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Assessing Student Attitudes and Perceptions Toward the Use of Artificial Intelligence in Dentistry

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Abstract

Background: Deep learning systems, one of the methods used by artificial intelligence for various clinical tasks, have been used in recent years. The aim of this study was to assess the attitudes and perceptions of dental students toward artificial intelligence and to provide information about their views on the use of artificial intelligence in dentistry.

Methods: The survey was sent to 72 participants from the universe of dental students and was conducted face-to-face.

Results: The majority of participants, 43 (61%), said they had a basic knowledge of artificial intelligence, while 54 students (75%) said they were aware that artificial intelligence applications were being used in dentistry. 29 (40%) of the participants thought that the use of artificial intelligence in dentistry and medicine would lead to bad practices. 65 (90%) of respondents thought that the use of AI in dentistry and medicine would increase their personal professional success.

Conclusion: The results reflect a general acceptance of AI in dentistry among respondents. The implementation of educational workshops on AI in dentistry should be supported, and the possibility of including AI education in undergraduate and postgraduate curricula should be considered.

Keywords: Student, artificial intelligence, dentistry, perceptions

INTRODUCTION

Applications that use high-tech technologies in healthcare include artificial intelligence (AI) applications.[1] Computer engineering applications such as machine learning and deep learning have enabled information systems to be used in health.[2] The need for decision-making in health has been integrated, in areas of expertise such as radiology and pathology, where data is highly concentrated. Deep learning systems, one of the methods used by AI for various clinical tasks, have been introduced in recent years.[3] Future systems are expected to make increasingly autonomous decisions.[4] Studies have shown that medical students are not worried or afraid of their places being filled by AI,[5] but that concerns about being "displaced" prevent some students from considering a specialty. There are both positive and negative perspectives on how AI will affect everyday human life. The pessimistic view of AI is that in many sectors, AIs will replace humans. There are also optimistic views that people with AI support will have more opportunities to benefit from future advances.[6,7]

While most AI research focuses on developing and evaluating AI algorithms and the prediction models that go along with them, very few studies have looked at the perspectives of dental students. It is clear that there is a knowledge gap in the sector and that it has to be filled since there is no doubt that the use of AI in healthcare and education will only increase.[8-10]

Therefore, dentists shall be prepared to effectively use AI as a resource for these changes. To address this issue, a survey was conducted among dental students to explore their opinions about AI in dentistry. The purpose of this study is to

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assess dental students' attitudes and perceptions toward AI and provide information on students' views regarding the use of AI in dentistry.

MATERIAL AND METHODS

The research domain was formed through a face-to-face gathering of dentistry students in 2023. However, the sample email was also provided with a response option and sent to 72 participants. The sample type follows a non-probability easy-sampling method. The unit of analysis focuses on every university student that satisfies the criteria for research inclusion and exclusion.

Participants in this research project were limited to students enrolled in the first to fifth year of a private or public university who provided informed consent. Only individuals who were 18 years or older and fluent in Turkish were considered for evaluation, regardless of gender. Excluded from the study were participants who failed to complete the survey or were non-native dental students visiting Türkiye for a temporary period as part of an international exchange program.

The survey consists of 22 questions and is structured into 3 sections: the first part of the survey has 3 questions about socio-demographic characteristics, such as age, gender, year of education, and the university they are studying. In the second part, the participants were asked 6 questions where an approach to AI was evaluated. In the third section, participants were asked to select from one of the values: "I agree fully, I agree partially," "I disagree partially," and "I do not agree entirely," and to determine their participation levels.

This research project has been reviewed by the Ethics Committee of İstanbul University-Cerrahpaşa (Approval No: 733256, Date: July 13, 2023). Similarly, ethical principles were taken into account in this study, with a view to respecting the willingness and privacy of participants.

