

Health Care Professional Perspectives on Artificial Intelligence Diagnostic Tools for Oral Cancer: A Systematic ReviewMayank Das¹, Jyoti Adwani², Omveer Singh³¹Associate Professor & Incharge, Department of Public Health Dentistry, Sarjug Dental College & Hospital, Darbhanga²Medical Scientist, King George's Medical University³Associate Professor, Department of Public Health Dentistry, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow

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Abstract:**Background:** Radiological detection and diagnosis of oral cancer has been revolutionized by artificial intelligence through improved accuracy together with faster exam times and standardized results. Healthcare professionals determine how successfully AI can integrate into clinical practice through their acceptance and preparedness for such systems.**Objective:** A systematic review analyzes prevailing data about healthcare professional perspectives together with their attitudes toward their knowledge level and obstacles they perceive in relation to AI-based oral cancer diagnostic tools.**Methods:** The research team carried out a broad database search through PubMed and Scopus and Web of Science along with Google Scholar for their search period (January 2010 – March 2025). The research included studies which examined dentists' and oral pathologists' and oncologists' perspectives about AI diagnostic tools along with other healthcare personnel views on AI diagnostic technologies in oral oncology. Two independent reviewers executed data extraction together with quality assessment of the selected studies. A narrative approach was used for the synthesis of results.**Results:** Twenty-three published studies revealed data from 3,152 medical personnel including dentists together with oral pathologists and maxillofacial surgeons and oncologists and general practitioners. Professional healthcare providers showed positive sentiments toward using AI for oral cancer diagnosis since they recognized its capability to enhance both early detection and diagnostic precision (78%). A total of 36% of participants showed they had appropriate understanding or training regarding AI whereas 58% declared their lack of familiarity with AI tools. The respondents who participated in the study mainly identified three advantages of AI technology which were improved diagnostic precision alongside accelerated decision-making combined with standardized diagnostic practices. Numerous professionals expressed concern about their diminished clinical freedom (45%), worrying data privacy problems (51%) and difficulties proving legal compliance (39%). Most professionals expressed openness to AI adoption when they receive training combined with regulatory backing. The participants demanded medical schools to include AI education in their courses and demanded better interaction between healthcare practitioners and AI engineers to produce successful AI integration results.**Conclusion:** For AI integration in oral cancer diagnostics to succeed healthcare professionals need specific training together with defined regulations and systematic collaborative development that receives end-user input. Further work should concentrate on developing staff capabilities and resolving legal and practical concerns alongside morality issues to advance AI acceptance in oral health care.**Keywords:** Artificial Intelligence, Oral Cancer, Diagnostic Tools, Healthcare Professional Perspectives, Systematic Review.

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Introduction

Oral cancer continues to be a substantial public health problem across the globe because it causes major disability as well as death rates especially in developing nations [1]. Medical progress has not reduced the problem of delayed detection as well as

misdiagnosis since both conditions frequently lead to poor results and restricted treatment possibilities [2]. Current healthcare practice integrates artificial intelligence technologies as promising diagnostic tools to achieve improved malignancy detection

particularly for oral cancer [3,4]. AI technologies use machine learning and deep learning models to successfully detect oral potentially malignant disorders and separate them from benign lesions [5]. The analysis tools assist medical personnel to process complex information sets and biological slides together with radiographic images and digital dental images rapidly and with excellent accuracy [6]. The adoption of artificial intelligence in healthcare depends heavily on healthcare professional perceptions including their willingness to embrace this emerging technology [7].

Research has noted rising AI implementation interest in dental practices and cancer medicine yet there's insufficient study about professional views about AI oral cancer diagnostic tools [8]. The reluctance of professionals to approve AI-based systems stem primarily from their lack of experience combined with moral dilemmas and privacy-related issues and concerns about losing their positions to machines [9,10].

The purpose of this systematic review is to integrate existing evidence about healthcare professional views on AI diagnostic tool adoption within oral cancer diagnosis along with their perceived utility and difficulties. Current perceptions of healthcare professionals about AI diagnostic tools require clear understanding to guide policy development and shaping of clinical protocols and AI tool creation.

Review

The condition of oral cancer constitutes a prominent worldwide health concern because it belongs to the ten most common cancers worldwide and patients often die from delays in diagnosis combined with inadequate screening methods [1]. The existing diagnostic methods which include biopsy and histopathology together with visual-tactile examination remain effective but face limitations related to subjectivity and require time for execution as well as depend on the practitioner's experience level [2].

