

AWARENESS AND PERCEPTION OF ARTIFICIAL INTELLIGENCE IN DENTISTRY: A CROSS-SECTIONAL SURVEY

Dentistry

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ABSTRACT

Artificial intelligence (AI) has gained increasing attention in dentistry, with applications ranging from diagnostic imaging and caries detection to prosthodontic design, orthodontic monitoring, and patient management. Successful clinical integration, however, depends on the awareness and perception of dental professionals and students. This cross-sectional survey assessed the knowledge and perception of AI among dental practitioners and undergraduates. A structured questionnaire evaluated awareness of applications, perceived benefits, limitations, and ethical concerns. Results indicated moderate awareness, with greater familiarity in radiology, CAD/CAM, and orthodontic applications, while gaps existed in advanced prosthodontics and implantology. Respondents largely trusted AI for preliminary diagnosis but cited cost, data privacy, and training as key barriers. Findings highlight the need for curriculum integration, continuing education, and ethical frameworks to foster responsible adoption of AI in dentistry.

KEYWORDS

Artificial intelligence, Prosthodontics, Predictive treatment planning, CAD/CAM, Implant planning.

INTRODUCTION

Artificial intelligence (AI) refers to computer systems that can perform tasks usually requiring human intelligence, such as reasoning, learning, and making decisions¹. In dentistry, AI is being used more widely across different fields, including caries detection, orthodontic planning, prosthodontic design, radiograph interpretation, and oral pathology²³. In prosthodontics and implantology, AI helps in designing prostheses, simulating implant placement, and analyzing occlusion⁴. In orthodontics, it is applied for remote monitoring of treatment, while in endodontics and periodontics it assists in detecting lesions and tracking disease progression⁵⁶. Studies show that AI diagnostic tools often perform as well as, or even better than, dental specialists, especially in radiology⁷⁸.

However, the acceptance and use of AI depend largely on the awareness and attitudes of dental students and professionals. Issues such as accuracy, ethics, patient independence, and data security continue to raise concerns⁹¹⁰. Evaluating awareness is therefore important for creating guidelines, training programs, and integrating AI into dental education in a safe and effective way¹¹.

AIM

The aim of this study was to evaluate the awareness and perception of artificial intelligence among dental professionals and undergraduate students, with emphasis on its applications, perceived benefits, limitations, and ethical concerns in dentistry.³

MATERIALS AND METHODS

This descriptive cross-sectional questionnaire-based survey was conducted among dental professionals and undergraduate students. Participants were recruited from teaching institutions and private practice. A pre-validated, self-administered questionnaire was developed based on previous literature on AI applications in dentistry¹⁻².

The questionnaire comprised four sections: demographics, awareness of AI applications, perception of AI benefits and risks, and acceptance of AI integration. Responses were measured on a 5-point Likert scale. Data were anonymized and analyzed using descriptive statistics (frequency, percentage, mean $\pm$ SD), and inferential analysis (Chi-square, t-tests) was applied to assess differences between groups. Ethical approval was obtained, and informed consent was secured from all participants.¹³

RESULTS

A total of 111 responses were collected. Most participants were undergraduate dental students (50.5%), followed by interns (28.8%),

postgraduates (10.8%), and practicing dentists (9%). Most respondents reported less than one year of clinical experience (60.4%). Nearly half (48.2%) perceived AI-generated radiographic interpretations to be equally reliable as manual diagnosis, while 26.4% considered them more reliable. Importantly, 76.9% expressed willingness to trust AI for preliminary caries and periapical lesion diagnosis.

