Perceptions of Artificial Intelligence Integration in Dentistry Among Dental Therapists in Nigeria

*Adelekan, Adeshola AJETUNMOBI, **Assumpta Ozioma NWOZOR-OKPALAKU

[*Dental Therapy Unit, Dentistry Department, Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria
**Department of Dental Therapy, Dental Therapists Registration Board of Nigeria, Awka Liaison Office, Anambra State, Nigeria]

Correspondence
Adelekan, Adeshola AJETUNMOBI
Dental Therapy Unit, Dentistry Department
Ekiti State University Teaching Hospital
Ado-Ekiti, Nigeria
Email: adesholaajetunmobi@gmail.com

ABSTRACT

Background: In dentistry, AI applications are increasingly being integrated into clinical practice. However, successful adoption depends largely on the awareness, knowledge, perceptions, and readiness of healthcare professionals, particularly dental therapists who play an important role in preventive and primary oral healthcare in Nigeria. This study assessed the awareness, knowledge, perceptions, and readiness for Artificial Intelligence integration among dental therapists in Nigeria.

Methods: A descriptive cross-sectional study was conducted among licensed dental therapists across Nigeria's six geopolitical zones. Participants were recruited from public and private healthcare facilities using purposive and stratified sampling techniques. Data were collected using a pretested structured, self-administered online questionnaire covering sociodemographic characteristics, awareness, knowledge, perceptions, perceived barriers, and readiness for AI adoption. Data were analysed using SPSS version 25. Descriptive statistics were used to summarise responses, while Chi-square tests, independent t-tests, and logistic regression were used for inferential analysis.

Results: A total of 112 dental therapists participated in the study, giving a response rate of 74.7%. Awareness of Artificial Intelligence was high, as 83.9% of respondents had heard of AI in dentistry. Knowledge of specific AI applications was moderate, with stronger knowledge in radiographic interpretation than in prosthodontics and periodontology. Respondents also had positive perceptions of AI, with 75.9% agreeing that AI can improve dental care quality and 69.6% agreeing that it enhances clinical decision-making. Readiness for AI integration was also high, as 75.0% were willing to adopt AI tools and 80.4% were willing to undergo AI-related training. Higher educational qualification and academic or research work settings were significantly associated with readiness for AI adoption.

Conclusion: Dental therapists in Nigeria demonstrated high awareness and positive perceptions of Artificial Intelligence, but gaps in detailed knowledge and practical readiness remain. Addressing these gaps through targeted training, curriculum integration, improved infrastructure, and institutional support is essential for effective and sustainable AI adoption in dental practice.

Keywords: Artificial Intelligence, Dental Therapy, Awareness, Knowledge, Perception, Readiness, Nigeria

Adelekan Adeshola Ajetunmobi
https://orcid.org/ 0009-0009-0647-8965
Assumpta, Ozioma Nwozor-Okpalaku
https://orcid.org/ 0009-0007-8327-593X

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INTRODUCTION

Artificial Intelligence (AI) is increasingly transforming healthcare through advanced analytical and decision-support systems that enhance diagnosis, treatment planning, and patient management. [19,21] In dentistry, AI technologies such as machine learning, deep learning, and convolutional neural networks are applied in caries detection, radiographic interpretation, and diagnostic support, thereby improving clinical precision and efficiency.[9,13,29]

In Nigeria, dental therapists constitute an essential component of the oral healthcare workforce, delivering preventive and basic restorative services under professional supervision[5,15]. Their responsibilities include oral health education, scaling and polishing, fluoride application, and community-based preventive care. With the ongoing digital transformation in dental practice, equipping dental therapists with AI-related knowledge is necessary to ensure a technologically competent workforce[16,20].

Despite the growing relevance of AI in dentistry, there is limited information on the level of awareness, knowledge, perceptions, and preparedness among dental therapists in Nigeria. Previous studies in other regions have shown varying levels of awareness and readiness among healthcare professionals, often influenced by training and exposure to digital technologies.[11,18,23]. This gap in evidence highlights the need for empirical assessment within the Nigerian context.

Therefore, this study aimed to evaluate the awareness, knowledge, perceptions, and readiness of dental therapists in Nigeria toward the integration of Artificial Intelligence in clinical dental practice.

THEORETICAL FRAMEWORK

This study is underpinned by the Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) Theory, both of which provide a framework for understanding the adoption of emerging technologies such as Artificial Intelligence in healthcare.

