4. FUTURE OF AI

The future of AI holds immense promise, with the potential to revolutionize industries, enhance human capabilities, and address complex global challenges. From accelerating new drug development and optimizing global supply chains to powering advanced robotics, AI is set to transform the way we live and work [40].

Looking ahead, one of the most significant advancements will be the transition from narrow AI to artificial general intelligence (AGI). With AGI, machines will be capable of thinking, learning, and acting like humans, effectively blurring the line between human and machine intelligence. This leap will open up unprecedented possibilities for automation and intelligent problem-solving across fields such as medicine, manufacturing, and transportation [40].

In parallel, the emergence of hybrid intelligence, where human cognition is integrated with machine learning will define a new era. This collaboration between human insight and machine precision will enhance decision-making and innovation. One such application is the hybrid intelligent image fusion method, which combines multimodal imaging for improved diagnosis and treatment planning. As such, technologies become more widespread, AI will not only augment human potential but also reshape the future of how we approach science, healthcare, and everyday life (Figure 4) [41, 42].

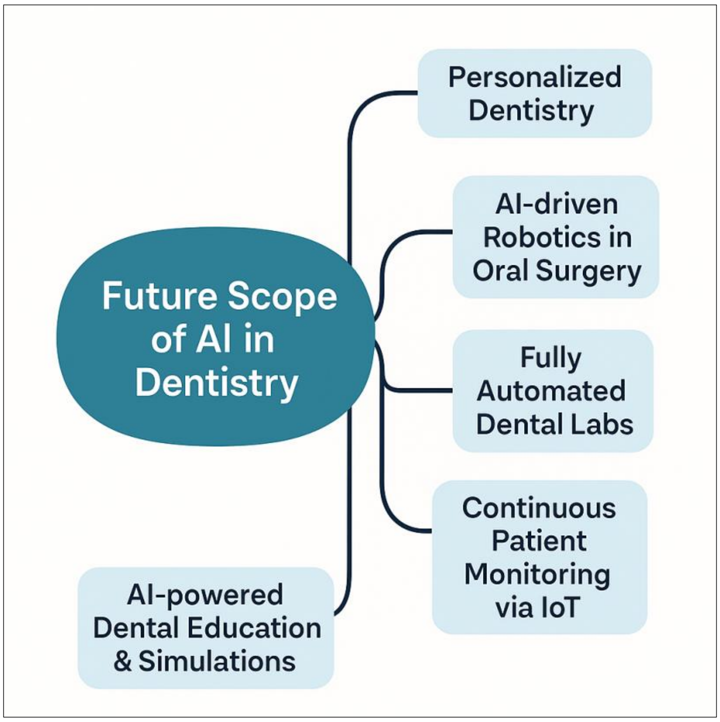

Figure 4: Future of AI

5. Limitations of AI

While AI offers transformative benefits across various fields, it also brings significant challenges that must be addressed. One major concern is job displacement, as AI can automate tasks traditionally performed by humans, potentially leading to unemployment in certain sectors. Additionally, AI systems can perpetuate bias and discrimination if trained on unbalanced data, producing unfair outcomes. Another issue is the phenomenon of "hallucinations," where AI models generate inaccurate or misleading information. Privacy is also at risk, as AI often relies on data that may be collected without user consent and vulnerable to breaches. Furthermore, many AI systems lack transparency, making it difficult to understand or explain their decisions, which can erode trust. Lastly, the environmental impact of AI is considerable, with large-scale models requiring significant energy and water resources, contributing to carbon emissions and ecological strain [43].

6. CONCLUSION

In conclusion, while AI holds tremendous potential to enhance patient care and ease the burden on healthcare systems, it should be seen as a powerful assistant, not a substitute for human expertise. AI can streamline routine processes, support clinical decision-making, and improve overall treatment outcomes in dentistry. However, its integration must be grounded in strong ethical principles, ensuring that human judgment remains at the forefront. Addressing challenges such as data quality, computational demands, and ethical implications is crucial. With thoughtful design and rigorous clinical validation, AI can become a reliable, unbiased, and transparent tool that empowers dentists to deliver more precise, efficient, and patient-centred care.

“AI will be part of the future, it's inevitable”- Sundar Pichai.