Lesion detection and diagnostic support were the most recognized radiographic applications (46.4%). In CAD/CAM, AI was associated with prosthesis design (38.7%), and in orthodontics, remote monitoring of treatment progress (48.2%) was emphasized. In prosthodontics, AI was linked to prediction of prosthesis failure via occlusal stress and material fatigue (30.6%) and margin detection with intraoral scanning (55.6%). High cost and learning curve were the major limitations (61.8%), while real-time chewing simulation was most cited as unavailable (50.9%). In endodontics, AI was commonly associated with periapical lesion detection (36.9%), while in periodontics it was recognized for tracking disease progression (49.5%). In implant-supported prosthodontics, AI was most often linked to implant position simulation (43.2%). For smile designing, enhanced patient communication through visual simulation was highlighted (51.4%). Overall, implant planning tools (42.3%) were perceived to hold the greatest potential, and respondents found AI more beneficial in lab-side workflows (37.8%) or both chair- and lab-side (36.9%) compared to chair-side alone (17.1%).

DISCUSSION

The present survey demonstrates that awareness and acceptance of artificial intelligence (AI) in dentistry are steadily increasing among dental students and young professionals, although notable gaps remain in advanced applications such as implantology and prosthodontics¹². A significant proportion of respondents perceived AI-generated radiographic diagnosis as reliable, and many expressed trust in its use for preliminary detection of caries and periapical lesions. These findings are consistent with previous studies that confirm AI's diagnostic accuracy in lesion detection, often matching or exceeding human specialists⁷⁸. Such trust reflects a growing readiness to integrate AI into radiographic workflows, provided that adequate validation and quality assurance measures are in place.

Awareness of AI applications in CAD/CAM and orthodontic monitoring also mirrors global trends in digital dentistry²³. The association of AI with prosthetic design and orthodontic remote treatment monitoring demonstrates that students are well exposed to its mainstream clinical uses. However, the limited recognition of AI's role in advanced prosthodontic procedures, such as implant planning

or occlusal simulation, highlights persistent knowledge gaps that must be addressed through targeted training and curriculum development⁴⁵.

Perceived barriers to AI integration, particularly the high cost of implementation and steep learning curves, were strongly reflected in this survey and align with international literature emphasizing financial and educational challenges⁶⁹. Beyond economics, concerns related to accuracy, professional autonomy, and patient data privacy remain important, echoing the issues raised in the FDI White Paper and other reviews²¹⁰. These ethical and professional considerations must be addressed through robust guidelines, transparent AI algorithms, and regulatory frameworks.¹²

Educational implications are significant. With undergraduate students forming the majority of respondents, it is clear that AI is currently discussed more in academic than clinical practice settings.¹³ Integrating AI literacy into undergraduate and postgraduate curricula, complemented by continuing dental education, will be essential to prepare practitioners for its safe and effective application¹¹.

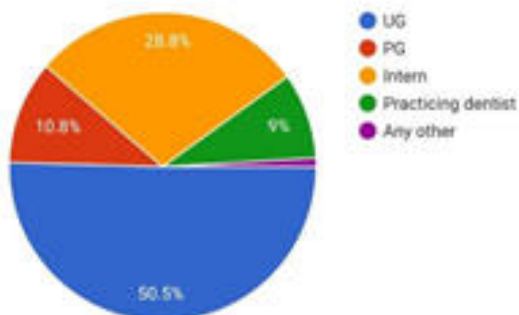
Overall, the findings align with published literature that underscores AI's potential to enhance diagnostic efficiency, treatment accuracy, and patient communication, while reinforcing the urgent need for ethical frameworks, structured training, and broader clinical exposure to overcome barriers to widespread adoption.

CONCLUSION

Dental students and professionals in this survey expressed generally positive perceptions of AI, especially in radiographic diagnostics, CAD/CAM, orthodontic monitoring, and periodontics. Trust in AI for preliminary diagnosis was high, though limitations related to cost, training, and data privacy were emphasized. Structured education, ethical guidelines, and ongoing training will be critical to fostering informed and responsible adoption of AI in dentistry.

1. What is your current professional status?

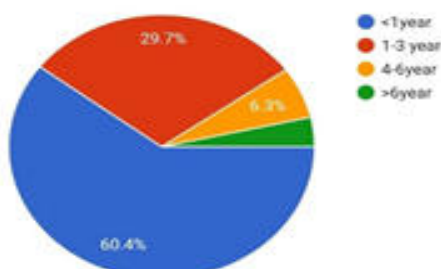
111 responses



Demographics A total of 111 responses were recorded. The majority of participants were undergraduate (UG) dental students (50.5%), followed by interns (28.8%), postgraduate (PG) students (10.8%), and practicing dentists (9%). Only 0.9% belonged to other categories.