The Technology Acceptance Model, originally developed to explain user acceptance of information systems, posits that two primary factors, perceived usefulness and perceived ease of use, determine an individual's intention to adopt a technology[31]. In the context of this study, dental therapists' perceptions of Artificial Intelligence as a tool that enhances diagnostic accuracy and clinical decision-making reflect perceived usefulness, while their comfort with learning and using AI systems aligns with perceived ease of use. Previous studies have demonstrated that these factors significantly influence the adoption of AI technologies among healthcare professionals[2,3].

In addition, the Diffusion of Innovation Theory explains how new technologies spread within a population over time, influenced by factors such as awareness, perceived advantages, compatibility with existing practices, and social influence[20]. Within this framework, the high level of awareness observed among dental therapists represents the knowledge stage of adoption, while willingness to undergo training and adopt AI tools reflects progression toward the persuasion and decision stages. However, barriers such as inadequate training, high cost, and limited infrastructure may hinder movement toward full implementation.

Together, these frameworks provide a useful lens for interpreting the findings of this study. They explain not only the current level of awareness and perception of Artificial Intelligence among dental therapists but also the factors influencing their readiness and the challenges affecting adoption.

MATERIALS AND METHODS

This study adopted a descriptive cross-sectional research design to assess the awareness, knowledge, perceptions, and readiness for Artificial Intelligence integration among licensed dental therapists practising across Nigeria's six geopolitical zones: North-Central, North-East, North-West, South-East, South-South, and South-West. The cross-sectional design was considered appropriate for capturing population-level perceptions and trends at a single point in time, consistent with similar studies conducted among healthcare professionals assessing attitudes toward emerging technologies.[11,26]

Participants were recruited from both public and private healthcare facilities, including teaching hospitals and primary healthcare centres, to ensure diverse representation of practice settings. A representative sample size was determined using Taro Yamane's formula, while purposive and stratified sampling techniques were employed to achieve adequate regional distribution and enhance the generalisability of findings. Eligible participants were dental therapists registered with the Dental Therapists Registration Board of Nigeria, actively engaged in clinical practice, and who provided informed consent prior to participation.

Data were collected using a structured, self-administered online questionnaire designed to capture sociodemographic characteristics, awareness of Artificial Intelligence, knowledge of its applications in dentistry, perceptions toward its use, perceived barriers, and readiness for adoption. The questionnaire structure was adapted from previously validated instruments used in similar studies assessing Artificial Intelligence awareness and acceptance among healthcare professionals[11,18,23]. To ensure reliability and validity, the instrument was pretested among 20 dental therapists, yielding a Cronbach's alpha coefficient of 0.82, indicating good internal consistency and reliability of the measurement scale. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corporation, Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were used to summarise the data. Inferential statistical tests, including Chi-square tests, independent t-tests, and logistic regression, were applied to examine associations, group differences, and predictors of AI readiness. Results were presented in tables to enhance clarity and interpretation. Ethical approval for the study was obtained from the Ethics and Research Committee of Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. Informed consent was obtained electronically from all participants prior to data collection. Participation was voluntary, and confidentiality was maintained by ensuring that no identifying information, such as names or hospital identification numbers, was included in the data collection or reporting process, in accordance with standard ethical guidelines for human subject research.[17,20]

RESULTS

A total of 112 dental therapists participated in the study, yielding a response rate of 74.7%. The majority of respondents were female (64.3%) and below 40 years of age (72.3%), indicating a relatively young workforce. Most participants held a Higher National Diploma (66.1%), while 19.6% had a Bachelor's degree and 10.7% possessed a Master's degree. Employment distribution showed representation across government facilities (35.7%), private clinics (32.1%), academic or research institutions (10.7%), and other settings (21.5%).

Sociodemographic Characteristics Detailed sociodemographic characteristics of respondents are presented in Table 1: Response Rate and Regional Distribution. Out of 150 invited participants, 112 completed the questionnaire, resulting in a response rate of 74.7%. The distribution of responses across Nigeria's six geopolitical zones was relatively balanced, enhancing the representativeness of the study.

