Research Article

Closing the Gap: Assessing Dentists' Knowledge about AI in Dental Practice

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Abstract

Background and Goals: The introduction of artificial intelligence (AI) has resulted in a paradigm change in the medical and dentistry industries. Understanding the fundamental concept, functioning principles, and prospective uses of AI as a diagnostic tool in Dentistry is crucial for its broad implementation. As a result, this study intends to analyze the knowledge and perspective of dental students and practitioners about the potential uses of AI in the field of dentistry. Materials and methods: Using Google Forms, a self designed questionnaire with a total of 13 questions was made. It was then sent online to dental professionals and students in Punjab, and the data were examined. Results: A total of 13 questions were answered and evaluated. The majority of respondents ranked their understanding of AI as mediocre. The participants were overwhelmingly confident that AI will enhance and standardize diagnosis. Among the most significant worries were the accountability for machine failures, data security or privacy issues, and the transfer of healthcare to major technological corporations.

Keywords: Artificial Intelligence (AI); Algorithm; Radiographs; Photographs

Introduction

The numerous applications of artificial intelligence (AI) in dentistry have caught academics' interest recently. AI is an algorithm for making decisions and solving issues. Convolutional neural networks [1], often known as CNNs, generate data-based outputs by acting independently and learning the structural patterns of an input dataset. By emulating human neurons and building a network structured in layers to convert complex input data (like radiographs or photographs) [4] into output data (like diagnosis or planning), CNNs are used in machine learning. Deep learning's [4,5] deep CNN architecture, which learns and completes challenging tasks without human assistance, has greatly enhanced machine learning over the past 20 years, opening the door to clinical applications like computer-aided diagnosis. Predictive data analytics, computer-aided diagnosis [2] based on medical pictures, and assisted treatment planning are some of the useful uses of AI in dentistry. The assessment of treatment choices, the prognosis of patients with oral cavity cancer, and the radiographic diagnostic of caries are among the pertinent dental medicine literature. Deep learning techniques have outperformed doctors in accuracy and efficiency in dental radiology, improving diagnosis. They also allow for a reduction in task time and the amount of missed discoveries, and they guard against overtreatment [6]. However, there is still discussion in the scientific, public, political, and business spheres regarding sensitive data, privacy security, and ethical issues. Misperceptions [2] about AI could give rise to unfounded worries. Only a small number of studies have examined how dental professionals or students perceive artificial intelligence (AI); the majority of studies have examined the perspectives of dental practitioners.

The purpose of the study was to ascertain the attitudes and knowledge of dental professionals towards AI.

Material and Methods

Study design

This study employed a questionnaire design to evaluate the knowledge, perceptions, and attitudes of dental professionals (faculty and practitioners) and undergraduate and graduate dental students regarding artificial intelligence based on their educational background [3].

Study population

Undergraduate dental students (third and final years), interns, postgraduate students, faculty, and private practitioners.

Inclusion criteria

Participants in this study comprised undergraduate and graduate students [5], teaching members, and private practitioners who volunteered to participate.

Data collection instrument

Ten closed-ended questions about artificial intelligence (AI) and its possible uses in dentistry were included in the questionnaire, in addition to three open-ended questions that asked participants to provide information about their name [2,3], age and institution.

The layout of closed-ended questions was determined by previous research evaluating dental students' attitudes and perceptions of artificial intelligence (AI) and an Indian study evaluating dental students' knowledge, attitudes, and perceptions of AI in dentistry.

Sampling and data collection procedure

The Institutional Research and Ethics Committee provided ethical approval, and a straightforward random sample was employed (Ref no 1527). The study took place during April and May of 2024, for a duration of one month. The survey was disseminated via email and social media platforms in the form of a Google forms link format. After receiving their agreement, confirming their willingness to engage in the study, outlining its purpose [4], and guaranteeing their anonymity, participants were only permitted to complete the form once and at any point in time.

