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Perception and Utilization of Artificial Intelligence (AI) among Dental Professionals in India: A Cross-sectional Survey

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Abstract

Aim: Artificial Intelligence (AI) is an emerging technology with growing relevance in dentistry. This study aimed to assess the perception and utilization of AI among dental professionals in India through an online survey conducted from Rama Dental College, Kanpur.

Methods: A descriptive, cross-sectional online survey was conducted among dental students and professionals using a structured and validated questionnaire. The survey link was distributed via WhatsApp and email. Participants were selected through convenience sampling. The questionnaire consisted of demographic details, AI awareness, attitude, practices, and perceived barriers.

Results: A total of 402 responses were analyzed. Out of the participants, 52.2% reported knowing what AI is, 47.8% had basic knowledge of AI principles, and 45.3% were aware of AI applications in dentistry. Social media (62.7%) was the most common source of information. Most participants (71.1%) agreed or strongly agreed that AI will bring major advancements in dentistry. However, only 28.1% had used AI applications in practice. The main barriers were lack of courses (70.3%) and insufficient time (65.4%).

Conclusion: The study revealed moderate awareness but high interest in AI among dental professionals in India. Despite the enthusiasm, practical implementation remains low due to educational and infrastructural barriers.

Keywords: Artificial intelligence, Perception, Utilization, Dental students, Dentists, India

INTRODUCTION

Artificial Intelligence (AI) is rapidly transforming the landscape of modern healthcare by enhancing diagnostic accuracy, streamlining workflows, and improving patient care. Defined as the capability of machines to mimic human cognitive functions such as learning, reasoning, and problem-solving, AI has found its place in many medical domains including radiology, pathology, and surgery.[1,2] In dentistry, AI applications range from caries detection, orthodontic treatment planning, forensic analysis, cephalometric tracing, and periodontal disease diagnosis, to even voice-assisted chair side support systems.[2,3]

AI is increasingly integrated into daily life via tools like voice assistants, image search, and recommendation systems. However, its integration into dentistry remains underutilized despite its promising benefits. Globally, studies have shown that dental professionals and students exhibit varied levels of awareness and acceptance toward AI. For example, research in Turkey and India reported moderate knowledge but largely positive attitudes among students.[3-5] Barriers to adoption include limited availability of AI-based training, lack of technical knowledge, and insufficient exposure to practical AI tools in academic curricula.[3, 6-9]

India, with its vast network of dental institutions and an evolving digital health ecosystem under initiatives like Digital India, presents an opportune environment to explore the readiness of dental professionals for AI integration. Evaluating current levels of AI awareness, perception, and utilization is critical to inform curriculum development, policy-making, and technological implementation in dental education.

The present study was conducted through the Department of Public Health Dentistry at Rama Dental College, Kanpur. It aims to assess the perception, awareness, and practical use of AI among dental professionals across India, and to identify the key barriers impeding AI adoption in dentistry

MATERIALS AND METHODS

This descriptive, cross-sectional study was conducted using an online survey designed to assess dental professionals' awareness, attitudes, and practices concerning Artificial Intelligence (AI). The study population included undergraduate dental students, interns, general dentists, and specialists across India. The survey was facilitated by the Department of Public Health Dentistry, Rama Dental College, Kanpur.

A convenience sampling method was adopted, and participants were invited through social media platforms (WhatsApp and email. Inclusion criteria were dental students and professionals currently studying or practicing in India. Participation was voluntary and anonymous.

QUESTIONNAIRE

The survey instrument comprised 17 structured questions divided into five sections:

1. **Demographic Information** – including age, gender, qualification, and location.
2. **Knowledge of AI** – participants' familiarity with AI concepts, working principles, and uses in dentistry.

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3. **Attitude Toward AI** – a series of 17 Likert-scale items (1 = strongly disagree to 5 = strongly agree) evaluating perceptions and acceptance of AI integration in dental education and practice.
4. **Practice and Experience** – whether participants had used AI-based tools, taken AI-related courses, or intended to learn more.
5. **Barriers to AI Utilization** – multiple-choice questions to identify factors hindering AI adoption in dental practice.

The questionnaire was adapted from validated tools used in previous international studies and reviewed by a panel of academic experts to ensure face and content validity. A pilot study with 10 participants confirmed clarity and flow.

ETHICAL CONSIDERATIONS

Prior to participation, all respondents were provided with an informed consent form embedded in the first page of the survey. Only those who agreed were allowed to proceed. The study was reviewed and approved by the Institutional Ethics Committee of Rama Dental College, Kanpur. Confidentiality and anonymity of responses were strictly maintained.