Table 1: Sociodemographic Characteristics of Respondents (N = 112)

Variable	Category	Frequency	Percent (%)
Gender	Male	40	35.7
	Female	72	64.3
Age (years)	<30	45	40.2
	30-39	36	32.1
	40-49	20	17.9
	≥50	11	9.8
Highest Qualification	HND	74	66.1
	BSc	22	19.6
	MSc	12	10.7
	Others	4	3.6
Employment Type	Government Facility	40	35.7
	Private Clinic	36	32.1
	Academic/Research	12	10.7
	Others	24	21.5

Table 2: Response Rate Across Geopolitical Zones

Geopolitical Zone	Invited	Responded	Response Rate (%)
North Central	25	18	72.0
North East	20	15	75.0
North West	20	14	70.0
South East	25	20	80.0
South South	30	22	73.3
South West	30	23	76.7
Total	150	112	74.7

Reliability of Instrument: The pilot-tested questionnaire demonstrated good internal consistency. Cronbach's alpha values for all domains exceeded the acceptable threshold, with an overall reliability coefficient of 0.82. **Awareness of Artificial Intelligence.** Awareness of Artificial Intelligence among respondents was high. A majority (83.9%) reported having heard of AI in dentistry. Furthermore, most respondents recognised its potential applications, including diagnosis (77.7%), treatment planning (73.2%), error reduction (69.6%), and patient management (66.1%).

Knowledge of AI Applications in Dentistry

Respondents demonstrated moderate knowledge of AI applications in dentistry. A substantial proportion correctly identified its use in radiographic interpretation (71.4%) and patient record management (62.5%). However, knowledge of AI applications in prosthodontics (60.7%), periodontology (58.0%), and oral lesion diagnosis (64.3%) was comparatively lower.

Perceptions and Attitudes Toward AI

Overall, respondents expressed positive perceptions toward AI integration in dental practice. The majority agreed that AI improves dental care quality (75.9%) and enhances clinical decision-making (69.6%). Additionally, 62.5% reported that AI tools are easy to learn and use. Concerns regarding job displacement were present but not predominant, with 55.4% disagreeing that AI would replace dental therapists.

Perceived Barriers to AI Integration

Several barriers to AI adoption were identified. The most commonly reported challenges included lack of training (73.2%), high cost of AI technologies (67.9%), limited infrastructure (62.5%), resistance from colleagues (53.6%), and low awareness of AI benefits (60.7%).

Readiness for Artificial Intelligence Integration

Respondents demonstrated a generally positive level of readiness toward the integration of Artificial Intelligence into dental practice. A total of 84 respondents (75.0%) indicated willingness to adopt AI tools in dental practice, while 90 respondents (80.4%) expressed willingness to undergo AI-related training. In addition, 86 respondents (76.8%) supported the integration of AI into dental practice, and 78 respondents (69.6%) indicated willingness to recommend AI use in dental therapy. These findings show that readiness for AI adoption was generally high, although practical implementation would require training, institutional support, and improved digital infrastructure.

Table 3: Reliability Analysis of Questionnaire (N = 20)

Scale / Domain	No. of Items	Cronbach's α	Interpretation
Sociodemographic Characteristics	6	-	Descriptive variables
Awareness of Artificial Intelligence	8	0.79	Acceptable reliability
Knowledge of AI Applications in Dentistry	7	0.81	Good reliability
Perceptions and Attitudes toward AI	9	0.84	Good reliability
Perceived Barriers to AI Integration	6	0.80	Good reliability
Overall Instrument	30	0.82	Good internal consistency

Table 4: Awareness of AI Among Respondents (N = 112)

Awareness Item	Yes	Percent (%)	No	Percent (%)
Heard of AI in dentistry	94	83.9	18	16.1
AI can assist in diagnosis	87	77.7	25	22.3
AI can improve treatment planning	82	73.2	30	26.8
AI can reduce errors	78	69.6	34	30.4
AI can assist in patient management	74	66.1	38	33.9

Table 5: Knowledge of AI Applications in Dentistry (N = 112)

Knowledge Item	Correct	Percent (%)	Incorrect/Don't Know	Percent (%)
AI in radiographic interpretation	80	71.4	32	28.6
AI in prosthodontics	68	60.7	44	39.3
AI in periodontology	65	58.0	47	42.0
AI in patient record management	70	62.5	42	37.5
AI in diagnosis of oral lesions	72	64.3	40	35.7

Table 6: Perceptions and Attitudes Toward AI (N = 112)