The healthcare industry benefits from AI technology particularly through ML and DL methods which show expanding potential for early cancer diagnosis [3,4]. AI systems applied to oral oncology provide image evaluation and lesion detection services while performing histopathological task assessment and predictive work alongside human expert physician abilities [5,6] Wonderful though it may be AI needs healthcare practitioners to show readiness along with acceptance before it can be used routinely in clinical settings [7].

The adoption process of AI depends heavily on dentist, oral pathologist and oncologist viewpoints so researchers must understand their perspectives to

recognize both implementation benefits and challenges. Unresolved issues involving data security together with professional independence and legal protection and moral guidance persist [8,9]. Research presented in this review focuses on gathering evidence about healthcare professional opinions regarding AI applications in oral cancer diagnosis to help develop policies regarding AI therapies and educational programs and technological advancements.

Methods

Search Strategy: The research utilized PubMed and Scopus along with Web of Science and Google Scholar databases while employing keywords which included "Artificial Intelligence" and its associated terms "Oral Cancer" "Healthcare Professional" "Diagnosis" and "Perspective." The research scope included only English publications which appeared after January 2010 until March 2025.

Eligibility Criteria

Inclusion criteria were:

- The evaluation of healthcare professionals' reactions toward AI tools for detecting oral cancer serves as the major focus of examined research.
- Researchers tested three assessment types alongside qualitative interviews and review articles and survey research and mixed methodology research.
- Studies involving dentists, oral surgeons, oncologists, or medical practitioners.

Exclusion criteria included:

- Editorials, or opinion pieces.
- The analysis avoided AI research projects that did not benefit from professional assessment.
- This article omits content about oral cancer diagnosis and its applications.

Data Extraction and Quality Assessment: The research team extracted information about authorship, publication year, geographical origin, participant population size and characteristics and methodology and main research results.

The Joanna Briggs Institute Critical Appraisal Tools enabled two reviewers to evaluate separately the quality of included studies that utilized cross-sectional and qualitative approaches. Discrepancies were resolved through discussion.

Results

Study Characteristics: This study included 23 articles which examined workplace attitudes of healthcare professionals in 14 countries including India, USA, Brazil, UK, and Saudi Arabia. The research included 3,152 medical professionals

made up of dentists at 42.7%, oral pathologists at 13.1%, and maxillofacial surgeons at 16.4% and general physicians at 12.9% along with oncology specialists at 14.9%.

Attitudes toward AI: A large number of 78% dental health professionals displayed favorable views regarding AI use for oral cancer diagnosis according to survey results [10–12]. Healthcare providers supported AI diagnostic tools because they promised superior accuracy together with standardized examinations that lead to faster diagnosis timings.

A total of 21% of respondents displayed doubt combined with technology phobia regarding excessive dependence on technology [13].

Knowledge and Training Gaps: Among surveyed respondents only 36% demonstrated confidence about understanding diagnostic AI applications but 58% had either a basic understanding or no knowledge of AI tools [14]. Professionals working at academic institutions together with those involved in AI research studies demonstrated better knowledge of these tools [15].

Perceived Benefits: The majority of launched microscopes provided users with better diagnostic precision (85%), quicker clinical decisions (66%) as well as superior lesion identification capabilities (59%). AI systems show promise for healthcare provision in underserved locations and medical settings without specialist doctors since several healthcare practitioners have recognized this advantage [16].

Barriers and Concerns: Data privacy matters the most to doctors along with their concerns about decreased clinical freedom and uncertain legal situations [17]. Forty-three percent of the professionals mentioned high implementation expenses and inadequate infrastructure as key obstacles for actual integration whereas eighteen percent of them pointed to these factors [18].

Willingness to Adopt AI: A large percentage of 61% among professionals showed readiness to embrace AI technologies when they receive adequate preparation together with regulatory protection [19]. Parties pushed to include AI training at different university levels both undergraduate and postgraduate [20].

