BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 5

DOI: 10.58240/1829006X-2025.21.5-333

ARTIFICIAL INTELLIGENCE AS AN EMERGING PARADIGM IN ORAL AND MAXILLOFACIAL SURGERY: A QUESTIONNAIRE-BASED STUDY IN KERALA.

Shradha Anil Kuzhivilayil [1], George Skariah P [2], Dilna S [3]
[1]House surgeon, PMS College of Dental Science and Research, Vattappara, Thiruvananthapuram, India,
Email: shradhaanilkuzhivilayil55@gmail.com
[2] Professor and HOD, Department of Oral and Maxillofacial Surgery, PMS College of Dental Science and Research, Vattappara, Thiruvananthapuram, India, Email: georgeclt@gmail.com
[3] Senior Lecturer, Department of Oral and Maxillofacial Surgery, PMS College of Dental Science and Research, Vattappara, Thiruvananthapuram, India, Email: drdilnas@gmail.com
***Corresponding Author:** Shradha Anil Kuzhivilayil, [1]House surgeon, PMS College of Dental Science and Research, Vattappara, Thiruvananthapuram, India,
Email: shradhaanilkuzhivilayil55@gmail.com
Received: *May 15. 2025;* ***Accepted:*** *Jun 15, 2025;* ***Published:*** *Jun.30,2025*

ABSTRACT

Objective: The objective of this study was to evaluate the attitude and perceptions of undergraduate and postgraduate dental students, and practicing clinicians towards the adoption of Artificial Intelligence in the Oral and Maxillofacial surgery curriculum.

Materials and Methods: To conduct a study on this, the online structured questionnaires administered through Google Forms were used in the state of Kerala in India during a period of 3 months. The questions of interest were about participants' knowledge of artificial intelligence, the perceived benefits and drawbacks of its use in academic or clinical contexts.

Results: A total of 300 respondents (100 undergraduates, 100 postgraduates, and 100 clinicians) completed the survey. All groups appeared to have a generally positive outlook on the integration of artificial intelligence. While the clinical benefits were highlighted, concerns were expressed by postgraduate students regarding the complexity and potential inaccuracies of artificial intelligence-generated results. Artificial Intelligence was regarded by practitioners as a tool to improve treatment quality, but it was also perceived to face issues such as a shortage of awareness, high training requirements, and public acceptance.

Conclusion: Finally, the study shows that artificial intelligence is perceived broadly as beneficial as an adjunct in the education and practice of dentistry. Insights generated above can be used as a valuable baseline to devise educational and clinical interventions aiming at humanizing the progression of artificial intelligence in oral healthcare delivery systems.

Keywords**:** AI, Oral surgery, Dental surgery, Questionnaires.

1. INTRODUCTION

Healthcare is a promising domain of Artificial Intelligence. Artificial Intelligence technologies have also been applied in recent years in dentistry to diagnose, plan the treatment, use robotic-assisted surgeries, and manage patient data. Artificial Intelligence tools can simulate human intelligence to analyze large datasets and identify patterns. For example, the integration of the Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) systems, RFID-equipped instruments, sensor-based gloves, and robot patients is currently helping to reshape the traditional teaching and practice of Oral and maxillofacial surgery.

The COVID-19 pandemic accelerated the rate of digital transformation in dental education as well as in practice. Since you could not connect through physical means, dental institutions started utilizing their online platforms, simulations, and algorithms-enabled tools to continue on with learning and clinical training [1].

The main focus is often technical capabilities of artificial intelligence, but rarely psychological, educational, and practical readiness of its users [2]. The present study aims to fill this gap by investigating the perceptions and attitudes of undergraduate and postgraduate dental students, as well as practicing clinicians in Kerala, towards the use of Artificial Intelligence in the Oral and Maxillofacial Surgery curriculum and its application in practice. For developing appropriate strategies for facilitating the smooth integration of artificial intelligence, it is important to understand how future and current dental

professionals envision artificial intelligence.

MATERIALS AND METHODS

Study Design

The study is an original research, which adopted a questionnaire with an exploratory approach. The research methodology was devised to probe the nuance in the opinions of three participant categories, namely, undergraduate students, postgraduate students, and regular dental clinicians in Kerala state of India. The questionnaires developed and distributed through Google Forms were used to collect data [1]. Because the study was qualitative, open-ended responses and selected choices could be subjected to thematic interpretation [2].

