

**A Survey on the Knowledge, Attitudes, and Perceptions of Dental Practitioners Regarding Generative Artificial Intelligence (AI) in India.**

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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 swiftly reshaping the field of contemporary healthcare by boosting the precision of diagnoses, optimizing operational processes, and enhancing patient treatment. AI, characterized by machines' ability to replicate human cognitive abilities like learning, reasoning, and problem-solving, has established its presence in various medical areas such as radiology, pathology, and surgery. [1,2]. In the field of dentistry, artificial intelligence is utilized for a variety of purposes, including the detection of cavities, planning orthodontic treatments, conducting forensic examinations, tracing cephalometric measurements, diagnosing periodontal diseases, and even providing voice-assisted support at the dental chair.[2,3].

AI is becoming a regular part of everyday life through applications such as voice assistants, image searches, and recommendation systems. Yet, its application in dentistry is still not fully realized, even though it holds significant potential benefits. Worldwide, research indicates that dental professionals and students have varying degrees of awareness and acceptance of AI. For instance, studies

conducted in Turkey and India found that students possess moderate knowledge but generally have a positive outlook towards AI.[3-5]. Challenges to embracing AI include the scarcity of AI-focused training programs, a lack of technical expertise, and limited integration of practical AI tools in educational programs. [3,6-9].

India, with its extensive network of dental schools and a growing digital health framework supported by initiatives like Digital India, offers a promising setting to assess how prepared dental professionals are for the integration of AI. Assessing the current state of AI awareness, perception, and usage is essential for guiding curriculum development, policy-making, and the implementation of technology in dental education.

This research was carried out by the Department of Public Health Dentistry at Rama Dental College in Kanpur. Its purpose is to evaluate the understanding, awareness, and practical application of AI among dental professionals throughout India, as well as to pinpoint the main obstacles hindering the integration of AI in the field of dentistry.

**Materials and Methods**

This study, which is descriptive and cross-sectional in nature, utilized an online survey to evaluate the knowledge, attitude, and perception of dental professionals regarding Artificial Intelligence (AI). Participants included undergraduate dental students, interns, general dentists, and specialists from various regions of India. The Department of Public Health Dentistry at Rama Dental College in Kanpur facilitated the survey.

A convenience sampling approach was utilized, with participants being recruited via social media channels such as WhatsApp and email. The study included dental students and professionals who are either studying or practicing in India. Participation was both voluntary and anonymous.

The study was reviewed and approved by the Institutional Ethics Committee of Rama Dental College, Kanpur. Confidentiality and anonymity of responses were strictly maintained. 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 survey tool consisted of 17 structured questions organized into five sections: Demographic Information, which included

details such as age, gender, qualifications, and location. Knowledge of AI assessed participants' understanding of AI concepts, operational principles, and applications in dentistry. Attitude Toward AI involved 17 Likert-scale items (ranging from 1 = strongly disagree to 5 = strongly agree) to gauge perceptions and acceptance of AI integration in dental education and practice. Practice and Experience explored whether participants had utilized AI-based tools, enrolled in AI-related courses, or planned to further their knowledge. Barriers to AI Utilization featured multiple-choice questions aimed at identifying obstacles to 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.

Information was gathered using Google Forms and then transferred to Microsoft Excel. The statistical evaluation was conducted with SPSS version 26 (IBM Corp., Armonk, NY, USA). For quantitative analysis, descriptive statistics such as frequencies, percentages, means, and standard deviations were utilized. To assess

differences between groups, inferential tests like t-tests and ANOVA were employed, with a significance level set at  $p < 0.05$ .

**Result:**

The survey collected 410 responses in total. Participants had an average age of  $24.6 \pm 3.9$  years. Females made up 63.9% of the respondents, while males accounted for 36.1%. Most respondents were undergraduate dental students (43.9%) and interns (21.2%), with the rest being general dentists (25.4%) and specialists (9.5%). (Table 1)

The Awareness regarding use of Artificial Intelligence was fair among participants. About 92.2% of the participants mentioned that they were familiar with AI, while 47.8% expressed having a fundamental grasp of AI concepts. A total of 44.4% of those surveyed were aware of AI applications in dentistry. Despite the high level of interest and awareness, practical exposure to AI was relatively low. Only 26.6% of participants had ever used AI

software or applications in dental practice, while 20.2% reported attending a course specifically related to AI. (Table 2)

A large majority of the participants (70.9%) either agreed or strongly agreed that AI would lead to significant advancements in the field of dentistry. Furthermore, 68.9% felt that AI should be integrated into the undergraduate dental curriculum, and 65.2% were in favor of its inclusion in postgraduate education. A considerable number of participants (66.4%) found the use of AI in dentistry to be exciting and expressed a keen interest in learning more about it. (Table 3)

Several challenges to integrating AI into dental practice were highlighted by participants. The most commonly cited issues included the lack of available courses (70.7%), limited time to learn due to practice commitments (64.9%), and the perception that knowledge of coding is necessary to use AI tools (59.8%). Additionally, 21.2% of participants expressed a lack of interest. (Table 4)