2. How many years of clinical experience do you have?

111 responses

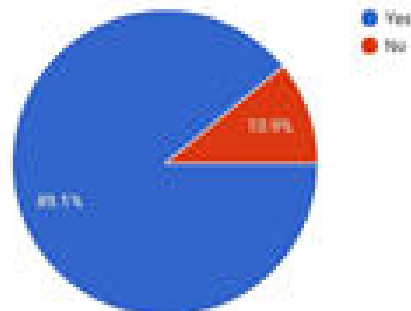


In terms of clinical experience, most respondents had less than 1 year

(60.4%), while 29.7% reported 1–3 years, 6.3% had 4–6 years, and 3.6% had more than 6 years of clinical experience.

3. Are you aware of the concept of AI?

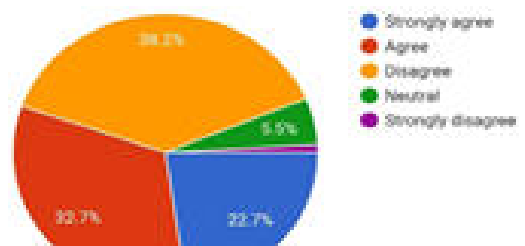
110 responses



The majority of participants (89.1%) reported being aware of the concept of AI, while only 10.9% indicated a lack of awareness. This suggests that most dental professionals and students are familiar with AI, reflecting a growing recognition of its role in healthcare.

4. Do you believe AI can improve the quality of the dental care?

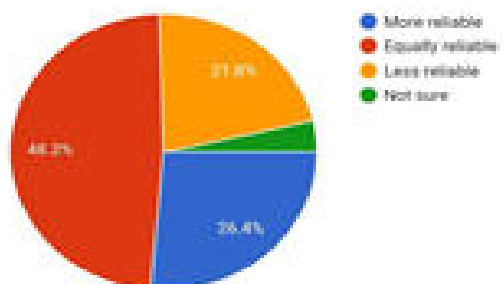
110 responses



When asked whether AI can improve the quality of dental care, responses were divided. While 22.7% strongly agreed and 32.7% agreed, indicating a positive outlook from more than half of the respondents, 38.2% disagreed and 5.5% remained neutral. Only a negligible proportion strongly disagreed.

5. How reliable do you find AI generated radiographic interpretation compared to manual diagnosis?

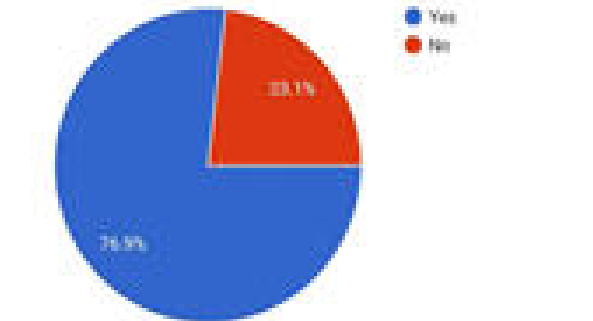
110 responses



Perception of AI in Radiographic Diagnosis When asked about the reliability of AI-generated radiographic interpretation compared to manual diagnosis, 48.2% of participants believed it was equally reliable, 26.4% considered it more reliable, 21.8% found it less reliable, and 3.6% were unsure.