Study Setting and Participants

The study was done over three months in Kerala, a state in India. This was selected because there is a multiplicity of dental institutions and practitioners in the region. Undergraduate and postgraduate dental students in recognized dental institutions and licensed dental practitioners practicing in the clinical environment were involved as participants. People who could provide relevant and informed perspectives on the subject matter were purposely sampled. In order to be included, participants had to be able to access digital platforms for online completion of the online survey and to have basic knowledge of digital tools [3].

Data Collection

Three different Google Form questionnaires were developed. Formulation of ten multiple-choice questions for each group with regards to participants' awareness, experiences and opinion on the application of artificial intelligence in oral and maxillofacial surgery was involved in the development of survey instruments [4]. In order to get a big and inclusive reach, the distribution of the Google Forms was carried out through institutional mailing lists, faculty referrals, social media platforms and professional dental forums. A brief overview of the study's purpose was given, and they were requested to provide informed consent [5]. The structure of Google Forms ensured anonymity and didn't have anything to do with IP tracking or any contact information. Assured the data would be stored securely and would be used solely for research purposes [6].

Data Analysis

Data will be analyzed using the statistical package SPSS 26.0 (SPSS Inc., Chicago, IL) and level of significance will be set at $p<0.05$. Descriptive statistics will be performed to assess the mean and standard deviation of the respective groups. Normality of the data will be assessed using Shapiro Wilkinson test. Inferential statistics to find out the difference between the groups will be done using Chi Square test.

Independent T test/ Mann Whitney U test will be used for comparison of 2 groups. One way Anova/ Kruskal Wallis test will be used for comparison of > 2 groups. Descriptive thematic analysis was conducted on the data obtained from the Google Form responses. The responses for undergraduates, postgraduates and practitioners were grouped in terms of participant cohorts and were analyzed to establish common themes and trends [7]. To get deeper qualitative insights, open-ended optional feedback and common remarks were used. Initially, the collected data was exported into a spreadsheet (Microsoft Excel) software for first sorting and organizing inside of. Responses were categorized into thematic clusters of 'perceived benefits,' 'concerns about accuracy,' 'training needs,' 'curriculum relevance,' and 'clinical integration,' and pre-coding was done. Counselling frequencies of specific response patterns were also calculated to see which perceptions were most frequently supported across each participant group [8].

Interview Sample Question

For example, a sample question asked of participants was 'Do you think Artificial Intelligence should be taught in the curriculum of Oral and Maxillofacial Surgery to undergraduate and postgraduate dental students?'. The next question directed to clinicians was, "Would you use AI-based diagnostic tools in clinical practice?"

RESULTS

Overview of Findings

The structured Google Forms generated data that revealed the complete picture regarding artificial intelligence perception and attitudes among undergraduate dental students, postgraduate dental students and practicing dental clinicians. The final sample comprised N = 300 respondents: 100 undergraduates, 100 postgraduates, and 100 practicing clinicians. Data showed that everyone among the examined groups expressed positive beliefs regarding integrating artificial intelligence. Undergraduate students saw artificial intelligence primarily as a modern educational instrument. Postgraduate students combined optimism with their belief in artificial intelligence's actual medical value. Artificial Intelligence reliability and possible system boundaries in critical medical scenarios caused them to raise their concerns. The current usage of artificial intelligence by practicing clinicians includes implementing it as an operational tool to enhance treatment efficiency while maintaining treatment quality [4-7]. The way students and dental practitioners feel about artificial intelligence changed depending on their dedication to the field and practice experience [9]. Clinical

professionals revealed significant enthusiasm toward artificial intelligence diagnostics.

All three populations sharing perceptions about artificial intelligence utility matched their evaluations of artificial intelligence complexity, together with requirements for training and ethical awareness within the field [10]. The findings demonstrate mutual agreement about artificial intelligence possibilities for oral and maxillofacial surgery practice, together with fundamental obstacles that need solutions for seamless implementation of artificial intelligence within clinical oral and maxillofacial surgery operations.

Detailed Thematic Findings

Undergraduate Students

A high degree of excitement was noted among undergraduate students regarding artificial intelligence. Undergraduate students primarily supported the idea that automation could simplify their education through interactive learning methods. The students reported that they need to begin their artificial intelligence coursework early because it would help minimize rote learning while developing analytical abilities.