Table 1: Demographic Distribution

Category	Subcategory	Number of Participants	Percent
Gender	Male	148	36.1%

	Female	262	63.9%
Qualification	Dental Student	180	43.9%
	Intern	87	21.2%
	General Dentist	104	25.4%
	Specialist	39	9.5%

Table 2: AI Awareness and Practices

Parameter	Yes		No	
	N	%	N	%
Knowledge what AI is	378	92.2%	32	7.8%
Basic understanding of AI principles	196	47.8%	214	52.2%
Know uses of AI in dentistry	182	44.4%	228	55.6%
Used AI in practice	109	26.6%	301	73.4%
Attended AI course	83	20.2%	327	79.8%

Table 3: Participant Attitudes Toward AI

Statement	Strongly Disagree N (%)	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)
I think AI will lead to major advances in dentistry and medicine.	12 (2.9%)	19 (4.6%)	88 (21.5%)	187 (45.6%)	104 (25.3%)

AI applications in dentistry are aligned with India's Digital Health Mission.	16 (3.9%)	22 (5.4%)	104 (25.4%)	178 (43.4%)	90 (21.9%)
Learning AI will open up better job opportunities for dentists.	14 (3.4%)	20 (4.9%)	96 (23.4%)	171 (41.7%)	109 (26.6%)
AI applications should be part of postgraduate dental training.	20 (4.9%)	25 (6.1%)	97 (23.6%)	165 (40.2%)	103 (25.2%)
AI applications should be part of undergraduate dental training.	18 (4.5%)	26 (6.5%)	83 (20.1%)	176 (42.8%)	107 (26.1%)
I find the use of AI in dentistry and medicine exciting.	16 (4%)	21 (5.2%)	100 (24.4%)	158 (38.4%)	115 (28%)
AI can be used in 3D implant positioning and planning.	15 (3.7%)	18 (4.5%)	113 (27.4%)	162 (39.6%)	102 (24.9%)
AI can be used for radiographic diagnosis of tooth caries.	13 (3.2%)	20 (5%)	118 (28.6%)	163 (39.8%)	96 (23.4%)
AI can be used for radiographic diagnosis of jaw pathologies.	17 (4.2%)	19 (4.7%)	115 (27.9%)	158 (38.6%)	101 (24.6%)
AI can be used for radiographic diagnosis of periodontal disease.	18 (4.5%)	22 (5.5%)	114 (27.6%)	155 (37.8%)	101 (24.6%)
AI can be used in forensic dentistry.	20 (5%)	24 (6%)	109 (26.4%)	159 (38.8%)	98 (23.9%)
AI can be used for diagnosis of soft tissue lesions in the mouth.	23 (5.7%)	21 (5.2%)	112 (27.1%)	154 (37.6%)	100 (24.4%)
AI can be used as a treatment planning tool in dentistry.	25 (6.2%)	22 (5.5%)	111 (26.9%)	152 (37.1%)	100 (24.4%)

AI can be used as a prognostic tool to predict the course of disease.	26 (6.5%)	25 (6.2%)	105 (25.4%)	157 (38.3%)	97 (23.6%)
AI can be used as a definitive diagnostic tool in disease diagnosis.	30 (7.5%)	26 (6.5%)	115 (27.9%)	150 (36.6%)	89 (21.6%)
AI could replace dentists/physicians in the future.	52 (12.7%)	48(11.7%)	113 (27.6%)	123 (29.9%)	74 (18.2%)

Table 4: Barriers to AI Utilization

Barrier	Yes		No	
	N	%	N	%
Lack of courses	290	70.7%	120	29.3%
Lack of time	266	64.9%	144	35.1%
Need for coding knowledge	243	59.8%	167	40.2%
Lack of Interest	87	21.2%	323	78.8%

**Discussion:**

The study's results reveal that dental professionals in India possess a moderate level of awareness and understanding of AI, with a significant interest in its potential application in dentistry. These findings are consistent with earlier international studies, which indicate that although dental practitioners' comprehension of AI is somewhat limited, their attitudes toward its adoption are generally favorable.[3-5].

The heavy dependence on social media as the main source of information reflects trends seen in Turkey and other developing countries, where formal education on new technologies like AI remains limited [4,6]. This trend highlights the pressing need for academic institutions to incorporate AI concepts into undergraduate and postgraduate programs, thus shifting AI education from informal channels to formal educational settings.

Interestingly, a significant number of participants believed that AI might eventually take over the role of dentists, a concern echoed in Turkey and Kenya [4, 9]. Nonetheless, research suggests that AI is more likely to support rather than replace

healthcare professionals, particularly in areas that require empathy, ethical decision-making, and interpersonal skills [10,11]. This highlights the importance of training dental practitioners not only in the use of AI but also in recognizing its limitations.

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, 30, 37]. 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 and lack of time were major constraints reported by respondents. Additionally, majority of participants 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 practitioners exhibit a favorable outlook towards AI, although their knowledge is moderate. Challenges such as the absence of courses and limited time need to be tackled. Integrating AI modules into dental education and encouraging hands-on experience can equip future dentists for a digital era.

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