6. Would you trust an AI system to make a preliminary diagnosis for dental caries or periapical lesion?

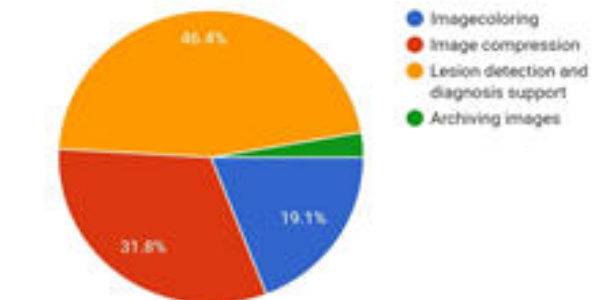
108 responses



A large majority (76.9%) of respondents expressed that they would trust an AI system to make a preliminary diagnosis for dental caries or periapical lesions, while 23.1% stated they would not.

7. What is the primary function of AI in dental radiographic analysis?

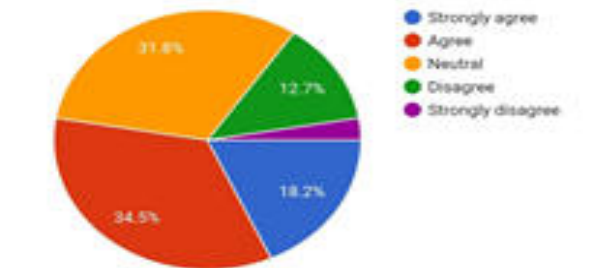
110 responses



Applications of AI in Dentistry Regarding the primary function of AI in dental radiographic analysis, nearly half (46.4%) identified lesion detection and diagnostic support, followed by image compression (31.8%), image coloring (19.1%), and archiving images (2.7%).

8. Do you believe AI can improve the fit and function of prosthetic appliances?

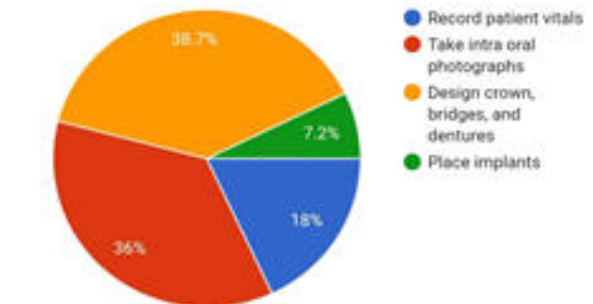
110 responses



Regarding the potential of AI to enhance the fit and function of prosthetic appliances, 18.2% strongly agreed and 34.5% agreed, together forming a majority of supportive responses. Meanwhile, 31.8% remained neutral, 12.7% disagreed, and a very small percentage strongly disagreed.

9.AI based CAD/ CAM system are used to

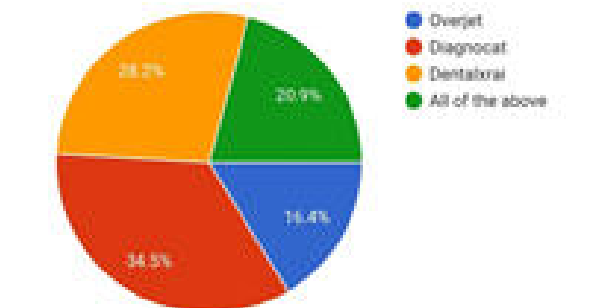
111 responses



For CAD/CAM systems, 38.7% of participants associated AI use with designing crowns, bridges, and dentures, 36% with intraoral photography, 18% with recording patient vitals, and 7.2% with implant placement.

10. Which of the following AI tools are commonly used for radiographic diagnosis in dentistry?

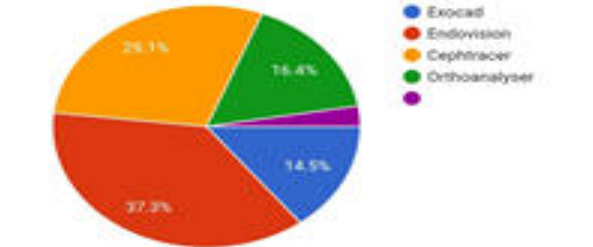
110 responses



When asked about AI tools used in radiographic diagnosis, 34.5% of respondents identified Diagnocat, 28.2% selected DentalXrai, 16.4% chose Overjet, and 20.9% were aware of all three tools.