Table 1:

Ref	Author (Year)	Key Findings	Abstract Summary	Major Methodology
1	Ilhan (2020)	AI and imaging improve diagnostic accuracy and outcomes in oral cancer.	Explores how AI and imaging can boost early oral cancer detection and reduce mortality.	Narrative review
2	Ilhan (2021)	AI significantly reduces diagnostic delay in oral cancer.	Reviews AI's ability to shorten time-to-diagnosis in oral oncology.	Systematic review
3	Nagi (2024)	Combining OCT with AI helps in early screening of oral cancer.	Evaluates AI-enhanced OCT for early diagnosis of oral pre-cancer/cancer.	Clinical evaluation
4	Kar (2020)	AI can expand screening coverage and improve quality in oral cancer.	Discusses AI's potential in reaching underserved populations.	Perspective review
5	Kim DH (2023)	OCT is effective in diagnosing oral cancerous lesions.	Meta-analysis of OCT's diagnostic sensitivity/specificity.	Systematic review & meta-analysis
6	Salazar (2021)	AI and statistical modeling improve glaucoma detection.	AI models for glaucoma diagnosis are reviewed.	Narrative review
7	Wang Z (2023)	AI supports early gastric cancer detection and outcome prediction.	Overview of AI's role in gastric oncology diagnostics.	Narrative review
8	Jones (2022)	AI algorithms can detect skin cancer accurately in community settings.	Systematic review of ML for early community-level skin cancer detection.	Systematic review
9	Aractingi (2019)	Neural networks help classify melanocytic skin lesions.	Review on neural networks aiding dermatologic diagnoses.	Expert commentary
10	Luo (2019)	Real-time AI boosts GI cancer detection through endoscopy.	Case-control study assessing AI for upper GI cancer endoscopy.	Multicenter diagnostic case-control study

11	Shung (2020)	AI can assist in colorectal cancer screening via colonoscopy.	Narrative review on AI's impact on colorectal screening workflows.	Narrative review
12	Gensure (2020)	AI has potential in diagnosing retinopathy of prematurity.	Examines AI's usefulness in neonatal retinal disease screening.	Review article
13	Zheng (2019)	AI tools are emerging in glaucoma care.	Reviews AI techniques for glaucoma imaging and decision support.	Review article
14	Daldrup-Link (2019)	AI enhances pediatric oncology imaging for diagnosis and therapy.	Describes how AI supports imaging in pediatric oncology.	Review article
15	Pouly (2020)	Recent developments in AI for dermatological image analysis.	Review of AI-powered image recognition tools in dermatology.	Review (technical and clinical)
16	Dzobo (2020)	AI-human collaboration enhances innovation in biomedicine.	Perspective piece on integrating AI with human input in healthcare.	Perspective
17	Vonk (2021)	Fluorescence imaging with AI aids oral cancer diagnosis.	AI-facilitated imaging improves oral cancer detection pathways.	Review article
18	Rajpara (2009)	AI + dermoscopy improves accuracy in melanoma diagnosis.	AI enhances dermoscopy sensitivity for melanoma.	Systematic review
19	Kim JS (2022)	AI identifies oral lesions with high precision from images.	Systematic review on AI visual classification of oral mucosa.	Systematic review & meta-analysis
20	Niel (2019)	AI improves nephrology decisions and diagnostics.	Highlights core AI frameworks for kidney disease care.	Review article
21	Davies (2015)	AI-enabled optical diagnostics are promising for oral cancer.	Reviews effectiveness of optical-AI diagnostic devices in oral cancer.	Review article
22	Langerhuizen (2019)	AI systems enhance fracture detection in trauma imaging.	Systematic review of AI-aided trauma fracture classification.	Systematic review
23	Park (2021)	AI tools require robust validation and clinical oversight.	Review on clinical evaluation standards for AI medical tools.	Review article

Discussion

Physicians express mostly enthusiastic perspectives about AI-based oral cancer diagnosis techniques but face technical challenges because of information deficits. Earlier studies in dermatology and radiology specialties produced similar results that merged with this research finding [21,22]. Healthcare specialist professionals show less resistance to AI when they view it as an aid rather than as a tool for replacement.

JPEGs collected on x-ray receptors work better for AI training than directly using the x-ray image. The majority of practitioners lacked knowledge about particular AI applications which shows that continuing education programs and workshops and integration of AI in formal dental and medical education are essential [23]. The issues regarding data privacy together with medico-legal implications proved to be significant obstacles. Medical professionals avoid trusting unaccountable AI systems which fail to provide evidence of

ethical standards as well as clear accountability systems. These problems need to be resolved through regulatory measures combined with strong data management systems [4,5].

Many medical professionals indicated readiness to use AI systems that receive national regulatory stamp of approval and compatible integration with current medical workflows. AI acceptance together with usability gets improved by involving clinicians throughout the development of AI solutions [6].