Results

The questionnaire was circulated to 100 individuals with 85 participants completing the questionnaire yielding a response rate of 85.03%. The majority of the participants were undergraduates and the private practitioners were the least.
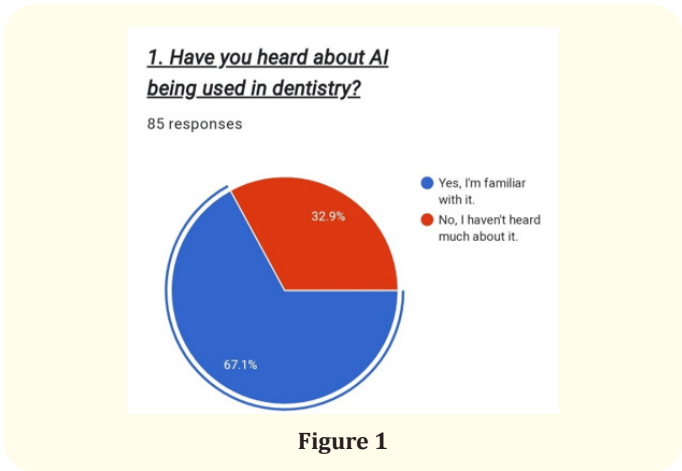

Figure 1

Among 85 subjects, 56 subjects (67.1%) were familiar with the concept of AI in dentistry and 29 subjects (32.9%) haven't heard much about the AI.
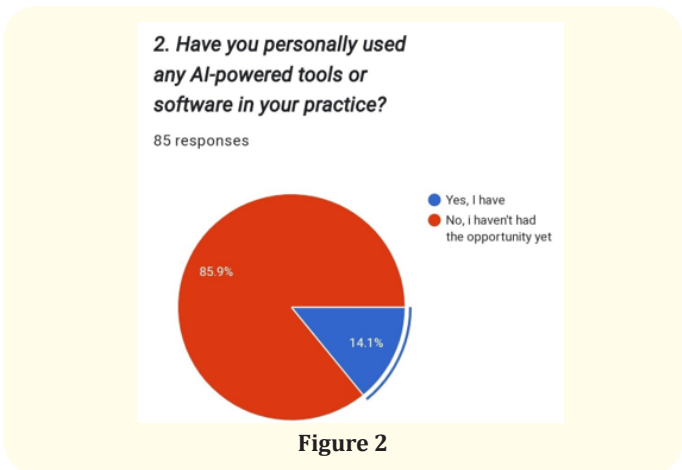

Figure 2

Among 85 subjects, only 12 subjects (14%) have used an AI powered tool Whereas among 85, 73 subjects (86%) haven't got the opportunity yet.
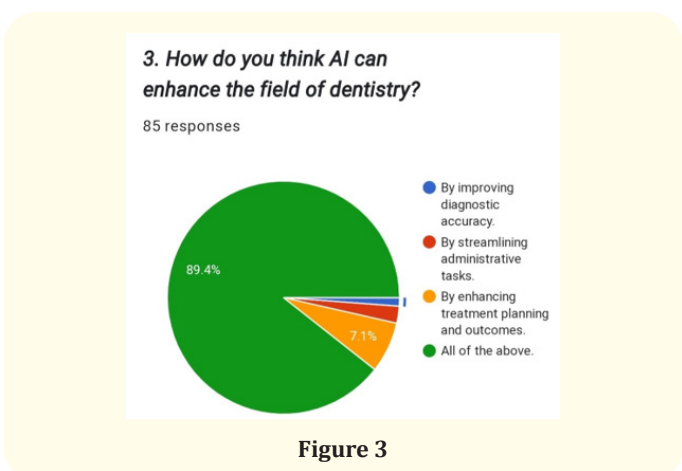

Figure 3

In response to the question, "How can artificial intelligence (AI) enhance the field of dentistry?", only one subject (1.2%) thought that AI could improve diagnostic accuracy[1], two subjects (2.4%) thought that AI could streamline administrative tasks, six subjects (7.1%) thought that AI could improve treatment planning and outcomes, and the remaining 76 subjects (89.4%) thought that all of these points were crucial to AI's ability to improve the field of dentistry.

