

EVALUATION OF STUDENTS ATTITUDES AND PERCEPTIONS ABOUT ARTIFICIAL INTELLIGENCE IN DENTISTRY

Dentistry

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ABSTRACT

Background & objectives: The adoption of artificial intelligence in healthcare marks significant change, yet there exists a disparity in how dental students perceive and approach these emerging technologies. The present study was conducted with the objective to evaluate attitudes and perceptions of students by sex and academic year regarding the use of artificial intelligence (AI) in dentistry. **Methods:** BDS students including interns were asked to fill a questionnaire having 17 questions, structured into 2 sections: the first part of the questionnaire was about sociodemographic characteristics. In the second part, the respondents were presented with 15 statements and asked to define their level of agreement by choosing one of the following values: disagree, do not know, and agree. The questionnaires were evaluated to assess students' attitudes and perceptions regarding the use of artificial intelligence in dentistry based on their sex and year of study using Chi-square test. The level of statistical significance was determined at $p < 0.05$. **Results:** Out of the 224 respondents, 21% were males and 79% were females. Maximum participants were BDS second year students (28%). 84.1% participants agreed that AI can be used as a treatment planning tool in the diagnosis and planning of dental treatment. Majority participants agreed that AI applications should be part of undergraduate and postgraduate dental education. However, majority participants disagreed that AI may replace dentist and doctors in the future. **Conclusion:** The study reveals a generally positive perception among dental students towards the integration of AI in dentistry. However, there is a consensus that while AI can significantly assist in routine and analytical tasks, it cannot replace the judgment and interpersonal skills of dentists.

KEYWORDS

artificial intelligence; machine learning; deep learning; dentistry.

INTRODUCTION

Despite the widespread integration of digital technologies and groundbreaking innovation, their potential to enhance public health remains largely unused, presenting vast opportunities for digital health solutions. One such technological advancement is artificial intelligence, which has significantly transformed the industry by utilizing databases and swiftly analysing gathered data, thereby streamlining processes, and boosting productivity for healthcare professionals.

Since dentistry is entering a new stage of its digitization such smart algorithms can be integrated within the health-care system to analyse health data, research findings, and treatment techniques to offer diagnostic and therapeutic recommendations for individual patients. Currently, the use of AI is rapidly advancing beyond text-based, image-based dental practice.⁽¹⁾

AI helps dentists from the most basic tasks, such as the registration of a patient's medical history, to more complex activities, such as the analysis of the information obtained to reach an accurate diagnosis, possible treatment options and the prognosis of each one. Likewise, it is used in auxiliary tests such as x-rays, identifying findings and interpreting them with a higher level of accuracy to provide accurate diagnoses in a short time.⁽²⁾ Researchers in 2019 developed a machine learning method to accurately quantify immune cells in the vicinity of oral cancer cells. This gives better insights into the spread of and resistance to cancer, thereby helping in determining chances of survival. Others are using neural networks to better detect dental decay and periodontal disease from radiographs. Such approaches can become standard practice in the near future. AI applications in health care are boundless.⁽³⁾ Yet to date, artificial intelligence is not capable of replacing the dental surgeon, but it is vitally important to recognize technological advances to improve dental practice in the future.⁽⁴⁾

As AI technology progresses, its potential to assist in diagnostic procedures, treatment planning, and educational field expands, necessitating an understanding of the future professionals' reception towards these changes.⁽⁵⁾ Nevertheless, there remains widespread reluctance among people to trust the outcomes provided by AI. Even in the field of dentistry, the use of artificial intelligence may be influenced by the perceptions and attitudes that dentists have with regards to this new technology. Therefore, this study was conducted to know the attitude and perceptions towards the use of artificial intelligence in

dentistry among undergraduate dental students.