7. Conflict of Interest: None.

8. Source of Funding: None.

REFERENCES

1. Turkkahraman H. Embracing the Unprecedented Pace of Change: Artificial Intelligence's Impact on Dentistry and Beyond. Eur J Dent. 2023;17(3):567-568.
2. Chen YW, Stanley K, Att W. AIin dentistry: current applications and future perspectives. Quintessence Int. 2020;51(3):248-57.
3. Choi JW. Assessment of panoramic radiography as a national oral examination tool: review of the literature. Imaging Sci Dent. 2011;41(1):1-6.
4. Nilsson NJ. Artificial Intelligence: A New Synthesis In:Massachusetts. United States: Morgan Kaufmann Publishers Inc.1998;513
5. Kareem SA, Pozos-Parra P, Wilson N. An Application of Belief Merging for the Diagnosis of Oral Cancer. Appl Soft Comput J. 2017;61:1105-12.
6. M. Ghaffari et al. A review of advancements of AIin dentistry. Dentistry Review. 2024; 100081.
7. Agrawal P, Nikhade P. AIin Dentistry: Past, Present, and Future. Cureus. 2022;4(7):e27405.
8. Reyes LT, Knorst JK, Ortiz FR, Ardengh TM. Scope and challenges of machine learning-based diagnosis and prognosis in clinical dentistry: A literature review. Journal of clinical and translational research. 2021;7(4):523-539.
9. Taleb A, Rohrer C, Bergner B, De Leon G, Rodrigues JA, Schwendicke F, Lippert C, Krois J. Self-Supervised Learning Methods for Label-Efficient Dental Caries Classification. Diagnostics. 2022;12(5):1237.
10. Qu Y, Lin Z, Yang Z, Lin H, Huang X, Gu L. Machine learning models for prognosis prediction in endodontic microsurgery. J. Dent. 2022;118:103947.
11. Gupta R, Srivastava D, Sahu M, Tiwari S, Ambasta RK, Kumar P. AI to deep learning: machine intelligence approach for drug discovery. Molecular diversity. 2021;25(3):1315-1360.
12. Manu Rathee et al. 3D Printing -A Revolution in Prosthetic Dentistry. Sch J Dent Sci, 2021 Dec 8(11): 327-334.
13. Kaur et al: Evolving Trends in Prosthodontics: A Brief Review AJOAD.2022; (2):05-07.
14. Ossowska A, Kusiak A, Świetlik D. AI in Dentistry-Narrative Review. International journal of environmental research and public health. 2022;*19*(6):3449.
15. Ahmed N, Abbasi MS, Zuberi F, Qamar W, Halim MSB, Maqsood A, Alam MK. AI Techniques: Analysis, Application, and Outcome in Dentistry-A Systematic Review. BioMed research international. 2021;9751564.
16. Mertens S, Krois J, Cantu AG, Arsiwala LT, Schwendicke F. AI for caries detection: randomized trial. J Dent 2021;115:103849
17. Zhou X, Yu G, Yin Q, Liu Y, Zhang Z, Sun J. Context aware convolutional neural network for children caries diagnosis on dental panoramic radiographs. Comput Math Methods Med. 2022; 6029245
18. Lee KS, Kwak HJ, Oh JM, et al. Automated detection of TMJ osteoarthritis based on artificial intelligence. J Dent Res. 2020;99(12):1363-1367.
19. Nguyen TT, Larrivée N, Lee A, Bilaniuk O, Durand R. Use of AIin Dentistry: Current Clinical Trends and Research Advances. J Can Dent Assoc. 2021;87:7.
20. Misra N, Agrawal S. AIin Dentistry: The Game Changer. Int J Recent Sci Res. 2022;11(5):38685-9.
21. Preshaw PM. Detection and diagnosis of periodontal conditions amenable to prevention. BMC Oral Health. 2015;15:S5.
22. Revilla-Le´on M, G´omez-Polo M, Barmak AB, Inam W, Kan JYK, Kois JC, Akal O. A model for diagnosing gingivitis and periodontal disease: a systematic review. J. Prosthet. Dent. 2022:1-9.
23. Khanna SS, Dhaimade PA: Artificial intelligence: transforming dentistry today. Indian J Basic Appl Med Res. 2017, 6:161-7.
24. Yadav P, Asdullah M, Gupta J, Khan MH. Enhancing dental care through artificial intelligence: A comprehensive overview. Int J Oral Health Dent 2023;9(4):247-250.
25. Rathee, Manu; Singh, Sandeep; Jain, Prachi; Divakar, S; Chahal, Sujata; Tomar, Sarthak Singh. Prosthodontic rehabilitation of mandibular discontinuity post-luminal type ameloblastoma using direct metal laser-sintering printed preci-vertix attachment and cast partial denture—A case report. Journal of Cancer Research and Therapeutics. 2024;20(6):1887-1890.
26. Manu Rathee et al. Reconstruction and Rehabilitation of Maxillary Defects Secondary to Mucormycosis. Saudi J Oral Dent Res. 2022; 7(1):1-7.
27. Rathee M, Divakar S, Jain P, Singh S, Chahal S. Prosthetic rehabilitation of mucormycosis patients using DMLS fabricated cast partial denture with semi-precision attachments- A case series. Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry. 2024;44(2):478-485.
28. Wadhwa B, Bhandari S, Singh U, Singh S. Near field communication tag to provide a unique identification aid for custom ocular prostheses. The Journal of prosthetic dentistry. 2024; S0022-3913(24)00408-6.
29. Wadhwa B, Bhandari S, Khanna M, Singh S, Singh U. Custom ocular prostheses incorporating braille for a patient with bilateral anophthalmia: A clinical report. The Journal of prosthetic dentistry. 2025;S0022-3913(24)00819-9.
30. De-Deus G, Souza EM, Silva EJNL, Belladonna FG, Sim˜ oes-Carvalho M, Cavalcante DM, Versiani