Perception Statement	Agree	Percent (%)	Neutral	Percent (%)	Disagree	Percent (%)
AI will improve dental care quality	85	75.9	15	13.4	12	10.7
AI may replace dental therapists	30	26.8	20	17.9	62	55.4
AI is easy to learn and use	70	62.5	28	25.0	14	12.5
AI enhances decision-making	78	69.6	22	19.6	12	10.7

Table 7: Perceived Barriers to AI Integration (N = 112)

Barrier	Yes	Percent (%)	No	Percent (%)
Lack of training	82	73.2	30	26.8
High cost of AI tools	76	67.9	36	32.1
Resistance from colleagues	60	53.6	52	46.4
Limited infrastructure	70	62.5	42	37.5
Low awareness of AI benefits	68	60.7	44	39.3

Table 8. Univariate Distribution of Readiness for AI Integration Among Respondents (N = 112)

Readiness Indicator	Ready / Supportive n (%)	Not ready / Unsure n (%)	Interpretation
Willingness to adopt AI tools in dental practice	84 (75.0)	28 (25.0)	High readiness for AI adoption
Willingness to undergo AI-related training	90 (80.4)	22 (19.6)	Strong interest in further training
Support for AI integration in dental practice	86 (76.8)	26 (23.2)	Positive professional acceptance
Willingness to recommend AI use in dental therapy	78 (69.6)	34 (30.4)	Positive advocacy for AI use
Overall readiness for AI adoption	82 (73.2)	30 (26.8)	Generally high readiness

Inferential Analysis Chi-square Analysis

Chi-square analysis revealed no significant association between gender and awareness of Artificial Intelligence ($\chi^2 = 0.92$, df = 1, p = 0.34).

Independent t-test

Independent t-test analysis showed a statistically significant difference in knowledge scores based on educational qualification. Respondents with higher qualifications (BSc/MSc) demonstrated higher knowledge scores compared to those with HND (t = 2.45, df = 108, p = 0.016).

Predictors of AI Readiness

Logistic regression analysis identified educational qualification and work setting as significant predictors of AI readiness. Respondents with higher educational qualifications were more likely to demonstrate readiness for AI adoption (OR = 2.15, p = 0.036), while those working in academic or research settings also showed increased readiness (OR = 1.95, p = 0.047). Age and gender were not statistically significant predictors.

Table 9: Chi-square Test: Gender vs Awareness of AI

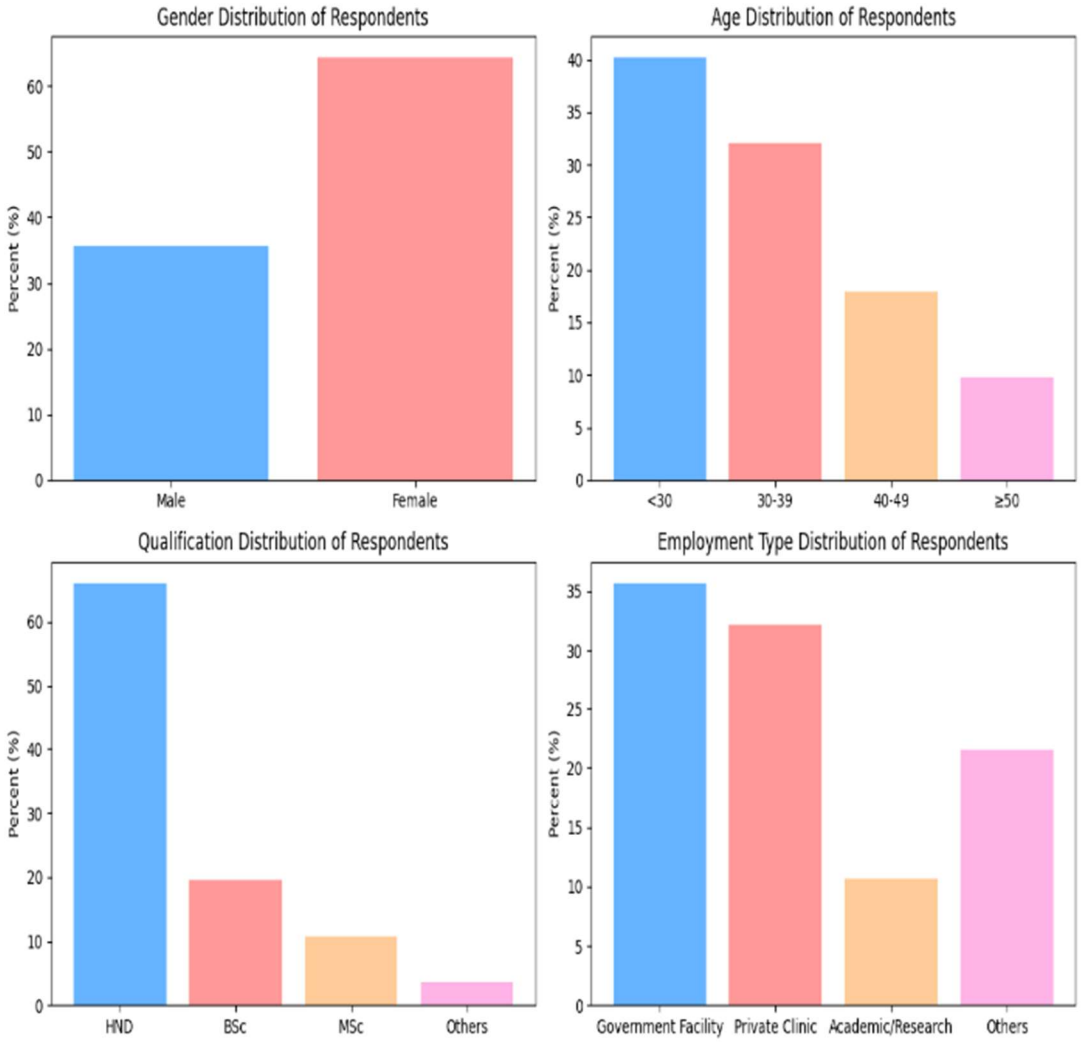
Heard of AI	Male	Female	Total
Yes	32	62	94
No	8	10	18
χ^2	0.92	Df	1
p-value	0.34		