Figure 4
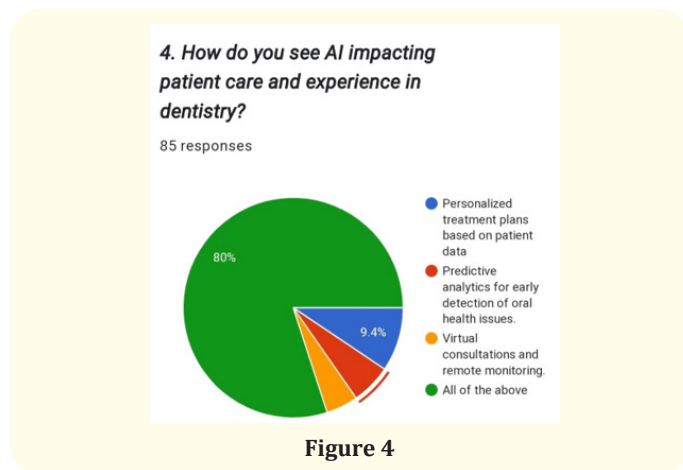
In question #4, the subjects were questioned about their thoughts on how AI is impacting patient care and experience in dentistry. 76 respondents believe AI can improve patient care through individualized treatment plans based on patient data, predictive analytics for early diagnosis of oral health problems[3], and virtual consultation and remote monitoring. Of the respondents, 8 (9.4%) believe individualized treatment plans based on patient data are beneficial, and 5 (5.9%) believe predictive analytics can help discover oral health risks early on. And only four subjects (4.7%) received grades for virtual consultation and remote monitoring.

In the fifth question, two subjects (2.4%) found virtual reality to be an interesting tool for patient education and anxiety reduction, ten subjects (11.8%) found AI Chabot's[2] to be an interesting tool for patient communication and appointment scheduling, twenty-seven subjects (31.8%) found AI-powered dental imaging software to be an interesting tool, and forty-six subjects (54.1%) found all of the aforementioned AI-powered tools to be interesting.
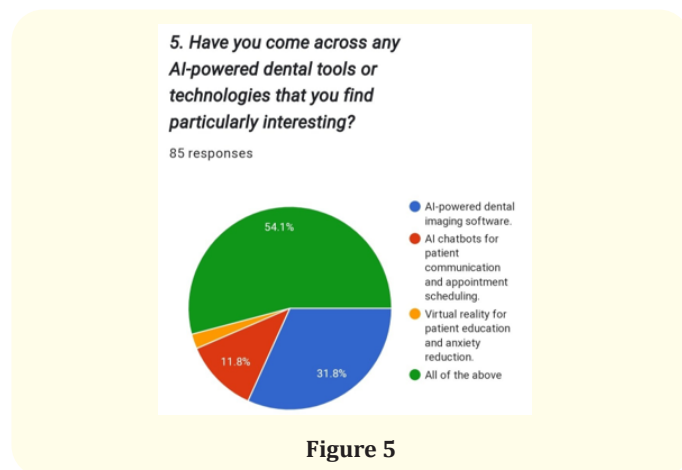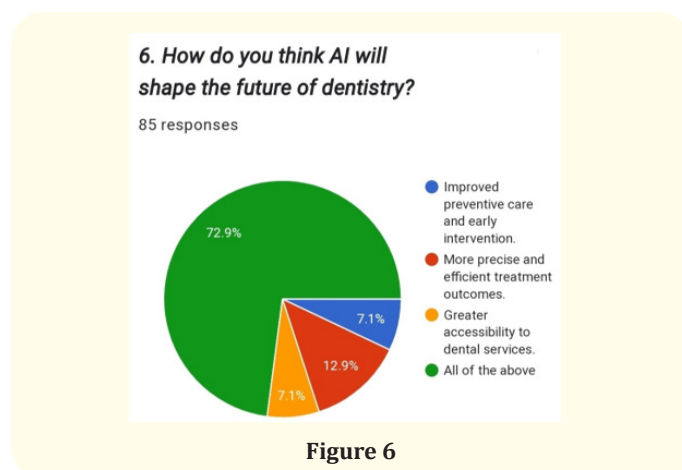

Figure 5

Figure 6

When asked how they thought artificial intelligence (AI) would shape the future of dentistry, the subjects responded as follows: 6 (7.1%) thought AI could help with preventive care and early intervention; the same number of subjects thought AI could help with greater accessibility to dental services; 11 (12.9%) thought AI could bring about more precise and efficient treatment; and the remaining 62 (72.9%) out of 85 subjects thought that all of these services offered by AI could influence dentistry in the future.