11. Which AI software is commonly used in prosthetic design?

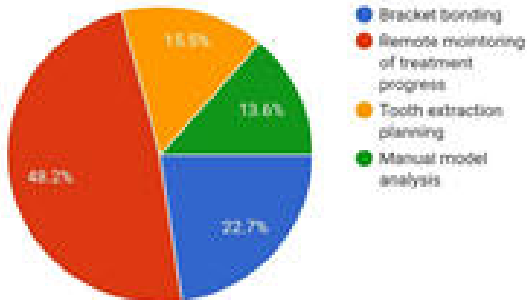
110 responses



In terms of commonly used AI software for prosthetic design , Endovision was identified by the majority (37.3%) as the most frequently utilized. This was followed by Cephtracer (29.1%) and Orthoanalyser (16.4%). Only 14.5% of respondents selected Exocad, even though it is a widely recognized tool in digital dentistry, suggesting variability in awareness and usage patterns among respondents.

12. In orthodontics, AI tools like dental monitoring are used for:

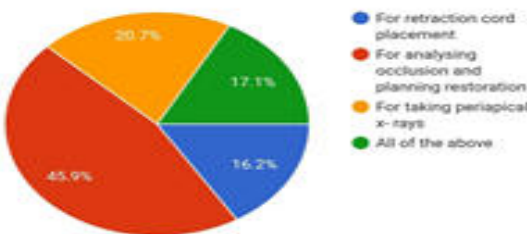
110 responses



In orthodontics, AI tools such as dental monitoring were most commonly linked to remote monitoring of treatment progress (48.2%), followed by bracket bonding (22.7%), tooth extraction planning (15.5%), and manual model analysis (13.6%).

13. In full mouth rehabilitation how can AI be utilised?

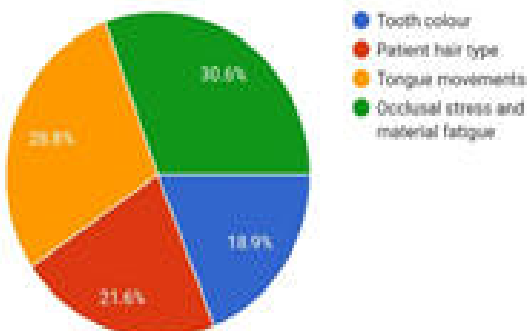
111 responses



When asked about AI utilisation in full-mouth rehabilitation , the majority of respondents (45.9%) indicated that AI is most useful for analysing occlusion and planning restorations. A smaller proportion (20.7%) considered its role significant in taking periapical radiographs, while 16.2% suggested its potential in retraction cord placement. Interestingly, 17.1% of respondents believed that AI could contribute to all of the above functions.

14. AI can predict prosthesis failure by analysing which of the following?

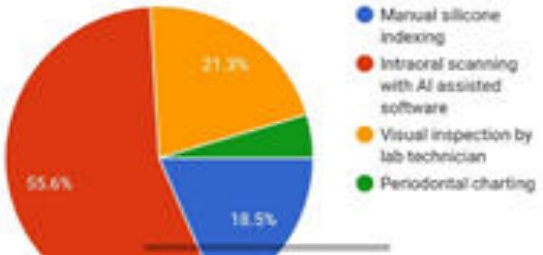
111 responses



When asked about factors AI can analyse to predict prosthesis failure, the majority identified occlusal stress and material fatigue (30.6%), followed by tongue movements (28.8%) and patient hair type (21.6%). Only 18.9% considered tooth colour as a factor.

15. Which AI driven technology aids in automatic margin detection in tooth preparation?

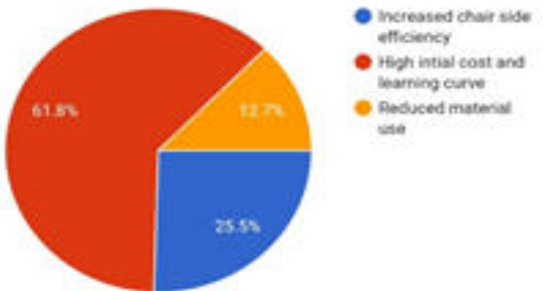
108 responses



More than half of the participants (55.6%) correctly recognized intraoral scanning with AI-assisted software as the primary tool for automatic margin detection in tooth preparation. Manual silicone indexing (18.5%), visual inspection (21.3%), and periodontal charting (4.6%) were less frequently chosen.