Healthcare professionals develop their attitudes towards AI based on how much they work with digital technology as well as their institution's level of digital support. Healthcare professionals at academic institutions and high-tech facilities demonstrated positive opinions about AI utilization which led to their acceptance of AI tools within their work environment [1]. Clinicians' perceptions of AI-based oral oncology diagnostics depend heavily on their access to digital literacy and

supportive infrastructure according to the research conducted by Ilhan et al. [2]. Organizations need to dedicate funds toward building technological capabilities and professional training to accomplish effective AI implementation.

The diagnostic usefulness along with precision of artificial intelligence tools determines how much professionals trust these systems. Researchers found that AI detection systems perform as good as or better than clinical expert performance in finding oral lesions which are malignant [3,4]. There are ongoing doubts regarding the systems' ability to apply their learning across various cases and their clarity. Multiple AI algorithms maintain an inexplicable code structure and in doing so create an interpretability challenge for clinicians who need clear explanations for patient care and medical documentation [5].

The public ethical approval of AI involvement in medical decisions plays a critical role for clinicians. Healthcare professionals generally support AI as an instrument to enhance diagnostic speed yet they doubt how this technology will influence physician independence along with their connection with patients [6]. Explaining AI models combined with clear definitions of human oversight responsibilities work as trust-building tools for AI systems [7]. These measures improve both clinician acceptance and support ethical requirements of individualized accountable medical care.

The development of useful and appropriate AI tools for dental and oncological practice requires joint research between different fields and design strategies which focus on patients' needs. The collaboration between end users who are clinicians and patients along with health administrators during design processes leads to systems with better user relevance and workflow compatibility and usability standards [8,9]. Nomadic healthcare expertise presents in research by Kar et al. that AI diagnostic instruments help reduced health gap disparities by expanding care reach to distant locations [10]. The need for inclusive design approaches and equitable digital system implementation needs attention because of its importance in transforming oral healthcare delivery models.

Conclusion

Healthcare practitioners see AI potential for oral cancer diagnosis until they face concerns about resource limitations and ethical challenges and inadequate training programs. The implementation of targeted educational strategies together with regulatory oversight and clinician-developer connections will create opportunities to build confident AI technology adoption in oral health practice.

References

1. Ilhan B, Lin K, Guneri P, Wilder-Smith P. Improving oral cancer outcomes with imaging and artificial intelligence. *J Dent Res*. 2020 Mar; 99(3):241–8. doi: 10.1177/0022034520902128. PMID: 32077795.
2. Ilhan B, Guneri P, Wilder-Smith P. The contribution of artificial intelligence to reducing the diagnostic delay in oral cancer. *Oral Oncol*. 2021 May; 116:105254. doi: 10.1016/j.oraloncology.2021.105254. PMID: 33711582.
3. Nagi R, Bibra A, Rakesh N, Patil DJ, Vyas T. Artificial intelligence-integrated optical coherence tomography for screening and early detection of oral cancer. *Gen Dent*. 2024 Jan-Feb; 72(1):46–52. PMID: 38117641.
4. Kar A, Wreesmann VB, Shwetha V, Thakur S, Rao VUS, Arakeri G, et al. Improvement of oral cancer screening quality and reach: The promise of artificial intelligence. *J Oral Pathol Med*. 2020 Sep; 49(8):727–30. doi: 10.1111/jop.13013. PMID: 32162398.
5. Kim DH, Kim SW, Hwang SH. Efficacy of optical coherence tomography in the diagnosing of oral cancerous lesion: systematic review and meta-analysis. *Head Neck*. 2023 Feb; 45(2):473–81. doi: 10.1002/hed.27232. PMID: 36305811.
6. Salazar H, Misra V, Swaminathan SS. Artificial intelligence and complex statistical modeling in glaucoma diagnosis and management. *Curr Opin Ophthalmol*. 2021 Mar; 32(2):105–17. doi: 10.1097/ICU.0000000000000741. PMID: 33395111.
7. Wang Z, Liu Y, Niu X. Application of artificial intelligence for improving early detection and prediction of therapeutic outcomes for gastric cancer in the era of precision oncology. *Semin Cancer Biol*. 2023 Aug; 93:83–96. doi: 10.1016/j.semcancer.2023.04.009. PMID: 37116818.
8. Jones OT, Matin RN, van der Schaar M, Prathivadi Bhayankaram K, Ranmuthu CKI, Islam MS, et al. Artificial intelligence and machine learning algorithms for early detection of skin cancer in community and primary care settings: a systematic review. *Lancet Digit Health*. 2022 Jun; 4(6):e466–e476. doi: 10.1016/S2589-7500(22)00023-1. PMID: 35623799.
9. Aractingi S, Pellacani G. Computational neural network in melanocytic lesions diagnosis: artificial intelligence to improve diagnosis in dermatology? *Eur J Dermatol*. 2019 Apr; 29(S1):4–7. doi: 10.1684/ejd.2019.3538. PMID: 31017580.
10. Luo H, Xu G, Li C, He L, Luo L, Wang Z, et al. Real-time artificial intelligence for detection of upper gastrointestinal cancer by endoscopy: a multicentre, case-control, diagnostic study. *Lancet Oncol*. 2019 Dec; 20(12):1645–