Methodology

This observational questionnaire-based, cross-sectional study was conducted in the Department of Pediatric Dentistry, H.P. Government Dental College and Hospital, Shimla. Prior ethical approval from the Institutional Ethical Committee was obtained. A 17-item self-administered questionnaire was developed and distributed online. The validity of the questionnaire was confirmed with similar articles with some modifications.^(6,7) The questionnaire was distributed among 224 BDS students including interns of the college and consent from the participants was obtained along with the web-based questionnaire. The structured questionnaire comprised of two sections: the first part was about sociodemographic characteristics. In the second part, the respondents were presented with 15 statements and asked to define their level of agreement by choosing one of the following values: disagree, do not know, and agree.

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics for Windows, Version 20 (IBM Corp., Armonk, N.Y., USA). Data was investigated for normality using the Kolmogorov-Smirnov test and assessed a non-normal distribution. The attitudes and perceptions regarding the use of artificial intelligence were analysed between gender and year of study using Chi-square test. The level of statistical significance was determined at $p < 0.05$.

RESULTS

The survey revealed a gender distribution of 21% male and 79% female participants (figure 1) among the 224 dental students. In terms of academic year, the participants were almost evenly spread across the early academic years with 29% in the first year and 28% in the second year. However, there were slightly fewer participants in the later stages of their studies as shown in figure 2.

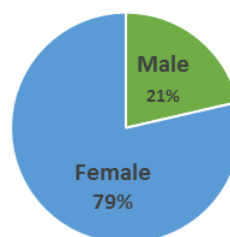
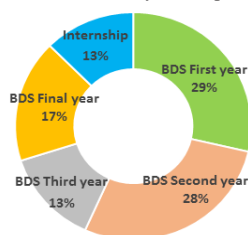


Figure 1: Gender Distribution Of Study Participants**Figure 2: Distribution Of Respondents Based On Year Of Study****Table 1: Attitude And Perceptions Regarding Ai In Dentistry Based On Gender**

Attitude and Perception regarding AI in dentistry (n = 224)		Gender [n (%)]		² value (p-value)
		Male	Female	
AI will lead to great advances in dentistry and medicine	Disagree	3 (6.2)	17 (9.7)	4.290 (0.117)
	I don't know	12 (25)	23 (13.1)	
	Agree	33 (68.8)	136 (77.3)	
AI may replace dentist and doctors in the future	Disagree	27 (56.2)	104 (59.1)	0.617 (0.735)
	I don't know	9 (18.8)	37 (21)	
	Agree	12 (25)	35 (19.9)	
AI can be used as a definitive diagnostic tool in disease diagnosis	Disagree	6 (12.5)	38 (21.6)	3.423 (0.181)
	I don't know	10 (20.8)	22 (12.5)	
	Agree	32 (66.7)	116 (65.9)	
AI can be used as a prognostic tool to predict the course of a disease and determine if there is a chance of recovery	Disagree	8 (16.7)	15 (8.5)	5.399 (0.067)
	I don't know	12 (25)	29 (16.5)	
	Agree	28 (58.3)	132 (75)	
AI can be used in the three-dimensional positioning and planning of implants	Disagree	0	8 (4.5)	2.275 (0.321)
	I don't know	6 (12.5)	20 (11.4)	
	Agree	42 (87.5)	148 (84.1)	
AI can be used as a treatment planning tool in the diagnosis and planning of dental treatment	Disagree	6 (12.5)	8 (4.5)	6.506 (0.039)*
	I don't know	9 (18.8)	20 (11.4)	
	Agree	33 (68.8)	148 (84.1)	
AI can be used as a quality control tool to assess the success of treatments	Disagree	7 (14.6)	18 (10.2)	1.632 (0.442)
	I don't know	10 (20.8)	28 (15.9)	
	Agree	31 (64.6)	130 (73.9)	
AI applications should be part of undergraduate dental education	Disagree	7 (14.6)	28 (15.9)	1.512 (0.470)
	I don't know	9 (18.8)	21 (11.9)	
	Agree	32 (66.7)	127 (72.2)	
AI applications should be part of postgraduate dental education	Disagree	4 (8.3)	11 (6.2)	3.400 (0.183)
	I don't know	10 (20.8)	20 (11.4)	
	Agree	34 (70.8)	145 (82.4)	
The use of AI in dentistry and medicine is exciting	Disagree	5 (10.4)	13 (7.4)	0.788 (0.675)
	I don't know	9 (18.8)	28 (15.9)	
	Agree	34 (70.8)	135 (76.7)	
AI can be used for radiographic diagnosis of dental caries	Disagree	1 (2.1)	5 (2.8)	1.043 (0.594)
	I don't know	9 (18.8)	23 (13.1)	
	Agree	38 (79.2)	148 (84.1)	
AI can be used for the diagnosis of soft tissue injuries in the oral cavity	Disagree	4 (8.3)	16 (9.1)	0.855 (0.652)
	I don't know	14 (29.2)	40 (22.7)	
	Agree	30 (62.5)	120 (68.2)	
AI can be used for radiographic diagnosis of jaw pathologies	Disagree	1 (2.1)	8 (4.5)	2.830 (0.243)
	I don't know	13 (27.1)	30 (17)	
	Agree	34 (70.8)	138 (78.4)	
AI can be used for the radiographic diagnosis of periodontal diseases	Disagree	1 (2.1)	10 (5.7)	2.010 (0.366)
	I don't know	14 (29.2)	38 (21.6)	
	Agree	33 (68.8)	128 (72.7)	
AI can be used in forensic odontology	Disagree	2 (4.2)	9 (5.1)	0.086 (0.958)
	I don't know	10 (20.8)	35 (19.9)	
	Agree	36 (75)	132 (75)	