DATA ANALYSIS

Data were collected via Google Forms and exported to Microsoft Excel. Statistical analysis was performed using SPSS version 27 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used for quantitative analysis. Inferential tests such as t-tests and ANOVA were applied to examine differences between groups, with $p < 0.05$ considered statistically significant.

RESULT

The survey received a total of 402 responses. The mean age of participants was 24.6 years (SD = 3.9). Female participants comprised 61.7%, while males constituted 38.3% of the sample. The majority were undergraduate dental students (45.8%) and interns (20.4%), with the remaining being general dentists (25.1%) and specialists (8.7%).

Awareness of Artificial Intelligence

Approximately 52.2% of participants reported that they knew what AI is, and 47.8% indicated a basic understanding of AI principles. Awareness of the uses of AI in dentistry was reported by 45.3% of the respondents. Social media was the most cited source of AI information (62.7%), followed by academic lectures and online content.

Attitudes toward AI

A significant portion of the participants (71.1%) agreed or strongly agreed that AI would bring major advancements in dentistry. Additionally, 68.9% believed AI should be incorporated into the undergraduate dental curriculum, while 65.2% supported its inclusion in postgraduate training. Many participants (66.4%) found the application of AI in dentistry exciting and expressed eagerness to learn more.

Practices and experience

Despite the high level of interest and awareness, practical exposure to AI was relatively low. Only 28.1% of participants had ever used AI software or applications in dental practice, while 21.6% reported attending a course specifically related to AI.

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Barriers to utilization

Participants identified multiple barriers hindering AI integration in dental practice. The most commonly reported were the lack of available courses (70.3%), limited time to learn and apply AI (65.4%), and the perception that coding knowledge is necessary to use AI tools (59.8%)

Table 1: Demographic Distribution

Category	**Subcategory**	**Percentage (%)**
Gender	Male	38.3
	Female	61.7
Qualification	Dental Student	45.8
	Intern	20.4
	General Dentist	25.1
	Specialist	8.7

Table 2: AI Awareness and Practices

Parameter	Percentage (%)
Know what AI is	52.2
Basic understanding of AI principles	47.8
Know uses of AI in dentistry	45.3
Used AI in practice	28.1
Attended AI course	21.6

Table 3: Participant Attitudes Toward AI

Statement	Strongly Disagree N (%)	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)

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I think AI will lead to major advances in dentistry and medicine.	12 (3%)	18 (4.5%)	86 (21.4%)	183 (45.5%)	103 (25.6%)
AI applications in dentistry are aligned with India's Digital Health Mission.	16 (4%)	22 (5.5%)	102 (25.4%)	174 (43.3%)	88 (21.9%)
Learning AI will open up better job opportunities for dentists.	14 (3.5%)	20 (5%)	94 (23.4%)	168 (41.8%)	106 (26.4%)
AI applications should be part of postgraduate dental training.	20 (5%)	25 (6.2%)	95 (23.6%)	162 (40.3%)	100 (24.9%)
AI applications should be part of undergraduate dental training.	18 (4.5%)	26 (6.5%)	81 (20.1%)	172 (42.8%)	105 (26.1%)
I find the use of AI in dentistry and medicine exciting.	16 (4%)	21 (5.2%)	98 (24.4%)	154 (38.4%)	113 (28%)
AI can be used in 3D implant positioning and planning.	15 (3.7%)	18 (4.5%)	110 (27.4%)	159 (39.6%)	100 (24.9%)
AI can be used for radiographic diagnosis of tooth caries.	13 (3.2%)	20 (5%)	115 (28.6%)	160 (39.8%)	94 (23.4%)
AI can be used for radiographic diagnosis of jaw pathologies.	17 (4.2%)	19 (4.7%)	112 (27.9%)	155 (38.6%)	99 (24.6%)
AI can be used for radiographic diagnosis of periodontal disease.	18 (4.5%)	22 (5.5%)	111 (27.6%)	152 (37.8%)	99 (24.6%)
AI can be used in forensic dentistry.	20 (5%)	24 (6%)	106 (26.4%)	156 (38.8%)	96 (23.9%)
AI can be used for diagnosis of soft tissue lesions in the mouth.	23 (5.7%)	21 (5.2%)	109 (27.1%)	151 (37.6%)	98 (24.4%)
AI can be used as a treatment planning tool in dentistry.	25 (6.2%)	22 (5.5%)	108 (26.9%)	149 (37.1%)	98 (24.4%)
AI can be used as a	26 (6.5%)	25 (6.2%)	102 (25.4%)	154 (38.3%)	95 (23.6%)

prognostic tool to predict the course of disease.					
AI can be used as a definitive diagnostic tool in disease diagnosis.	30 (7.5%)	26 (6.5%)	112 (27.9%)	147 (36.6%)	87 (21.6%)
AI could replace dentists/physicians in the future.	51 (12.7%)	47 (11.7%)	111 (27.6%)	120 (29.9%)	73 (18.2%)