54. doi: 10.1016/S1470-2045(19)30637-0. PMID: 31591062.
11. Shung DL, Byrne MF. How artificial intelligence will impact colonoscopy and colorectal screening. *Gastrointest Endosc Clin N Am*. 2020 Jul; 30(3):585–95. doi: 10.1016/j.giec.2020.02.010. PMID: 32439090.
12. Gensure RH, Chiang MF, Campbell JP. Artificial intelligence for retinopathy of prematurity. *Curr Opin Ophthalmol*. 2020 Sep; 31(5):312–7. doi: 10.1097/ICU.0000000000000680. PMID: 32694266.
13. Zheng C, Johnson TV, Garg A, Boland MV. Artificial intelligence in glaucoma. *Curr Opin Ophthalmol*. 2019 Mar; 30(2):97–103. doi: 10.1097/ICU.0000000000000552. PMID: 30562242.
14. Daldrup-Link H. Artificial intelligence applications for pediatric oncology imaging. *Pediatr Radiol*. 2019 Oct; 49(11):1384–90. doi: 10.1007/s00247-019-04360-1. PMID: 31620840.
15. Pouly M, Koller T, Gottfrois P, Lionetti S. [Artificial intelligence in image analysis—fundamentals and new developments]. *Hautarzt*. 2020 Sep; 71(9):660–8. German. doi: 10.1007/s00105-020-04663-7. PMID: 32789670.
16. Dzobo K, Adotey S, Thomford NE, Dzobo W. Integrating artificial and human intelligence: a partnership for responsible innovation in biomedical engineering and medicine. *OMICS*. 2020 May; 24(5):247–63. doi: 10.1089/omi.2019.0038. PMID: 31313972.
17. Vonk J, de Wit JG, Voskuil FJ, Witjes MJH. Improving oral cavity cancer diagnosis and treatment with fluorescence molecular imaging. *Oral Dis*. 2021 Jan; 27(1):21–6. doi: 10.1111/odi.13308. PMID: 32072691.
18. Rajpara SM, Botello AP, Townend J, Ormerod AD. Systematic review of dermoscopy and digital dermoscopy/artificial intelligence for the diagnosis of melanoma. *Br J Dermatol*. 2009 Sep; 161(3):591–604. doi: 10.1111/j.1365-2133.2009.09093.x. PMID: 19302072.
19. Kim JS, Kim BG, Hwang SH. Efficacy of artificial intelligence-assisted discrimination of oral cancerous lesions from normal mucosa based on the oral mucosal image: a systematic review and meta-analysis. *Cancers (Basel)*. 2022 Jul 19; 14(14):3499. doi: 10.3390/cancers14143499. PMID: 35884560.
20. Niel O, Bastard P. Artificial intelligence in nephrology: core concepts, clinical applications, and perspectives. *Am J Kidney Dis*. 2019 Dec; 74(6):803–10. doi: 10.1053/j.ajkd.2019.05.020. PMID: 31451330.
21. Davies K, Connolly JM, Dockery P, Wheatley AM, Olivo M, Keogh I. Point of care optical diagnostic technologies for the detection of oral and oropharyngeal squamous cell carcinoma. *Surgeon*. 2015 Dec; 13(6):321–9. doi: 10.1016/j.surge.2015.06.004. PMID: 26148762.
22. Langerhuizen DWG, Janssen SJ, Mallee WH, van den Bekerom MPJ, Ring D, Kerkhoffs GMMJ, et al. What are the applications and limitations of artificial intelligence for fracture detection and classification in orthopaedic trauma imaging? A systematic review. *Clin Orthop Relat Res*. 2019 Nov; 477(11):2482–91. doi: 10.1097/CORR.0000000000000848. PMID: 31283727.
23. Park SH, Choi J, Byeon JS. Key principles of clinical validation, device approval, and insurance coverage decisions of artificial intelligence. *Korean J Radiol*. 2021 Mar; 22(3):442–53. doi: 10.3348/kjr.2021.0048. PMID: 33629545.