RESULTS

A total of 72 students who met the entry criteria were evaluated. Table 1 presents data on the overall and socio-demographic characteristics of the participants. Of the participants in the study, 34 were males (53%) and 38 were females (47%). Table 2 shows an assessment of the attitudes and perceptions regarding the use of AI in dentistry. The majority of participants, 43 (61%), said they had basic knowledge about AI, while 54 students (75%) reported that they were aware that AI applications were being used in dentistry. Sixty-seven of the respondents (92%) believe that AI will lead to major advances in dentistry and medicine in the future. However, 12 respondents (17%) believe that this new technology will be replaced by doctors in future medical and dental practices. Twenty-nine respondents (40%) believe that AI will lead to bad practices in dental and medical use. Sixty-five (90%) of the participants believed that their use of AI in the field of dentistry and medicine would enhance their personal professional success.

Table 1. Demographic Data

Gender		
	Male	53% (38)
	Female	47% (34)
Age		
	19	19% (14)
	20	46% (33)
	21	25% (18)
	22	7% (5)
	23	3% (2)
Undergraduate class		
	Second class	60 (83%)
	Third class	12 (17%)

Thirty-one percent of respondents partially endorsed the use of AI as a tool for diagnosing diseases, while 60% fully endorse it as a treatment planning tool in dentistry. Fifty-three percent of respondents fully agree that AI can be used as a prognostic tool to predict the course of a disease and determine whether there is a chance of recovery. (Table 3) When clinics was examined in separate headings in terms of the use of AI technology in treatment planning, and clinical decision-making, the percentage of totally agreed participants was 44% in oral surgery, 44% in oral radiology, 35% in endodontics, 42% in orthodontics, 29% in pedodontics, 40% in periodontics, 54% in restorative dentistry, and 49%

Table 2. Approach to Artificial Intelligence

Do you have basic knowledge about the working principle of artificial intelligence?	
Yes	44 (61%)
No	28 (39%)
Do you know that artificial intelligence is used in dentistry?	
Yes	54 (75%)
No	18 (25%)
Do you think artificial intelligence will lead to major advances in dentistry and medicine?	
Yes	66 (92%)
No	6 (8%)
Do you think artificial intelligence will replace physicians in dentistry and medical practices?	
Yes	12 (17%)
No	60 (83%)
Do you think that the use of artificial intelligence in dentistry and medicine will lead to bad practices?	
Yes	29 (40%)
No	43 (60%)
Do you think that the use of artificial intelligence in dentistry and medicine will increase your personal professional success?	
Yes	65 (90%)
No	7 (10%)

Table 3. Evaluation of Knowledge and Approach to the Use of Artificial Intelligence in Dentistry

1.	Artificial intelligence can be used as a definitive diagnostic tool in diagnosing diseases.
	• Totally Agree: 18 (25%), Partially Agree: 22 (31%), Undecided: 9 (13%), Partially Disagree: 17 (24%), Totally Disagree: 5 (7%)
2.	Artificial intelligence can be used as a treatment planning tool in dentistry.
	• Totally Agree: 43 (60%), Partially Agree: 21 (29%), Undecided: 6 (9%), Partially Disagree: 1 (1%), Totally Disagree: 1 (1%)
3.	Artificial intelligence can be used as a prognostic tool to predict the course of a disease and determine whether there is a chance of recovery.
	• Totally Agree: 38 (53%), Partially Agree: 27 (37%), Undecided: 6 (9%), Partially Disagree: 1 (1%), Totally Disagree: 0 (0%)
4.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in oral and maxillofacial surgery.
	• Totally Agree: 32 (44%), Partially Agree: 25 (35%), Undecided: 12 (17%), Partially Disagree: 3 (4%), Totally Disagree: 0 (0%)
5.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in oral and maxillofacial radiology.
	• Totally Agree: 32 (44%), Partially Agree: 17 (24%), Undecided: 14 (19%), Partially Disagree: 5 (7%), Totally Disagree: 4 (6%)
6.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in endodontics.
	• Totally Agree: 25 (35%), Partially Agree: 19 (26%), Undecided: 20 (27%), Partially Disagree: 4 (6%), Totally Disagree: 4 (6%)
7.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in orthodontics.
	• Totally Agree: 30 (42%), Partially Agree: 24 (33%), Undecided: 13 (18%), Partially Disagree: 5 (7%), Totally Disagree: 0 (0%)
8.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in pedodontics.
	• Totally Agree: 21 (29%), Partially Agree: 20 (28%), Undecided: 18 (25%), Partially Disagree: 6 (8%), Totally Disagree: 7 (10%)
9.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in periodontics.
	• Totally Agree: 29 (40%), Partially Agree: 22 (31%), Undecided: 11 (15%), Partially Disagree: 8 (11%), Totally Disagree: 2 (3%)
10.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in restorative treatment.
	• Totally Agree: 39 (54%), Partially Agree: 20 (28%), Undecided: 11 (15%), Partially Disagree: 2 (3%), Totally Disagree: 0 (0%)
11.	Artificial intelligence technology can be used in diagnosis, treatment planning, and clinical decision-making in prosthodontics.
	• Totally Agree: 35 (49%), Partially Agree: 17 (24%), Undecided: 12 (16%), Partially Disagree: 3 (4%), Totally Disagree: 5 (7%)
12.	Artificial intelligence applications should be a part of undergraduate dental education.
	• Totally Agree: 19 (26%), Partially Agree: 16 (22%), Undecided: 9 (12%), Partially Disagree: 14 (20%), Totally Disagree: 14 (20%)
13.	Artificial intelligence applications should be a part of postgraduate dentistry education.
	• Totally Agree: 21 (29%), Partially Agree: 11 (15%), Undecided: 14 (20%), Partially Disagree: 11 (15%), Totally Disagree: 15 (21%)