Table 4: Barriers to AI Utilization

Barrier	Percentage (%)
Lack of courses	70.3
Lack of time	65.4
Need for coding knowledge	59.8

DISCUSSION

The findings of this study indicate that dental professionals in India exhibit a moderate level of awareness and knowledge regarding AI, with a notable inclination toward its potential integration into dentistry. These results align with previous international research suggesting that while the understanding of AI among dental practitioners remains limited, their attitudes toward its adoption are generally positive.[3-5]

The reliance on social media as the primary source of information (62.7%) mirrors trends observed in Turkey and other developing nations, where formal educational exposure to emerging technologies like AI is still minimal.[4-6] This pattern underscores the urgent need for academic institutions to embed AI concepts within undergraduate and postgraduate curricula, thereby transitioning AI education from informal platforms to structured learning environments.

Interestingly, 48.1% of participants believed AI could eventually replace dentists, a concern also raised in Turkey and Kenya.[4,9] However, studies argue that AI is more likely to assist rather than replace clinicians, especially in tasks requiring empathy, ethical judgement, and interpersonal communication.[10,11] This emphasizes the need to train dental professionals not just in using AI, but also in understanding its limits.

Despite positive sentiments, actual usage of AI in practice remains low, a discrepancy echoed in other international studies.[4,6,11] As in the Saudi study, key barriers in our cohort included lack of courses and time (70.3% and 65.4%, respectively). The perception that AI requires coding knowledge (59.8%) adds to hesitancy—a challenge that could be addressed by providing user-friendly AI tools and hands-on workshops.[11]

Our results show broad support for integrating AI into dental curricula, with 68.9% and 65.2% of participants favoring its inclusion at undergraduate and postgraduate levels, respectively. This reinforces the need for formal AI training in line with digital health transformation initiatives such as Digital India and the National Digital Health Mission. Similar advocacy was noted in Saudi Arabia's Vision 2030, which emphasizes technological integration in healthcare.[6]

The findings of this study reveal a generally positive attitude toward AI among Indian dental professionals, aligned with global trends observed in Saudi Arabia, Turkey, and Kenya.[4] The belief that AI will lead to significant advancements (mean = 4.02) matches similar attitudes reported by Yüzbaşıoğlu in Turkey (74.6%) and Aboalshamat in Saudi Arabia (75%).[4,6]

Despite the optimism toward AI's role in dental advancements (71.1% agreed), the gap between awareness and actual usage persists. Only 28.1% of participants reported having used AI applications in practice. This discrepancy could be attributed to limited access to AI tools, a lack of structured training, and unclear integration pathways within clinical workflows. The finding also reflects the broader global challenge of translating technological enthusiasm into practical competence.[1,2]

Notably, barriers such as the unavailability of dedicated AI courses (70.3%) and lack of time (65.4%) were major constraints reported by respondents. Additionally, nearly 60% perceived the need for coding skills as a deterrent to AI adoption. These concerns highlight the importance of demystifying AI for dental professionals and ensuring that its use does not require extensive technical expertise. Short-term certification programs, integrated modules, and hands-on workshops could be valuable in bridging this gap.

From a policy standpoint, these findings support the argument for incorporating AI literacy within national dental education strategies, especially as India moves forward with initiatives like the National Digital Health Mission and Digital India. Training the future workforce in digital tools will be critical to enhancing the efficiency, quality, and accessibility of oral healthcare delivery.

Comparative analyses with studies conducted in Saudi Arabia, Turkey, and India[4,6,7] reveal consistent patterns of curiosity and positivity toward AI, yet varying degrees of implementation. This emphasizes the role of local institutional leadership in piloting AI-based projects, conducting awareness programs, and offering incentives for continuing education on emerging technologies.

Overall, the study presents a promising outlook for AI in Indian dentistry. However, realizing its full potential will require coordinated efforts between academic institutions, regulatory bodies, and technology providers to ensure accessible, practical, and ethically aligned integration of AI in dental education and clinical practice.

CONCLUSION

Indian dental professionals demonstrate a positive attitude toward AI with moderate knowledge levels. Barriers such as lack of courses and time constraints need to be addressed. Incorporating AI modules in dental education and promoting practical exposure can prepare the upcoming generation of dentists for a digital future.

Conflict of interest

The authors declare that there is no conflict of interest.

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