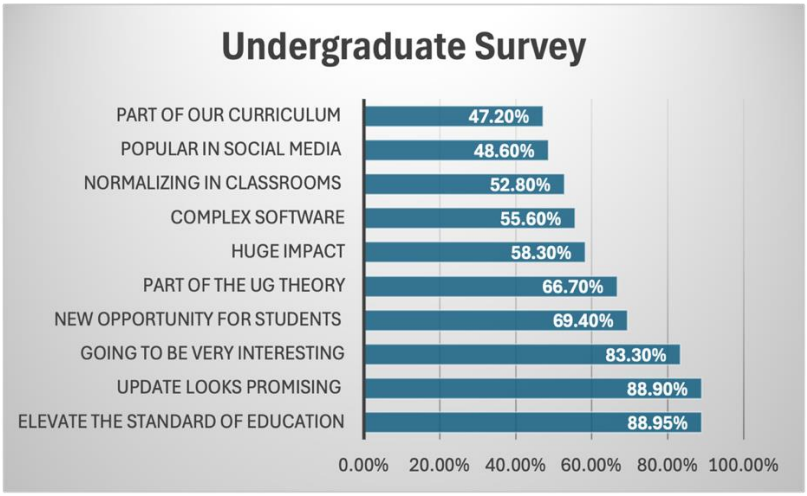

Figure 1. Demonstrates the result of the Undergraduate survey, in which a maximum of 88.95% have an opinion that artificial intelligence will elevate the standard of education. Students believed introducing artificial intelligence would prepare them better to perform in the digitally transformed clinical environment of the future [11]. Artificial intelligence functions as a traditional classroom enhancement system. Their responses demonstrated enthusiasm, but they simultaneously acknowledged the necessity of appropriate training methods.

Postgraduate Students

The postgraduate student population demonstrated a fairly advanced clinical approach to their understanding of artificial intelligence. Students generally focused their answers on how artificial intelligence helps surgeons check and plan operations, as well as deliver personalized medical treatments. The participants in Postgraduate studies stressed that artificial intelligence systems would help manage complicated surgery cases through prediction systems that also reduce errors made by physicians [13].

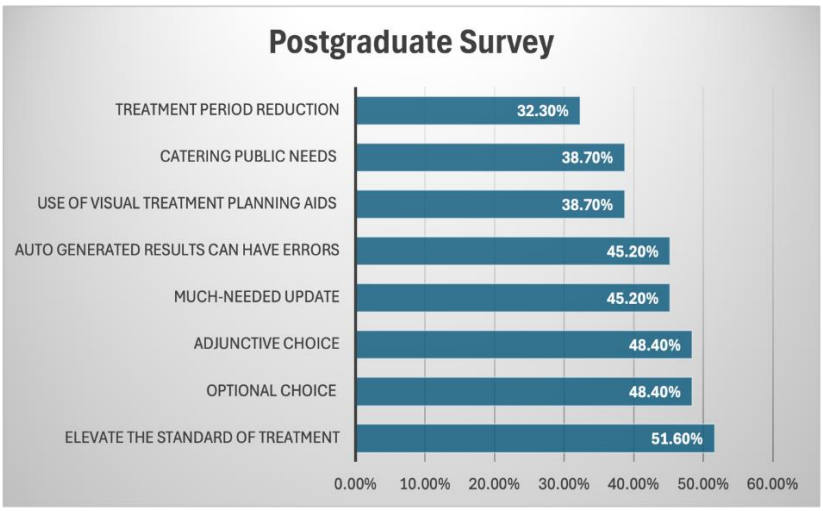

Figure 2. Survey participants from the postgraduate level showed an even temperament when discussing artificial intelligence.

Postgraduate students expressed multiple concerns related to machine dependency and contextual comprehension scarcity [10-13]. A survey participant declared that artificial intelligence technology performs well by helping medical staff, but professionals must maintain authority in situations that need subjective evaluation of patients.
The postgraduate students showed special attention to technical flaws and biased data processing within artificial intelligence algorithms. The participants expressed their concern about implementing artificial intelligence tools unless artificial intelligence tools first receive continuous validation and regulatory oversight [14]. The research team suggested formal artificial intelligence training requirements and education for postgraduate students.