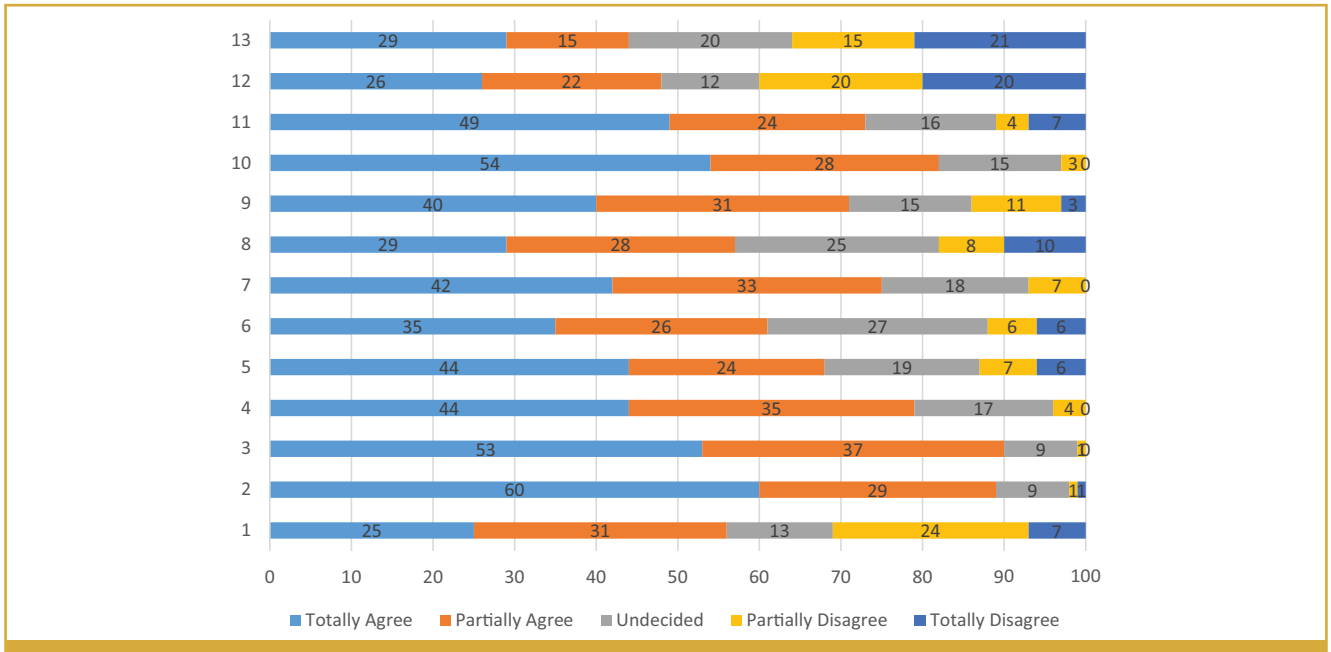

Figure 1. Evaluation of knowledge and approach to the use of artificial intelligence in dentistry.