***- statistically significant

Table 2: Attitude And Perceptions Regarding Ai In Dentistry Based On Year Of Study

Attitude and Perception regarding AI in dentistry (n = 224)		I BDS [n (%)]	II BDS [n (%)]	III BDS [n (%)]	IV BDS [n (%)]	Intern [n (%)]	² value (p-value)
AI will lead to great advances in dentistry and medicine	Disagree	7 (10.9)	6 (9.5)	3 (10)	2 (5.1)	2 (7.1)	8.378 (0.397)
	I don't know	11 (17.2)	7 (11.1)	4 (13.3)	11 (28.2)	2 (7.1)	
	Agree	46 (71.9)	50 (79.4)	23 (76.7)	26 (66.7)	24 (85.7)	
AI may replace dentist and doctors in the future	Disagree	36 (56.2)	36 (57.1)	20 (66.7)	23 (59)	16 (57.1)	9.592 (0.295)
	I don't know	12 (18.8)	19 (30.2)	5 (16.7)	7 (17.9)	3 (10.7)	
	Agree	16 (25)	8 (12.7)	5 (16.7)	9 (23.1)	9 (32.1)	
AI can be used as a definitive diagnostic tool in disease diagnosis	Disagree	9 (14.1)	8 (12.7)	6 (20)	10 (25.6)	11 (39.3)	12.071 (0.148)
	I don't know	11 (17.2)	11 (17.5)	3 (10)	4 (10.3)	3 (10.7)	
	Agree	44 (68.8)	44 (69.8)	21 (70)	25 (64.1)	14 (50)	
AI can be used as a prognostic tool to predict the course of a disease and determine if there is a chance of recovery	Disagree	7 (10.9)	9 (14.3)	0	2 (5.1)	5 (17.9)	12.057 (0.149)
	I don't know	12 (18.8)	8 (12.7)	10 (33.3)	7 (17.9)	4 (14.3)	
	Agree	45 (70.3)	46 (73)	20 (66.7)	30 (76.9)	19 (67.9)	
AI can be used in the three-dimensional positioning and planning of implants	Disagree	3 (4.7)	2 (3.2)	1 (3.3)	1 (2.6)	1 (3.6)	3.111 (0.927)
	I don't know	8 (12.5)	8 (12.7)	5 (16.7)	4 (10.3)	1 (3.6)	
	Agree	53 (82.8)	53 (84.1)	24 (80)	34 (87.2)	26 (92.9)	
AI can be used as a treatment planning tool in the diagnosis and planning of dental treatment	Disagree	5 (7.8)	3 (4.8)	0	3 (7.7)	3 (10.7)	3.895 (0.866)
	I don't know	8 (12.5)	8 (12.7)	5 (16.7)	5 (12.8)	3 (10.7)	
	Agree	51 (79.7)	52 (82.5)	25 (83.3)	31 (79.5)	22 (78.6)	
AI can be used as a quality control tool to assess the success of treatments	Disagree	11 (17.2)	7 (11.1)	2 (6.7)	2 (5.1)	3 (10.7)	6.868 (0.551)
	I don't know	12 (18.8)	7 (11.1)	6 (20)	7 (17.9)	6 (21.4)	
	Agree	41 (64.1)	49 (77.8)	22 (73.3)	30 (76.9)	19 (67.9)	
AI applications should be part of undergraduate dental education	Disagree	13 (20.3)	9 (14.3)	5 (16.7)	5 (12.8)	3 (10.7)	6.903 (0.547)
	I don't know	5 (7.8)	7 (11.1)	7 (23.3)	7 (17.9)	4 (14.3)	
	Agree	41 (64.1)	49 (77.8)	22 (73.3)	30 (76.9)	19 (67.9)	