16. Which limitation is often associated with AI in prosthodontics?

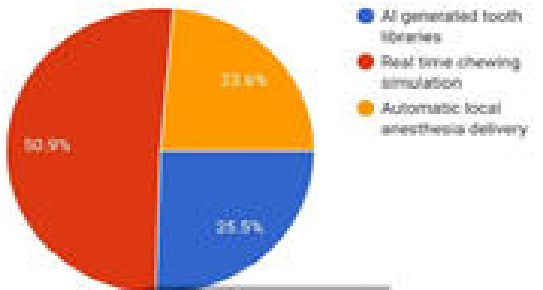
110 responses



The most cited limitation was the high initial cost and steep learning curve (61.8%), followed by increased chair-side efficiency (25.5%) and reduced material use (12.7%).

17. Which feature is not currently available in AI driven prosthodontic software?

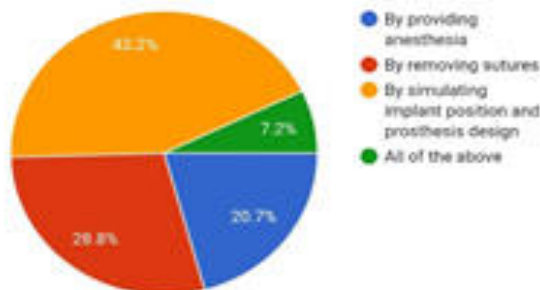
110 responses



Half of the respondents (50.9%) reported that real-time chewing simulation is not currently available in AI prosthodontic software. Others identified AI-generated tooth libraries (25.5%) and automatic local anesthesia delivery (23.6%).

18. How does AI support implant supported prosthodontics?

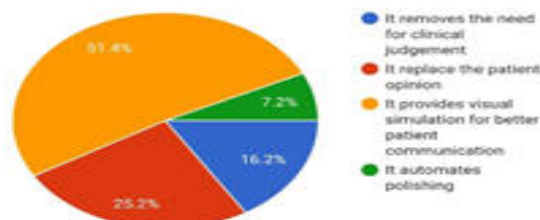
111 responses

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Most respondents (43.2%) recognized AI's role in simulating implant position and prosthesis design, while 28.8% selected removal of sutures, 20.7% anesthesia provision, and 7.2% all of the above.

19. What is one major advantage of AI in smile designing?

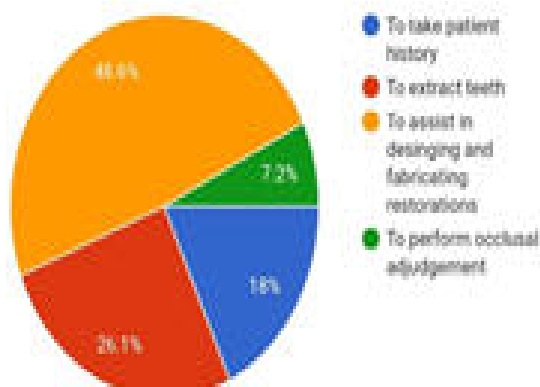
111 responses

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The majority (51.4%) acknowledged visual simulation for better patient communication as a major advantage. Fewer participants chose replacement of patient opinion (25.2%), removal of clinical judgment (16.2%), and automation of polishing (7.2%).