The seventh question addressed the participants about the difficulties or worries they had with implementing AI in dentistry. Seven participants (8.2%) believed it would work with the current workflows and system; nine participants (10.6%) believed dental professionals should receive training and education; eleven participants (12.9%) expressed concerns about data security and privacy; and the remaining fifty-eight participants (68.2%) believed all of the questions were pertinent.
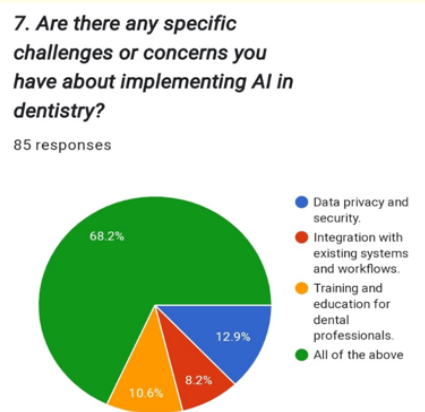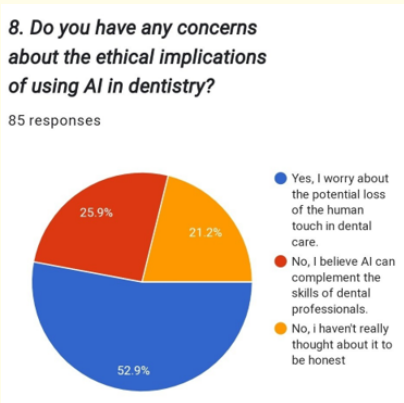
Figure 7

Figure 8

The eighth question addressed the participants about their concerns about the moral ramifications[1] of using artificial intelligence to dentistry. The answers are as follows. The possible loss of the human touch in dental treatment is a concern for 45 individuals (52.9%), whereas 22 subjects (25.9%) think AI can enhance dental practitioners' skills, and the remaining 18 subjects (21.2%) haven't given it much attention.
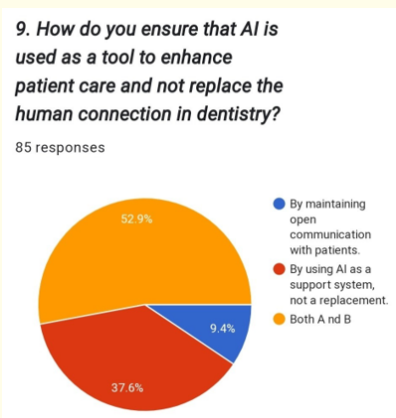

Figure 9

The following are the responses we received from respondents to our question regarding how to make sure artificial intelligence (AI) in dentistry is utilized to improve patient care rather than to replace human interaction:- Eight individuals (9.4%) believe that open contact with patients is the key to success, while 32 subjects (37.6%) believe that AI should be used as a support system rather than a replacement. The remaining 45 subjects (52.9%) agree with both of these statements.

Figure 10

The following are the responses to our last question, which asked the participants to describe how they see artificial intelligence playing a part in dentistry education and training:- Three respondents (3.5%) believe AI has the potential to completely transform how dental educators pursue their studies, Of the 85 individuals, 7 (8.2%) believe AI might help with complicated dental treatments, 8 (9.4%) believe it can improve dentistry students' experiences [5], and the remaining 67 (78.8%) believe that all of these aspects are significant when taken into consideration collectively.

Conclusion

The results of this study indicate that dental professionals and students are aware of artificial intelligence (AI) and its possible uses in dentistry. Our research revealed important shortcomings that need to be fixed, making it necessary to incorporate, improve, and expand AI instruction in dentistry schools in order to dispel false beliefs and inspire professionals to engage in this field. The present status of AI in dentistry is already changing the way oral health is treated. The future presents limitless possibilities for AI to improve diagnosis, treatment planning, and patient involvement. However, it is critical to address these discoveries with a thorough understanding of the ethical and practical ramifications. As AI evolves, the dentistry community should embrace its promise while maintaining the greatest levels of patient care and privacy. The future of dentistry is intelligent, and we have the potential to mold it positively. Overall, dentists had a positive attitude regarding the application of AI in dentistry.

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