Table 10: Independent t-test: Knowledge Score by Qualification

Qualification	Mean Knowledge Score	SD	T	df	p-value
HND	3.8	1.2	2.45	108	0.016*
BSc / MSc	4.2	1.0			

Table 11. Logistic Regression: Predictors of AI Readiness

Predictor Variable	OR	95% CI	p-value
Age ≥40 vs <40	0.88	0.45-1.72	0.71
Gender (Female vs Male)	1.10	0.56-2.15	0.78
Qualification (BSc/MSc vs HND)	2.15	1.05-4.42	0.036*
Work Setting (Academic/Research vs Others)	1.95	1.01-3.77	0.047*



DISCUSSION

This study assessed the awareness, knowledge, perceptions, and readiness of dental therapists in Nigeria toward the integration of Artificial Intelligence in dental practice. The discussion is presented in line with the objectives of the study.

Awareness of Artificial Intelligence

The findings showed a high level of awareness of Artificial Intelligence among dental therapists, as 83.9% of respondents had heard of AI in dentistry. Many respondents also recognised that AI could assist in diagnosis, treatment planning, error reduction, and patient management. This indicates that AI is becoming increasingly familiar among dental therapists in Nigeria, even though practical integration into routine dental therapy practice is still emerging.

This finding is similar to the findings of Dashti et al.[11], who reported that dental professionals generally showed good awareness of AI and its growing

relevance in dentistry. It is also comparable with Hasan et al.[18], who observed increasing awareness of AI among healthcare workers. The high awareness recorded in the present study may be due to the growing discussion of AI in healthcare, increased access to digital health information, and wider exposure to technology-related professional updates.

Knowledge of AI Applications in Dentistry

Although awareness was high, respondents demonstrated only moderate knowledge of specific AI applications in dentistry. Knowledge was higher in areas such as radiographic interpretation and patient record management but lower in prosthodontics, periodontology, and oral lesion diagnosis. This suggests that many dental therapists are aware of AI in general terms but may not yet have detailed understanding of its specialised clinical applications.

This finding is similar to Murali et al.[26], who reported that dentists were aware of AI but had limited detailed knowledge of its practical clinical applications. It is also consistent with Jeong et al.[23], who found that dental students and professionals required more structured education on AI use in dentistry. The moderate knowledge observed in this study may be linked to limited AI content in dental therapy training, lack of hands-on exposure, and the relatively new nature of AI integration in Nigerian dental practice.

Perceptions Toward Artificial Intelligence

Respondents generally had a positive perceptions of AI integration in dental practice. Most agreed that AI could improve dental care quality, support clinical decision-making, and enhance patient outcomes. However, some concerns were observed, particularly regarding possible job replacement and ease of use.