20. What is the primary role of AI in digital prosthodontics?

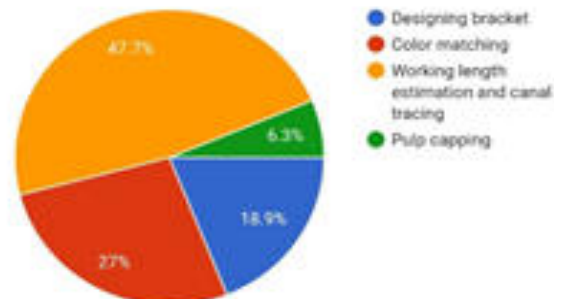
111 responses

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For the primary role of AI in digital prosthodontics, nearly half of the participants (48.6%) reported that its main application lies in assisting with designing and fabricating restorations. Meanwhile, 26.1% felt AI contributes to tooth extraction planning, and 18% highlighted its usefulness in taking patient history. Only 7.2% selected occlusal adjustment as the main role of AI.

21. Which AI function is most during root canal therapy?

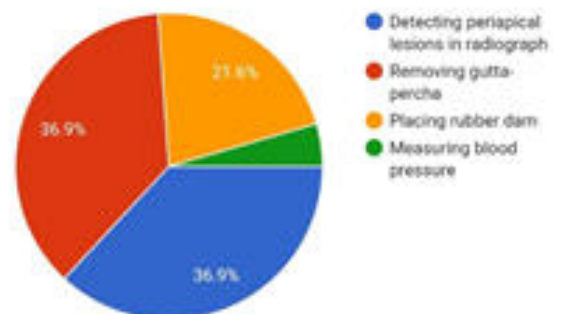
111 responses

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The highest proportion of respondents (47.7%) pointed to AI's role in working length estimation and canal tracing, which are critical for treatment accuracy. Additionally, 27% highlighted its use in color matching, and 18.9% associated it with bracket designing-although the latter seems more relevant to orthodontics than endodontics. A minimal 6.3% of respondents suggested its application in pulp capping, indicating limited perceived utility in this aspect.

22. AI in endodontics helps in

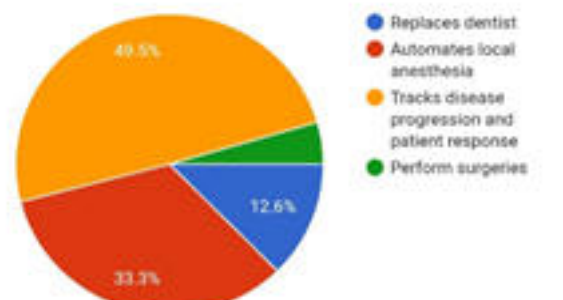
111 responses

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The most common response was detecting periapical lesions in radiographs (36.9%), closely followed by removing gutta-percha (36.9%). Placing rubber dams (21.6%) and measuring blood pressure (4.5%) were less frequently chosen.

23. Which of the following is a potential benefits of AI in periodontics?

111 responses

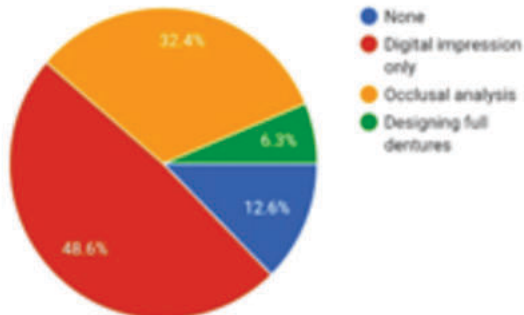
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Nearly half (49.5%) selected tracking disease progression and patient response as the key benefit. Automating local anesthesia (33.3%), replacing dentists (12.6%), and performing surgeries (4.5%) were chosen less often.

24. Which prosthodontics procedure would you trust AI perform autonomously

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111 responses

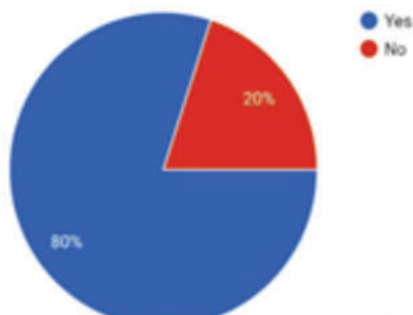


Almost half (48.6%) selected digital impressions only. About one-third (32.4%) preferred occlusal analysis, while 12.6% indicated none, reflecting a cautious stance toward fully autonomous AI integration. Designing full dentures was the least trusted option (6.3%).

