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Evaluation of Knowledge, Attitude and Practice of Artificial Intelligence Among Dentists in West Bengal: A Cross-Sectional Survey

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Abstract

Background: Artificial Intelligence is rapidly transforming healthcare delivery and dental education through applications in diagnosis, radiology, pathology, orthodontics, prosthodontics, research, and patient management. Successful integration depends on dentists' preparedness and perceptions.

Aim: To evaluate the knowledge, attitude, and practice regarding artificial intelligence among dentists in West Bengal through a cross-sectional online survey.

Materials and Methods: A questionnaire-based cross-sectional online survey was conducted among 227 dentists in West Bengal. Data were tabulated using Microsoft Excel and statistically analyzed using GraphPad Prism. Descriptive statistics were expressed as frequency and percentage. The Chi-square (χ^2) test was applied for categorical variables, and a P value ≤ 0.05 was considered statistically significant.

Results: Most respondents were aged 23–34 years (65.6%), male (63.4%), and BDS graduates (57.7%). Awareness of AI was high (93.4%), and 78.9% had used AI to improve knowledge. ChatGPT was the most preferred AI platform (46%). Participants believed AI could improve research quality (74%), support radiological diagnosis (53.7%), assist pathology (65.2%), improve prosthodontic procedures (75.3%), and aid orthodontic treatment planning (70%). Most favoured AI training in dental education (89.9%) and curricular updates (81.5%). However, 77.1% disagreed that AI could replace dentists, while 55.5% had never used AI for diagnosis or treatment planning.

Conclusion: Dentists in West Bengal demonstrated high awareness and positive attitudes toward AI, although routine clinical implementation remains limited. Incorporating AI education, practical training, and ethical guidelines may promote responsible adoption in dentistry.

Keywords: Artificial intelligence; Dentistry; Knowledge; Attitude; Practice.

Introduction

Artificial intelligence (AI) refers to computational systems capable of simulating human cognitive functions such as learning, reasoning, problem-solving, and decision-making. With advances in machine learning, deep learning, and natural language processing, AI has emerged as a transformative force in healthcare. In dentistry, AI applications now include automated radiographic interpretation, caries detection, periodontal risk prediction, cephalometric landmark tracing, oral lesion recognition, prosthetic design, appointment management, and personalized treatment planning.[1,2]

The growing integration of AI into dental practice offers several advantages, including increased diagnostic consistency, reduced clinical workload, improved workflow efficiency, and enhanced research productivity. However, concerns regarding data privacy, bias, medico-legal accountability, and overdependence on algorithms remain relevant.[3]

The successful adoption of AI in dentistry depends not only on technological availability but also on clinicians' knowledge, attitudes, and willingness to use such systems. Previous studies from different countries have shown increasing awareness among dentists, yet practical use in routine care remains limited.[4,5]

India has one of the world's largest dental workforces, and the use of digital technologies is expanding rapidly. Nevertheless, region-specific evidence regarding dental professionals' readiness for AI remains scarce. West Bengal, an important educational and healthcare hub in eastern India, provides a suitable context to assess this issue.

Therefore, the present study aimed to evaluate the knowledge, attitude, and practice of artificial intelligence among dentists in West Bengal through a cross-sectional online survey.

Materials and Methods

A descriptive cross-sectional online survey was conducted among dentists practicing, studying, or teaching in West Bengal. A total of 227 dentists who voluntarily responded to the questionnaire were included in the final analysis. A structured questionnaire was developed to assess: a) Demographic characteristics – age, sex, qualification b) Knowledge – awareness of AI, familiarity with AI platforms, understanding of deep learning c)Attitude – beliefs regarding AI applications in specialties, education, ethics, and future scope d)Practice – frequency of AI use and application in clinical work.

Statistical Analysis

The collected data were tabulated in a spreadsheet using Microsoft Excel 2021, and then statistical analysis was carried out using GraphPad Prism for Windows, Version 10.1.2 (GraphPad Software, La Jolla, California, USA).

Descriptive statistics were used to report categorical variables in frequencies and percentages. The Chi-square (χ^2) test was used to analyze categorical variables. A P value of ≤ 0.05 was considered statistically significant.

Results

Demographic Characteristics

Among the respondents, the majority belonged to the 23–34 years age group, comprising 149 (65.6%) individuals. This was followed by 47 (20.7%) participants aged 35–45 years, 25 (11.0%) in the 46–56 years category, and only 6 (2.6%) participants aged 57 years and above. With respect to sex distribution,

144 (63.4%) respondents were male, while 83 (36.6%) were female. Regarding educational qualification, 131 (57.7%) participants held a Bachelor of Dental Surgery (BDS) degree, while 96 (42.3%) had a Master of Dental Surgery (MDS) qualification.