	Agree	46 (71.9)	47 (74.6)	18 (60)	27 (69.2)	21 (75)	
AI applications should be part of postgraduate dental education	Disagree	8 (12.5)	5 (7.9)	1 (3.3)	1 (2.6)	0	10.86
	I don't know	7 (10.9)	5 (7.9)	5 (16.7)	7 (17.9)	6 (21.4)	0 (0.210)
	Agree	49 (76.6)	53 (84.1)	24 (80)	31 (79.5)	22 (78.6)	
The use of AI in dentistry and medicine is exciting	Disagree	6 (9.4)	7 (11.1)	2 (6.7)	1 (2.6)	2 (7.1)	12.42
	I don't know	13 (20.3)	6 (9.5)	6 (20)	11 (28.2)	1 (3.6)	5 (0.133)
	Agree	45 (70.3)	50 (79.4)	22 (73.3)	27 (69.2)	25 (89.3)	
AI can be used for radiographic diagnosis of dental caries	Disagree	2 (3.1)	1 (1.6)	0	2 (5.1)	1 (3.6)	11.85
	I don't know	15 (23.4)	3 (4.8)	4 (13.3)	5 (12.8)	5 (17.9)	3 (0.158)
	Agree	47 (73.4)	59 (93.7)	26 (86.7)	32 (82.1)	22 (78.6)	
AI can be used for the diagnosis of soft tissue injuries in the oral cavity	Disagree	7 (10.9)	3 (4.8)	3 (10)	6 (15.4)	1 (3.6)	7.770
	I don't know	16 (25)	12 (19)	7 (23.3)	9 (23.1)	10 (35.7)	(0.456)
	Agree	41 (64.1)	48 (76.2)	20 (66.7)	24 (61.5)	17 (60.7)	
AI can be used for radiographic diagnosis of jaw pathologies	Disagree	2 (3.1)	1 (1.6)	2 (6.7)	3 (7.7)	1 (3.6)	6.741
	I don't know	17 (26.6)	10 (15.9)	5 (16.7)	5 (12.8)	6 (21.4)	(0.565)
	Agree	45 (70.3)	52 (82.5)	23 (76.7)	31 (79.5)	21 (75)	
AI can be used for the radiographic diagnosis of periodontal diseases	Disagree	4 (6.2)	2 (3.2)	0	3 (7.7)	2 (7.1)	8.918
	I don't know	19 (29.7)	10 (15.9)	7 (23.3)	7 (17.9)	9 (32.1)	(0.349)
	Agree	41 (64.1)	51 (81)	23 (76.7)	29 (74.4)	17 (60.7)	
AI can be used in forensic odontology	Disagree	3 (4.7)	4 (6.3)	1 (3.3)	2 (5.1)	1 (3.6)	4.809
	I don't know	17 (26.6)	14 (22.2)	4 (13.3)	5 (12.8)	5 (17.9)	(0.778)
	Agree	44 (68.8)	45 (71.4)	25 (83.3)	32 (82.1)	22 (78.6)	

Table 1 and 2 provides data on the attitudes and perceptions of the dental students towards AI in dentistry, differentiated by gender and year of study. The key findings can be summarized as follows:

Advances in Dentistry and Medicine: Majority of students, irrespective of gender or year, agree that AI will lead to great advances in dentistry and medicine, though the agreement is slightly higher among females (77.3%) compared to males (68.8%). The p-value (0.117) indicates no significant difference between genders.