25. Do you believe AI can reduce the chairside time in prosthodontic treatment?

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110 responses

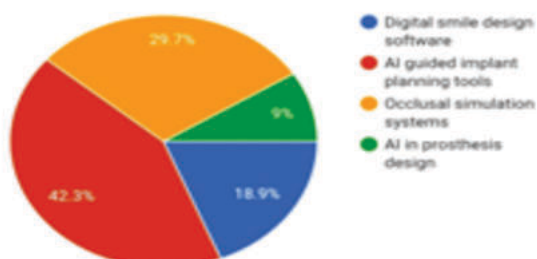


A large majority (80%) of respondents believed that AI can reduce chairside time in prosthodontic treatment, while 20% disagreed. This highlights the confidence in AI's efficiency-enhancing capabilities in clinical workflows.

26. Which AI tools do you think has the greatest potential impact in prosthodontics?

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111 responses

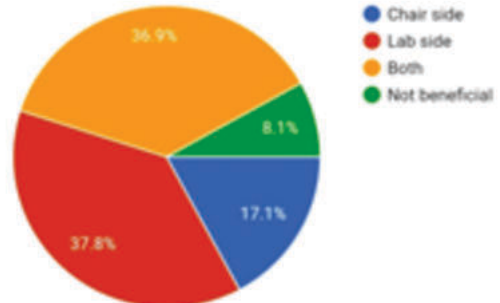


Most participants (42.3%) believed AI-guided implant planning tools had the greatest potential, followed by occlusal simulation systems (29.7%), digital smile design software (18.9%), and AI in prosthesis design (9%).

27. Is AI integration in prosthodontics more beneficial in lab side or chair side work flow?

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111 responses

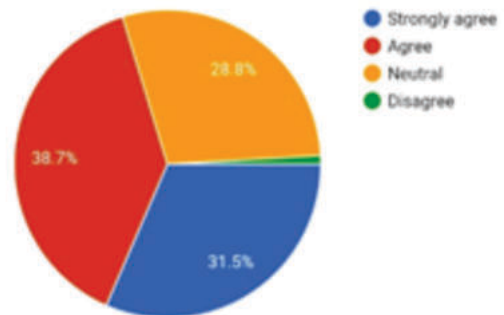


Respondents were divided: 37.8% found AI more beneficial in lab workflows, 36.9% reported both chair-side and lab-side, 17.1% preferred chair-side alone, and 8.1% felt it was not beneficial.

28. Do you believe AI will lead to a more customized approach in prosthodontics?

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111 responses

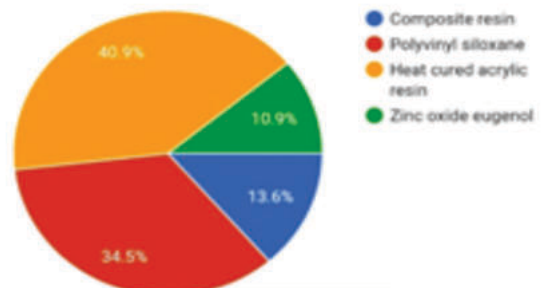


When asked whether AI would lead to a more customized approach in prosthodontics, 31.5% of respondents strongly agreed and 38.7% agreed, indicating that the majority (70.2%) perceived AI as beneficial for customization. Meanwhile, 28.8% remained neutral, and only a negligible proportion (0.9%) disagreed. This suggests an overall positive outlook on AI's potential to individualize prosthodontic care.

30. Which material is most commonly used for making CD bases?

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110 responses



Heat-cured acrylic resin was the most frequently chosen material

(40.9%). Polyvinyl siloxane was selected by 34.5% of participants, composite resin by 13.6%, and zinc oxide eugenol by 10.9%. The predominance of heat-cured acrylic resin aligns with its established role as the gold standard in prosthodontics due to favorable physical and esthetic properties.

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