Knowledge Regarding AI

A total of 212 (93.4%) respondents reported that they were aware of AI (P<0.0001). A majority of 173 (76.2%) knew websites used for AI, and 179 (78.9%) had used AI to improve knowledge regarding a topic (P<0.0001). Among AI platforms, ChatGPT was the most preferred (46%), followed by Google Gemini (28%), Perplexity AI (12%), Microsoft Copilot (8%), and others. Awareness of deep learning models such as recurrent neural networks and convolutional neural networks was lower, with 51.1% reporting no awareness.

Attitude Toward AI

A total of 168 (74%) respondents believed AI can improve research quality (P<0.0001).More than half preferred AI use in radiological diagnosis (53.7%), while 71.4% agreed radiologists should be adequately trained in AI.A majority believed pathologists can use AI for lesion image interpretation and histopathology (65.2%).Regarding prosthodontics, 75.3% believed AI-assisted procedures could save clinic time, improve quality, and reduce visits. A total of 159 (70%) agreed AI has a role in cephalometric analysis and orthodontic treatment planning. Strong support was seen for AI training among medical/dental students (89.9%) and updating the curriculum with AI (81.5%). However, 77.1% disagreed that AI can replace dentists/general practitioners. Approximately 65.6% felt advancing AI may affect future creativity, and 38.8% believed AI could violate ethical principles.

Practice of AI

The most common pattern of AI use was “when need arises” (52.9%). For diagnosis, treatment planning, and prognosis, 55.5% reported never using AI, 43.2% used it sometimes, and only 1.3% always used it. For maintenance of records, follow-up, and clinical management, 49.8% never used AI, 42.7% used it sometimes, and 7.5% always used it.

Table 1:Demographic characteristics and chief complaints of the study respondents

Variable	Category	Frequency (%)
Age (years)	23–34	149 (65.6%)
	35–45	47 (20.7%)
	46–56	25 (11.0%)
	≥57	6 (2.6%)
Sex	Female	83 (36.6%)
	Male	144 (63.4%)
Qualification	BDS	131 (57.7%)
	MDS	96 (42.3%)

Table 2: Responses to questions

Question	Response Category	Frequency (%)	P value[a]
Are you aware of AI?	Yes	212 (93.4%)[#]	<0.0001*
	No	13 (5.7%)	
	Don’t know	2 (0.9%)	

Do you know the websites used for AI?	Yes	173 (76.2%)[#]	<0.0001*
	No	47 (20.7%)	
	Don't know	7 (3.1%)	
Have you used AI to improve your knowledge regarding a topic?	Yes	179 (78.9%)[#]	<0.0001*
	No	47 (20.7%)	
	Don't know	1 (0.4%)	
What LLM app do you use if yes? (Multiple response)[M]	ChatGPT (OpenAI)	182 (46%)[#]	<0.0001*
	Google Gemini	112 (28%)	
	Perplexity AI	49 (12%)	
	Microsoft Copilot	33 (8%)	
	Others	8 (2%)	
	None	10 (3%)	
Are you aware of deep learning models like recurrent neural networks and convolutional neural networks?	Yes	81 (35.7%)	<0.0001*
	No	116 (51.1%)[#]	
	Don't know	30 (13.2%)	
As a researcher, do you think applications of AI in all stages of research can improve the quality of it?	Yes	168 (74%)[#]	<0.0001*
	No	29 (12.8%)	
	Don't know	30 (13.2%)	
Do you prefer using AI in radiological diagnosis?	Yes	122 (53.7%)[#]	<0.0001*
	No	69 (30.4%)	
	Don't know	36 (15.9%)	
Are radiologists to be trained adequately in using AI for the interpretation of diagnosis?	Agree	162 (71.4%)[#]	<0.0001*
	Disagree	22 (9.7%)	
	Don't know	43 (18.9%)	
Do you think pathologists can use AI for the interpretation of the color of lesions, photographs, and analysis of histopathology in the diagnosis of cancer?	Yes	148 (65.2%)[#]	<0.0001*