Practicing Clinicians

The dental clinicians who were already practicing the profession viewed artificial intelligence with a practical understanding. Medical staff considered artificial intelligence-assisted radiographic interpretation, together with automated documentation and digital patient record analysis, as the most beneficial uses of artificial intelligence [15]. A practitioner stated that "artificial intelligence enables medical staff to decrease their diagnostic work while enhancing diagnostic precision specific to high-volume treatment facilities."

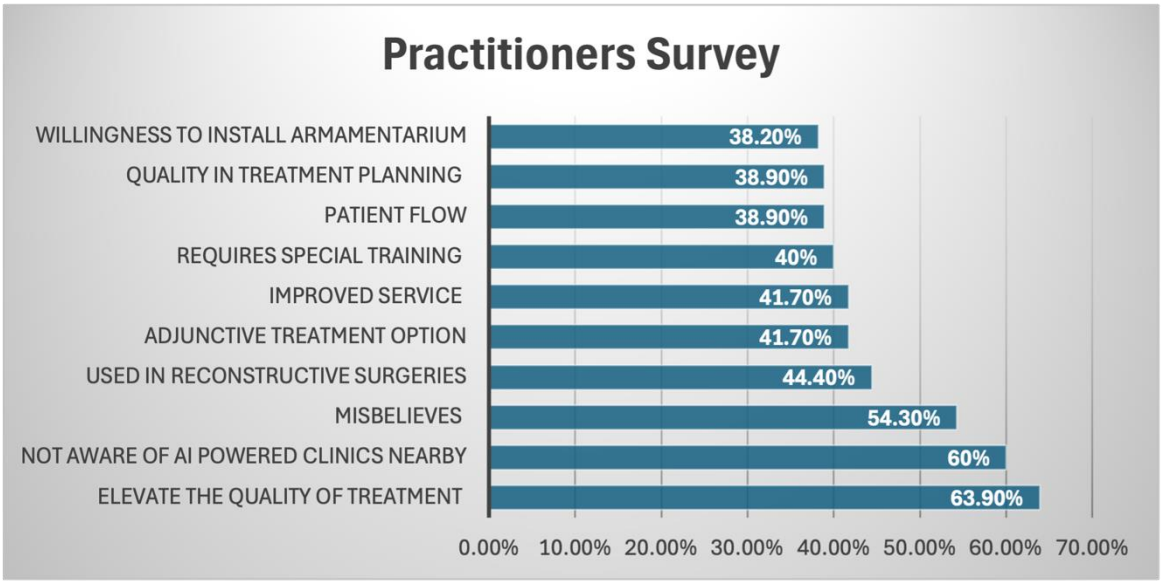

Figure 3. Highlights the ignorance of the general population being unaware of such updates, along with the dilemma existing between the misbeliefs, nearly accounting for 54.30% and specialized training necessities.

The main challenges mainly arose from insufficient formal training for the staff and inadequate technical support systems and patient awareness levels [16]. A study participant stated that patients often do not understand or distrust medical instrumentation. Education and transparency are essential." Practitioners and patients need awareness to create trust in artificial intelligence.

Common Themes

The research revealed common dominant themes. All participants demonstrated a widespread recognition of artificial intelligence utility. The positivity about artificial intelligence implementation met resistance because participants raised questions about tool complexity, with worries about errors and insufficient user education. Multiple participants identified the requirement for structured educational programs as a vital issue [17]. Minimum educational support systems become vital because state-of-the-art tools do not automatically produce desirable results. Postgraduate students and clinicians together highlighted ethical issues.

3. DISCUSSION

Students at both undergraduate and postgraduate levels in dentistry, together with practicing clinicians, show positive attitudes toward implementing Artificial Intelligence within Oral and Maxillofacial Surgery applications. Research findings show that acceptance toward artificial intelligence remains positive among undergraduate and postgraduate students and practitioners, yet understanding differs. The participants' development level and their experience in clinical work, and their current professional demands determine these distinctions [18].

Alignment with Existing Literature

This qualitative research outcome is consistent with academic analysts. Artificial intelligence has become increasingly important for diagnostic imaging, as well as treatment planning and robotic-assisted surgery and

patient management according to research conducted by Muller et al.[10]. The dental field has widely accepted artificial intelligence technology because it improves decision accuracy and enhances minimally invasive procedures, as well as reduces administrative workload [19]. Artificial intelligence diagnostic systems used in dentistry demonstrated similar abilities with radiographic images as trained clinicians, according to Muller et al.[10]. Research literature reveals that Undergraduate and postgraduate students' enthusiasm in this study corresponds with a worldwide pattern where professionals become proficient in digital technologies.