This finding is similar to Chen et al.[9] and Schwendicke et al.[29], who reported that dental professionals often view AI as a supportive tool rather than a replacement for human clinical judgment. However, the concern about job displacement is also similar to the findings of Roganović et al.[27], who noted that ethical concerns and professional uncertainty remain common issues in AI adoption. The positive perception in this study may be because respondents recognised the possible benefits of AI, while the concerns may be due to limited practical experience, inadequate formal training, and uncertainty about how AI may affect professional roles.

Readiness for AI Adoption

The findings showed that dental therapists were generally ready to adopt AI tools and undergo further training. Specifically, 75.0% of respondents were willing to adopt AI tools, while 80.4% were willing to undergo AI-related training. Readiness was significantly associated with educational qualification and work setting. Respondents with BSc/MSc qualifications and those working in academic or research environments showed greater readiness for AI adoption.

This finding is similar to Al-Qudimat et al.[2] and AlZaabi and Masters[3], who reported that higher educational exposure increased readiness and acceptance of AI among healthcare professionals. It also agrees with Hameed et al.[17], who identified training, institutional support, and digital infrastructure as major factors influencing AI adoption in healthcare. The higher readiness among respondents with advanced qualifications may be because they are more exposed to research, digital tools, and recent developments in healthcare. Similarly, those in academic or research settings may have better access to professional updates and innovation-driven environments.

Overall, the study shows that dental therapists in Nigeria are aware of AI and have positive perceptions toward its use. However, their knowledge and practical readiness still require improvement. Therefore, structured training, curriculum integration, policy support, and improved digital infrastructure are necessary for successful AI adoption in dental therapy practice.

CONCLUSION

The findings of this study indicate that dental therapists in Nigeria demonstrate high awareness of Artificial Intelligence and generally hold positive perceptions toward its integration into dental practice. However, their knowledge of specific AI applications and practical exposure remain moderate, highlighting a gap between awareness and competence. This gap is consistent with findings from previous studies among healthcare professionals, where awareness of Artificial Intelligence does not necessarily translate into practical proficiency[11,18].

The study further shows that dental therapists are receptive to AI adoption, especially where training and institutional support are available. However, lack of structured training programmes, limited exposure to practical applications, high cost of AI tools, and

inadequate infrastructure may constrain effective integration. These findings align with existing literature, which identifies training, accessibility of digital infrastructure, and institutional support as critical determinants of successful AI implementation in healthcare systems[17,25].

In addition, this research contributes insight into predictors of AI readiness, showing that higher educational qualifications and academic or research work settings are associated with increased preparedness for AI adoption. This suggests that embedding AI literacy into dental therapy curricula and continuous professional development programmes will be important in preparing the workforce for technological changes in dental practice.

LIMITATIONS

Despite the design and regional coverage of this study, some limitations should be acknowledged. First, the cross-sectional design captures perceptions and readiness at a single point in time and may not reflect changes in awareness or knowledge over time. Second, data collection relied on self-reported questionnaires, which may be subject to response bias. Third, although the sample included dental therapists from all six geopolitical zones in Nigeria, representation was not equal across all regions, which may affect generalisability. Finally, the study focused on awareness, knowledge, perceptions, and readiness without direct observation of practical AI use, limiting conclusions regarding actual clinical competency.

RECOMMENDATIONS

Based on the findings and limitations of this study, the following recommendations are proposed to enhance AI integration in dental therapy practice in Nigeria:

1. Curriculum Enhancement: Structured AI education should be incorporated into undergraduate and postgraduate dental therapy programmes to build foundational knowledge and practical skills.
2. Professional Development: Continuous professional development programmes, including workshops and hands-on training sessions, should be developed to improve practical competency among practising dental therapists[17,24].
3. Infrastructure Improvement: Dental facilities should invest in digital infrastructure, including software, hardware, reliable internet access, and technical support, to facilitate the adoption of AI technologies.
4. Policy and Regulation: Regulatory bodies such as the Dental Therapists Registration Board of Nigeria should establish policies and guidelines to ensure ethical, safe, and standardised use of AI in dental practice.
5. Research and Monitoring: Further research should be encouraged to evaluate the impact of AI integration on clinical outcomes, workforce readiness, and patient care delivery.

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Nil.

Conflict of Interest

None declared

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