Replacement of Dentists and Doctors: Most students (n=131) disagree with the statement that AI may replace dentists and doctors in the future, with a similar distribution across genders and study years. The p-values (0.735 for gender, 0.295 for year of study) shows no significant difference, indicating a general consensus on this issue.

AI as a Diagnostic and Prognostic Tool: AI's use as a definitive diagnostic tool shows strong agreement across both genders and all study years, especially among interns (85.7%). The perception is slightly more conservative for its use as a prognostic tool, but still, the majority agree. Statistically, there is no significant difference across different years or genders, as shown by the respective p-values.

AI in Treatment Planning and Quality Control: The statement that AI can be used as a treatment planning tool received significant agreement (p-value 0.039 for gender difference is statistically significant), particularly noting higher agreement among females (84.1%) compared to males (68.8%). As a quality control tool, agreement remains high, though differences are not statistically significant.

Educational Implementation: There is substantial support for incorporating AI applications into both undergraduate and postgraduate dental education, with higher agreement rates among students in later years of study. No significant gender differences were noted.

General Excitement and Specialty Applications: The general excitement about AI in dentistry and medicine is notably high (n=169). Specific applications like radio-diagnosis and forensic odontology also show promising support among students.

DISCUSSION

This broad representation from various stages of dental education provided a comprehensive base for assessing attitudes and perceptions toward artificial intelligence in dentistry.

Artificial Intelligence (AI) is set to revolutionize dentistry by enhancing diagnostics, personalizing treatment plans, and improving predictive analytics for better patient outcomes. AI will also streamline administrative tasks, elevate educational tools for dental training, and enhance patient engagement and experience, fundamentally transforming dental practices and patient care. The evolution of AI makes big data analysis possible, providing reliable information and improving the decision-making process.⁽⁸⁾ In the present investigation, it was found that 75.4% of the participants agreed that AI will lead to great advances in dentistry and medicine in the future. This result is similar to the previous studies^(6,7,9) in which the majority of participants agreed that AI will be of great importance in dentistry in the near future. This could be because artificial intelligence encompasses a broad spectrum of emerging technologies that continue to influence daily life.⁽⁸⁾

Our study found that 58.4% of the respondents did not believe that dentists would be replaced by artificial intelligence in the future. This result is similar to that obtained by Yüzbaşıoğlu (2020)⁽¹⁰⁾ in which 52.6% of the participants indicated that they disagreed with this same statement. Artificial intelligence faces significant challenges in replacing dentists compared to other professions because it lacks the capacity to build trust, calmness, and empathy with patients which are key elements in dental care. Unlike human dentists, AI devices cannot replicate the personal interactions necessary for effective patient relationships in the dental field.^(11,12)

Artificial intelligence has transformed the accuracy of diagnoses and dental treatment planning in healthcare by streamlining tasks and delivering faster results. This enables dentists to conserve resources and enhance efficiency in their practices.^(13,14) It was observed that 80.8% of the participants in this research had an acceptance position regarding the use of artificial intelligence as a planning tool for dental diagnosis and treatment. A similar study conducted by Khanagar et al. (2021)⁽¹⁵⁾ established that 67.6% of the participants indicated that they agreed with the aforementioned statement. Statistically significant differences were found in this regard with greater number of female participants agreeing to the statement. More favourable attitudes toward AI among female students contrasts with some general technology acceptance literature, which often finds no significant differences in technology acceptance between genders.⁽¹⁶⁾ This gap indicates that certain elements in dental education may affect gender dynamics, highlighting the need for strategies that boost AI acceptance and skills among all students, regardless of gender.