Differing Perspectives Between Undergraduate and Postgraduate Students

The current research shows that undergraduate students welcome Artificial Intelligence as a fresh curriculum element. Their positive attitudes emerged because they believed artificial intelligence systems could simplify difficult anatomical ideas and deliver individualized lesson formats [20].

Postgraduate students demonstrated a blend of positive and reserved outlook. Student experience with real patients influenced postgraduate students to recognize that Artificial Intelligence tools have their practical boundaries and confirmed clinical usefulness. Postgraduate students raised doubts about Artificial Intelligence-based output reliability. Postgraduate students face the unique situation where academic understanding meets real-life clinical demands, which explains their different answers. Multiple participants demonstrated an increased need for evidence and validation from healthcare professionals who work with patients [21].

Practitioners' Hesitation and Real-World Concerns

Medical practitioners demonstrated more extensive caution in their responses. Healthcare personnel acknowledged Artificial Intelligence's positive impacts. The healthcare professionals limited their approval processes through analysis of existing work process constraints [22]. Hospital practitioners brought up three major issues, which included inadequate training for Artificial intelligence systems, difficulties integrating Artificial intelligence routines into existing workflows and patients' doubts about Artificial intelligence systems.

Barriers to Artificial Intelligence Integration

All participant groups highlighted the absence of organized training related to Artificial Intelligence as their primary theme. Practitioners without digital health education during their time at school expressed strong concerns about training in artificial intelligence tools [23]. Healthcare providers indicated that their lack of suitable infrastructure presented a barrier. Practice settings that lack high-end hardware and adequate software integration, along with reliable technical support, cannot implement advanced artificial intelligence tools.

Members of the study voiced their concern because patients generally show little understanding of artificial intelligence systems. Developing trust in patients represents an essential consideration because patient trust affects their healthcare decisions significantly.

The survey responses contained numerous ethical matters and the need for regulatory compliance. The group of postgraduate students and clinical practitioners agreed on the necessity of protecting patient information and maintaining proper ethical conduct [24].

The healthcare providers demonstrated misgivings because literature discussions address the need for artificial intelligence transparency, together with bias control and ethical monitoring.

Artificial Intelligence Potential in Oral and Maxillofacial Surgery: Opportunities for Transformation

The overall evidence indicates that artificial intelligence provides powerful opportunities to redefine Oral and maxillofacial surgery. The participants recognized multiple promising uses of artificial intelligence. These include: Artificial intelligence helps medical professionals achieve better results in image interpretation by checking radiographic and CT/MRI results to discover bone fractures, cysts, tumors, and infections [25]. Precision surgical guide and implant, and prosthesis development is enabled by integrating CAD/CAM systems, which implement Computer-Aided Design and Manufacturing technologies [26]. The employment of artificial intelligence-powered robotic systems is becoming more common in minimally invasive surgeries. RFID-tagged medical tools and gloves use smart technology to deliver interactive device feedback for ongoing surgical decisions and data recording.

Study Limitations

The research based its participant recruitment on a diverse number of individuals selected from the state of Kerala, India, but included the total participant count. The participants' responses through Google Forms demonstrate potential bias since they depend on both individual interpretation and the habit of offering socially acceptable responses [27]. The rigid design of the questionnaire restricts researchers from obtaining as many in-depth research findings.

Future Directions

These current results provide a solid basis for upcoming research ventures. Research following participants through time should measure how their views change concerning artificial intelligence, specifically before and after participating in artificial intelligence education for dental students. Educational

intervention studies about adding artificial intelligence modules to the dental curriculum and their effects on student success need to be implemented [22-23].

Practice-based artificial intelligence testing programs give medical professionals the opportunity to examine how these tools perform in actual patient procedures. Additional research should determine how dental professionals in orthodontics and periodontics, and prosthodontics view the implementation of artificial intelligence technology. This research shows that dental students and dental clinicians view artificial intelligence positively for oral and maxillofacial surgery practice, but their viewpoints remain affected by their handler experience and educational standing and clinical practice level. The extreme positive attitude toward artificial intelligence must overcome training gaps and infrastructure restrictions, along with moral problems, to succeed in practical adoption [24-27].