MA. A critical analysis of research methods and experimental models to study root canal fillings. Int. Endod. J. 2022;55:384-445.
31. Li S, et al. AIfor caries and periapical periodontitis detection. J. Dent. 2022;122: 104107.
32. Saghiri MA, Asgar K, Boukani KK, Lotfi M, Aghili H, Delvarani A, et al. A new approach for locating the minor apical foramen using an artificial neural network. Int. Endod. J. 2012;45: 257-65.
33. Saghiri MA, Garcia-Godoy F, Gutmann JL, Lotfi M, Asgar K. The reliability of artificial neural network in locating minor apical foramen: a cadaver study. J. Endod. 2012;38:1130-4.
34. Jeon SJ, Yun JP, Yeom HG, Shin WS, Lee JH, Jeong SH, Seo MS. Deep-learning for predicting C-shaped canals in mandibular second molars on panoramic radiographs. Dentomaxillofacial Radiol. 2021;50:20200513.
35. Monill-Gonz´alez A, Rovira-Calatayud L, D'Oliveira NG, Ustrell-Torrent JM. AIin orthodontics: where are we now? A scoping review. Orthod. Craniofac. Res. 2021;24:6-15.
36. Li S, Guo Z, Lin J, Ying S. AI for classifying and archiving orthodontic images. Biomed Res. Int. 202:1-11.
37. AKDEN˙ IZ BS, AYKAÇ V, TURGUT M, ÇET˙ IN S. Digital dental models in orthodontics: a review. J. Exp. Clin. Med. 2022;39:250-5.
38. Hansa I, Katyal V, Semaan SJ, Coyne R, Vaid NR. Aidriven remote monitoring of orthodontic patients: clinical applicability and rationale. Semin. Orthod. 2021;27:138-56.
39. Amialahmadi H, Khalili-Tanha G, Nazari E, Rezaei-Tavirani M. AIand bioinformatics: a journey from traditional techniques to smart approaches. Gastroenterol Hepatol Bed Bench. 2024;17(3):241-252.
40. Lekadir K, Frangi AF, PorrasAR, Glocker B, Cintas C, Langlotz CP et al. FUTURE-AI: international consensus guideline for trustworthy and deployable AI in healthcare. BMJ. 2024;388:e081554.
41. Hosny A, Parmar C, Quackenbush J, Schwartz LH, Aerts HJWL. AI In Radiology. Nature Reviews. Cancer. 2018;18:500-510.
42. Grischke J, Johannsmeier L, Eich L, Griga L, Haddadin S. Dentronics: Towards Robotics and AI In Dentistry. Dent Mater. 2020;36(6):765-778.
43. Hashimoto DA, Witkowski E, Gao L, Meireles O, Rosman G. AI in Anesthesiology: Current Techniques, Clinical Applications, and Limitations. Anesthesiology. 2020;132(2):379-394.