in prosthodontic dentistry. The percentage of totally disagreed in the same topic was 0% in oral surgery, 6% in oral radiology, 6% in endodontics, 0% in othodontics, 10% in periodontology, 3% in restorative dentistry, 0% in prosthodontic dentistry 7%.

Artificial intelligence applications should be part of undergraduate dental education, with 26% of respondents totally agreed, 22% partially agreed, 12% undecided, 20% partially disagreed, and 20% totally disagreed. Artificial intelligence applications should be part of post-graduate dental education, with 29% of respondents totally agreed, 15% partially agreed, 20% being undecided, 15% partially disagreed, and 21% totally disagreed (Figure 1).

DISCUSSION

Artificial intelligence has many applications in the medical field as a potential technological advancement, particularly in dentistry.[11,12] In the current survey, 92% of participants said AI will eventually result in significant advancements in dentistry and medicine. This finding is consistent with a research by author Karan-Romero,[13] who found that most participants believed AI will have a significant impact on dental medicine in the near future.[13,14]

This may be the result of AI finding applications in new fields on a daily basis. Big data analysis is made possible by the development of AI, which enhances decision-making and produces dependable information.[15] According to our survey, 83% of participants do not think AI will ever take the role of dentists. Of the participants, 52.6% in a research on dentistry students disagreed with the same statement, which is comparable to the current outcome. Similarly, a survey revealed that 37.78% of dentistry students opposed having this new technology replace their chairs.[13]

Because AI technologies may simplify procedures and produce results faster, they have changed the accuracy of dental diagnosis and treatment planning. This has allowed dentists to become more productive and save resources in their dental offices.[16,17] Of the participants, 82% said that AI may be applied in the field of restorative dentistry therapy. Similar findings were found in another survey, when 84.2% of participants agreed with the same assertion. The reason for this might be the superior efficacy of neural network algorithms in detecting dental decay by radiography, especially in cases when the sensitivity exceeds 82% and the teeth are smaller. Artificial intelligence is utilized by pediatric dentists to make clinical decisions, create preventative measures, and create treatment plans that are suitable for their patients.[18,19] Of the respondents in our survey, 57% are in favor of using AI in dentistry in the future, 25% are unsure, and 18% are against. We may assume that dentists are more hopeful about the possibility that their opinions may change in the future because of the large percentage of ambiguity among them.

It is an undeniable fact that machine learning has begun to replace human labor in certain activities.[16,19] It has been stated that AI could automate 35% of jobs in the UK in the next 10-20 years.[20] But in the health sector, it is known that this is more difficult because of the ethical consequences surrounding the use of AI in this sector. Therefore, it is unlikely that AI systems will replace human doctors on a large scale, rather than combining efforts in the care of patients.[20,21]

Respondents agreeing with 48% of the answers to the question that AI should be part of undergraduate education, with 40% saying they did not, while 12% said they were uncertain. The result, however, may have been that students do not frequently use AI applications because AI applications are not currently part of professional practice.

The limitation of the study is that the sample size is small. It may cause difficulties in the overall implementation of the results. A wider participatory survey may be requested in the future. The results reflect that AI has seen widespread acceptance among participants in dentistry. Digital dentistry is a course that is often offered as an optional in the dental curriculum. Therefore, not all departments offer such courses. This fact may support the implementation of informative workshops on AI in dentistry and evaluate the possibility of integrating AI training into university programs and curricula.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul University-Cerrahpaşa (Approval no: 733256, Date: July 13, 2023).

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