	No	37 (16.3%)	
	Don't know	42 (18.5%)	
Do you think in the field of prosthodontics, AI-assisted procedures can save clinic time, quality of work, and number of visits?	Yes	171 (75.3%)[#]	<0.0001*
	No	18 (7.9%)	
	Don't know	38 (16.7%)	
Do you think the interpretation of cephalometric analysis and treatment plans in the department of orthodontics is also a part of AI?	Yes	159 (70%)[#]	<0.0001*
	No	29 (12.8%)	
	Don't know	39 (17.2%)	
Do you think training must be given in AI for all medical/dental students?	Agree	204 (89.9%)[#]	<0.0001*
	Disagree	9 (4%)	
	Don't know	14 (6.2%)	
Do you think AI can replace the role of dentists/general practitioners?	Agree	29 (12.8%)	<0.0001*
	Disagree	175 (77.1%)[#]	
	Don't know	23 (10.1%)	
Do you think the medical/dental curriculum can be updated with AI?	Agree	185 (81.5%)[#]	
	Disagree	18 (7.9%)	
	Don't know	24 (10.6%)	
Do you think advancing AI in the medical/dental field can affect creativity in the future?	Yes	149 (65.6%)[#]	<0.0001*
	No	54 (23.8%)	
	Don't know	24 (10.6%)	
Do you think the use of AI in the field of medicine/dental field can violate ethical principles?	Yes	88 (38.8%)	0.004*
	No	52 (22.9%)[#]	
	Maybe	87 (38.3%)	
How often do you use AI apps?	When need arises	120 (52.9%)[#]	<0.0001*
	Seldom	45 (19.8%)	
	To update myself	32 (14.1%)	

	Frequently	30 (13.2%)	
As a practitioner, do you use AI for diagnosis, treatment plan, and prognosis?	Sometimes	98 (43.2%)	<0.0001*
	Never	126 (55.5%)	
	Always	3 (1.3%)#	
As a practitioner, do you use AI for the maintenance of records, follow-up, and clinical management?	Sometimes	97 (42.7%)	<0.0001*
	Never	113 (49.8%)	
	Always	17 (7.5%)#	

Discussion

The present study demonstrated a high level of awareness of AI among dentists in West Bengal, with 93.4% reporting familiarity with AI. This finding is comparable to the study by Kalaimani et al., who reported substantial awareness among dentists and dental students in India.[4] Similar findings were also noted by Usha et al., where most respondents recognized AI and expressed willingness to learn more about it.[5]

The widespread use of AI for self-learning (78.9%) and the dominance of ChatGPT as the preferred platform suggest that dentists are increasingly using generative AI tools for education, literature support, and professional communication. Recent literature indicates that large language models are becoming common among healthcare professionals for academic productivity and decision support.[6]

Despite strong general awareness, technical knowledge of deep learning remained limited, with 51.1% unaware of recurrent neural networks or convolutional neural networks. This pattern reflects findings from previous studies showing that users often engage with AI applications without understanding the underlying algorithms.[3,7] Such gaps may limit critical appraisal of outputs, especially in diagnostic contexts.

Attitudes toward AI were largely positive. Most respondents believed AI can improve research quality (74%), which aligns with recent evidence showing AI utility in data extraction, systematic reviews, predictive analytics, and manuscript preparation.[6]

Respondents also recognized AI's role in clinical specialties. Support for AI in radiology, pathology, prosthodontics, and orthodontics corresponds with published studies demonstrating high diagnostic accuracy of AI systems in radiographic lesion detection, cephalometric tracing, oral cancer screening, CAD/CAM design, and treatment planning.[1,2,8]

A particularly notable finding was the strong support for integrating AI into dental education, with 89.9% favoring student training and 81.5% supporting curricular reform. This mirrors international consensus that future dental graduates require competencies in digital dentistry, AI ethics, data interpretation, and human-AI collaboration.[5,9]

Importantly, most respondents rejected the idea that AI could replace dentists. Similar findings have been reported globally, where clinicians perceive AI as an adjunct rather than a substitute.[10] Dentistry involves empathy, communication, procedural dexterity, patient trust, and ethical reasoning—qualities not easily replicated by machines.

Ethical concerns were substantial in the present study, with many participants believing AI may violate ethical principles or expressing uncertainty. Common concerns include data privacy, informed consent, bias, transparency, and medico-legal liability.[11] These concerns highlight the need for regulatory frameworks and responsible governance.

Although awareness and attitudes were favoUrable, routine clinical use remained limited. More than half of respondents had never used AI for diagnosis or treatment planning. This gap between interest and implementation has also been observed in previous surveys and may result from limited access to validated tools, lack of training, cost barriers, or uncertainty regarding reliability.[4,10]

Overall, dentists in West Bengal appear receptive to AI but require structured educational and infrastructural support for practical integration.

Limitations

Cross-sectional design limits causal interpretation. Self-reported responses may introduce recall or social desirability bias. Online survey methodology may exclude less digitally active practitioners. Findings may not be generalizable outside West Bengal.

Conclusion

Dentists in West Bengal demonstrated high awareness and positive attitudes toward artificial intelligence, particularly in education, research, and specialty practice. However, actual clinical implementation remains relatively low. Most respondents considered AI a supportive tool rather than a replacement for dentists. The inclusion of AI in dental curricula, continuing education, ethical guidance, and access to validated technologies will be crucial for future adoption.

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