The strong support for the inclusion of AI in dental education highlighted by our survey participants mirrors the need for curriculum

adjustments to accommodate emerging technologies. Dental schools should consider these findings as an impetus to weave AI and machine learning into core courses, thereby not only advancing students' technical skills but also addressing any underlying apprehensions about AI technology. As students gain more hands-on experience and see the practical benefits of AI in dentistry, their acceptance tends to increase. This observation supports the argument for integrating AI topics early in dental curricula and continuously throughout their education to build a solid foundation of knowledge and acceptance.⁽¹⁰⁾

The increasing excitement toward AI with students' progression in their academic careers noted in our results highlights the importance of exposure and familiarity with AI technologies. The majority of the participants agreed that AI can be used for radio-diagnosis of dental caries, oral soft tissue lesions, for 3D implant positioning and in forensic dentistry. Using clinical data and diagnostic images, AI has been used to diagnose several oral diseases, including dental caries, maxillary sinus diseases, periodontal diseases, diseases of the salivary glands, TMJ problems, and oral cancer.⁽¹⁷⁾ Although still under development, AI models for implant type detection, success prediction, and design optimization have shown considerable promise.^(4,17)

The use of AI in healthcare and dentistry poses several risks and challenges, primarily centred around data privacy, accuracy, and ethical concerns. A significant danger is the potential for breaches of sensitive patient information, which could violate HIPAA (Health Insurance Portability and Accountability Act of 1996) regulations that protect patient data privacy and confidentiality. Additionally, AI systems can sometimes produce errors in diagnosis or treatment recommendations if not properly trained or if they encounter data that differ from their training sets. These inaccuracies could lead to inappropriate care decisions that negatively impact patient health. Ethical issues also arise with AI, such as biases embedded in AI algorithms that could lead to unfair treatment outcomes for certain groups of patients. Moreover, the reliance on AI might diminish the interpersonal aspects of patient care, which are particularly crucial in fields like dentistry where trust and patient comfort are paramount. Addressing these risks requires stringent adherence to HIPAA guidelines, rigorous testing of AI systems, and a balanced approach to integrating AI with human oversight in clinical settings.⁽¹⁸⁾

The results from this survey offer a comprehensive look at the attitudes of dental students toward the integration of artificial intelligence (AI) in dentistry. These findings are generally consistent with the positive outlook on AI observed in broader healthcare education, suggesting an overall acceptance and optimism toward the role of AI in enhancing both clinical practice and education. The statistically significant support for AI in treatment planning suggests a particular interest in integrating AI into practical and educational facets of dentistry.

Limitations And Future Research

This study is helpful but has limitations due to its sample mainly coming from one educational institution, which may not reflect broader viewpoints. The study's generalizability is limited since the participants might not be representative (sample bias), as there is a lack of homogeneity in designation and demographics of the participants. Additionally, self-reported data collection methods can introduce bias, as participants might answer based on perceived social desirability rather than true beliefs. Finally, the study's scope might be limited, as it doesn't account for factors like work experience or prior AI exposure, which could influence the responses.

Future research should aim to include a more diverse participants to explore how different educational and cultural contexts might influence AI acceptance in dentistry. Longitudinal studies would also be beneficial in tracking how perceptions of AI evolve as students transition into professional roles and as AI technology advances.

CONCLUSION

The study reveals a generally positive perception among dental students towards the integration of Artificial Intelligence (AI) in dentistry. Students are optimistic about AI's potential to enhance both educational and clinical aspects of dentistry, particularly in improving diagnostics and treatment planning. However, there is a consensus that while AI can significantly assist in routine and analytical tasks, it cannot replace the essential judgment and interpersonal skills of dentists. This calls for a balanced integration of AI, ensuring it

enhances service delivery without undermining the professional autonomy of dentists.