4.CONCLUSION

Artificial Intelligence now receives increased recognition for its ability to improve dental education and oral and maxillofacial surgery clinical practice, as this research confirms. Every participant agreed that artificial intelligence technology has beneficial effects on diagnostic accuracy and clinical support, and educational enhancement. The study shows that some differences exist in terms of artificial intelligence comprehension and preparedness for usage due to their varying practical hands-on experience. The study establishes a vital necessity to establish training programs to educate professionals about ethical artificial intelligence technology operations. The research provides baseline knowledge which researchers can build on to determine artificial intelligence's practical effects in dental practice.

AUTHOR CONTRIBUTIONS

S. Anil Kuzhivilayil: Conceptualization, Investigation, Writing original draft.
G. Skariah P: Methodology, Visualization, Supervision.
S. Dilna: Methodology, Visualization, Supervision.

5.DECLARATIONS

FUNDING

No external funding was received for this study.

ETHICAL APPROVAL

This study received ethical approval from the Ethics committee of PMS College Of Dental Science and Research Hospital under the protocol number PMS/IEC/2023/Additional/OCT/26.

INFORMED CONSENT

Written informed consent was obtained from all participants.

ACKNOWLEDGMENTS

The authors thank all participants for their valuable time and insights, and the hospital authorities for facilitating the interviews.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Murali S, Bagewadi A, Kumar L, Fernandes A, Panwar A, Keluskar V: Knowledge, attitude, and perception of dentists regarding the role of artificial intelligence and its applications in oral medicine and radiology: a cross sectional study. Journal of Oral Medicine and Oral Surgery. 2023, 29:22. 10.1051/mbcb/2023018

[2] Al-Dabbagh N, Alnowailaty Y, Abed H, Sharka R, Alhilou A, Almarghlani A: Patients' Perception of using Robotics and Artificial Intelligence in Dentistry: A Cross-sectional Study. The. Open Dentistry Journal. 2024, 23:18. 10.2174/0118742106339605240918065914

[3] Abouzeid HL, Chaturvedi S, Abdelaziz KM, Alzahrani FA, AlQarni AA, Alqahtani NM: Role of robotics and artificial intelligence in oral health and preventive dentistry-knowledge, perception and attitude of dentists. Oral health & preventive dentistry. 2021, 15:1693873. 10.3290/j.ohpd.b1693873

[4] Jeong H, Han SS, Kim KE, Park IS, Choi Y, Jeon KJ: Korean dental hygiene students' perceptions and attitudes toward artificial intelligence: an online survey. Journal of Dental Education. 2023, 87:804-12. 10.1002/jdd.13189

[5] Karan-Romero M, Salazar-Gamarra RE, Leon-Rios XA: Evaluation of attitudes and perceptions in students about the use of artificial intelligence in dentistry. Dentistry Journal. 2023, 5:125. 10.3390/dj11050125

[6] Bisdas S, Topriceanu CC, Zakrzewska Z, et al.: Artificial intelligence in medicine: a multinational multi- center survey on the medical and dental students' perception. Frontiers in Public Health. 2021, 24:795284. 10.3389/fpubh.2021.795284

[7] Yüzbaşıoğlu E.: Attitudes and perceptions of dental students towards artificial intelligence. J Dent Educ.2021, 85:60-68. 10.1002/jdd.12385

[8] Balel Y: Can ChatGPT be used in oral and maxillofacial surgery? . Journal of stomatology, oral and maxillofacial surgery. 2023, 1:101471. 10.1016/j.jormas.2023.101471