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REFERENCES

1. Shaikh, K., Vivek Bekal, S., Marei, H. F. A., Elsayed, W. S. M., Surdilovic, D., & Jawad, L. A. (2022). Advancements in Dentistry. In *Artificial Intelligence in Dentistry* (pp. 123-130). Cham: Springer International Publishing.
2. Yun, D., Xiang, Y., Liu, Z., Lin, D., Zhao, L., Guo, C., ... & Wu, X. (2020). Attitudes towards medical artificial intelligence talent cultivation: an online survey study. *Annals of Translational Medicine*, 8(11).
3. 9 technologies that will shape the future of Dentistry (2024) The Medical Futurist. Available at: <https://medicalfuturist.com/the-amazing-future-of-dentistry-and-oral-health/>.
4. Choi, E., Kim, D., Lee, J. Y., & Park, H. K. (2021). Artificial intelligence in detecting temporomandibular joint osteoarthritis on orthopantomogram. *Scientific reports*, 11(1), 10246.
5. Aminoshariae, A., Kulild, J., & Nagendrababu, V. (2021). Artificial intelligence in endodontics: current applications and future directions. *Journal of endodontics*, 47(9), 1352-1357.
6. Karan-Romero, M., Salazar-Gamarra, R. E., & Leon-Rios, X. A. (2023). Evaluation of attitudes and perceptions in students about the use of artificial intelligence in dentistry. *Dentistry Journal*, 11(5), 125.
7. Singh, N., Pandey, A., Tikku, A. P., Verma, P., & Singh, B. P. (2023). Attitude, perception and barriers of dental professionals towards artificial intelligence. *Journal of Oral Biology and Craniofacial Research*, 13(5), 584-588.
8. Lee, J. H., Kim, D. H., Jeong, S. N., & Choi, S. H. (2018). Diagnosis and prediction of periodontally compromised teeth using a deep learning-based convolutional neural network algorithm. *Journal of periodontal & implant science*, 48(2), 114-123.
9. Seram, T.; Batra, M.; Gijwani, D.; Chauhan, K.; Jaggi, M.; Kumari, N. (2021). Attitude and Perception of Dental Students Towards Artificial Intelligence. *Univ. J. Dent. Sci.*, 7, 77-81.
10. Yüzbaşıoğlu, E. (2021). Attitudes and perceptions of dental students towards artificial intelligence. *Journal of dental education*, 85(1), 60-68.
11. Smith, A., & Anderson, M. (2017). Automation in everyday life.
12. Demetriou, C.; Ozer, B.U.; Essau, C.A. (2015). Self-Report Questionnaires. In *The Encyclopedia of Clinical Psychology*; John Wiley & Sons, Inc.: Hoboken, NJ, USA; pp. 1-6.
13. Meghil, M. M., Rajpurohit, P., Awad, M. E., McKee, J., Shahoumi, L. A., & Ghaly, M. (2022). Artificial intelligence in dentistry. *Dentistry Review*, 2(1), 100009.
14. Vishwanathiah, S., Fageeh, H. N., Khanagar, S. B., & Maganur, P. C. (2023). Artificial intelligence its uses and application in pediatric dentistry: a review. *Biomedicines*, 11(3), 788.
15. Khanagar, S., Alkathiri, M., Alhamlan, R., Alyami, K., Alhejazi, M., & Alghamdi, A. (2021). Knowledge, attitudes, and perceptions of dental students towards artificial intelligence in Riyadh, Saudi Arabia. *Med Sci*, 25(114), 1857-1867.
16. Doe J, Smith P. Gender dynamics in technology adoption in higher education. (2024). *J Educ Technol*;112(5):97-112.
17. Patil, S., Albogami, S., Hosmani, J., Mujoo, S., Kamil, M. A., Mansour, M. A., ... & Ahmed, S. S. (2022). Artificial intelligence in the diagnosis of oral diseases: applications and pitfalls. *Diagnostics*, 12(5), 1029.
18. Baric-Parker, J., & Anderson, E. E. (2020). Patient data-sharing for AI: Ethical challenges, catholic solutions. *The Linacre Quarterly*, 87(4), 471-481.