[9] Pauwels R, Del Rey YC: Attitude of Brazilian dentists and dental students regarding the future role of artificial intelligence in oral radiology: a multicenter survey. Dentomaxillofacial Radiology. 2021, 1:20200461.
10.1259/dmfr.20200461
[10] Müller A, Mertens SM, Göstemeyer G, Krois J, Schwendicke F: Barriers and enablers for artificial intelligence in dental diagnostics: a qualitative study. Journal of Clinical Medicine. 2021, 10:1612. 10.3390/jcm10081612
[11] Miragall MF, Knoedler S, Kauke-Navarro M, et al.: Face the future—artificial intelligence in oral and maxillofacial surgery. Journal of clinical medicine. 2023, 30:6843. 10.3390/jcm12216843
[12] Shan T, Tay FR, Gu L: Application of artificial intelligence in dentistry. Journal of dental research. 2021,100:232-44.
10.1177/0022034520969115
[13] Rasteau S, Ernenwein D, Savoldelli C, Bouletreau P: Artificial intelligence for oral and maxillo-facial surgery: A narrative review. Journal of stomatology, oral and maxillofacial surgery. 2022, 1:276-82.
10.1016/j.jormas.2022.01.010
[14] Syed W, Basil A. Al-Rawi M: Assessment of awareness, perceptions, and opinions towards artificial intelligence among healthcare students in Riyadh, Saudi Arabia. Medicina. 2023, 24:828.
10.3390/medicina59050828
[15] Oluwadiya KS, Adeoti AO, Agodirin SO, et al.: Exploring artificial intelligence in the Nigerian medical educational space: an online cross-sectional study of perceptions, risks and benefits among students and lecturers from ten universities. Nigerian Postgraduate Medical Journal. 20231, 30:285-92.
10.4103/npmj.npmj_18623_
[16] Jha N, Shankar PR, Al-Betar MA, Mukhia R, Hada K, Palaian S: Undergraduate medical students' and interns' knowledge and perception of artificial intelligence in medicine. Advances in Medical Education and Practice. 2022, 23:927.
10.2147/amep.s368519
[17] Shinners L, Grace S, Smith S, Stephens A, Aggar C: Exploring healthcare professionals' perceptions of artificial intelligence: Piloting the Shinners Artificial Intelligence Perception tool. Digital Health. 2022, 8:20552076221078110.
10.1177/20552076221078110
[18] Abu-Farha R, Fino L, Al-Ashwal FY, Zawiah M, Gharaibeh L, Harahsheh MA, Elhajji FD: Evaluation of community pharmacists' perceptions and willingness to integrate ChatGPT into their pharmacy practice: a study from Jordan. Journal of the American Pharmacists Association. 2023, 1:1761-7.10.1016/j.japh.2023.08.020
[19] Ahmed Z, Bhinder KK, Tariq A, et al.: Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Pakistan: A cross-sectional online survey. Annals of Medicine and Surgery. 20221, 76:103493.
10.1016/j.amsu.2022.103493
[20] Ogolodom MP, Ochong AD, Egop EB, et al.: Knowledge and perception of healthcare workers towards the adoption of artificial intelligence in healthcare service delivery in Nigeria. AG Salud. 2023, 31:16.10.62486/agsalud202316
[21] Antes AL, Burrous S, Sisk BA, Schuelke MJ, Keune JD, DuBois JM: Exploring perceptions of healthcare technologies enabled by artificial intelligence: an online, scenario-based survey. BMC medical informatics and decision making. 2021, 21:1-5. 10.1186/s12911-021-01586-8
[22] Chan CK, Hu W: Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. International Journal of Educational Technology in Higher Education. 2023, 17:43.
10.1186/s41239-023-00411-8
[23] Wu C, Xu H, Bai D, Chen X, Gao J, Jiang X: Public perceptions on the application of artificial intelligence in healthcare: a qualitative meta-synthesis. BMJ open. 20231, 13:066322.
10.1136/bmjopen-2022-066322
[24] Kaushik R, Rapaka R: A Patient-Centered Perspectives and Future Directions in AI-powered Teledentistry. Discoveries. 2024, 31:199.
10.15190/d.2024.18
[25] Pedro AR, Dias MB, Laranjo L, Cunha AS, Cordeiro JV: Artificial intelligence in medicine: A comprehensive survey of medical doctor's perspectives in Portugal. PLoS One. 2023, 7:0290613.
10.1371/journal.pone.0290613
[26] Swed S, Alibrahim H, Elkalagi NK, et al.: Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Syria: a cross-sectional online survey. Frontiers in artificial intelligence. 2022, 29:1011524.
10.3389/frai.2022.1011524
[27] Eschert T, Schwendicke F, Krois J, Bohner L, Vinayahalingam S, Hanisch M: A survey on the use of artificial intelligence by clinicians in dentistry and oral and maxillofacial surgery. Medicina. 2022, 5:1059.
10.3390/medicina58081059