Clinical Epidemiology and Global Health 36 (2025) 102200

Contents lists available at ScienceDirect

Clinical Epidemiology and Global Health

journal homepage: www.elsevier.com/locate/cegh

Original article

Perceptions and challenges of Artificial Intelligence adoption in Nigerian public healthcare: Insights from consultant doctors across five tertiary hospitals

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ARTICLE INFO

Keywords:
Artificial intelligence
Public healthcare
Consultant doctors
Nigeria
Data privacy
Healthcare ethics

ABSTRACT

Problem considered: Artificial Intelligence (AI) adoption in Nigerian healthcare settings faces unique challenges due to limited infrastructure, regulatory gaps, and varied levels of familiarity among healthcare professionals. This study explores consultant doctors' perceptions of AI adoption in public healthcare across five tertiary hospitals in Southwestern Nigeria.

Method: The study was conducted across five purposively selected public tertiary hospitals across five states. Using purposive sampling, 15 consultant doctors from specialties, including radiology, internal medicine, and emergency medicine, participated in semi-structured interviews. Data was collected through interviews that explored knowledge, challenges, and opportunities surrounding AI in healthcare. Following Braun and Clarke's framework, thematic analysis was used to identify key themes.

Results: The study revealed a nascent but growing awareness of AI's applications in healthcare, with familiarity primarily concentrated in diagnostic imaging and predictive analytics. While consultants acknowledged AI's potential to enhance diagnostic speed and accuracy, they also expressed concerns regarding diminished human interaction, the risk of diagnostic inaccuracies, and the potential for over-reliance on AI systems. Ethical considerations surrounding data privacy and the need for robust regulatory oversight were prominent. Participants emphasized the necessity for stringent data protection protocols and well-defined guidelines governing AI implementation.

Conclusion: Consultant doctors view AI as a potentially transformative tool for Nigerian public healthcare but underscore the critical need for comprehensive training programs, robust regulatory frameworks, and substantial infrastructural improvements to ensure its responsible and effective integration. Additionally, AI models must be customized to address Nigeria-specific healthcare challenges.

1. Introduction

Artificial Intelligence (AI) is reshaping numerous industries across the globe, driving a wave of innovation that is revolutionizing sectors such as finance, sports, public health, transport, and more. In finance, AI has optimized processes like fraud detection and algorithmic trading, while in sports, it is transforming performance analysis and enhancing fan engagement.[1,2] Public health surveillance systems are increasingly

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https://doi.org/10.1016/j.cegh.2025.102200
Received 18 December 2024; Received in revised form 18 September 2025; Accepted 7 October 2025
Available online 10 October 2025

relying on AI to predict disease outbreaks and manage pandemics, while in transportation, autonomous vehicles and AI-powered traffic management systems are improving mobility.[3,4] This technological evolution has left no domain untouched, and the healthcare sector is no exception.

In the past decade, AI has been particularly influential in transforming healthcare delivery, significantly enhancing various aspects of medical practice. From facilitating quicker and more accurate diagnoses to enabling continuous health monitoring through wearable devices, AI is easing the burden on healthcare professionals while improving patient outcomes.[5,6] These advancements have reached a point where robotic surgeries can now be performed remotely, allowing skilled surgeons to operate on patients hundreds of kilometres away.[7] The rapid integration of AI into healthcare is leading to more precise treatments, improved access to care, and innovations in medical procedures that result in better health outcomes.

There are already significant disparities in conventional healthcare delivery between developed and developing nations, and with the rise of AI, we seem to be heading down a similar path.[5,8] AI development and adoption are advancing rapidly in the West, where there is more robust infrastructure, technical expertise, and established regulatory frameworks to address emerging concerns like ethical issues and data privacy.[9,10] In contrast, many countries in the global south, including Nigeria, are only beginning to build the necessary infrastructure for electronic data collection and records management.[11] This lack of localized data and infrastructure complicates the integration of AI in healthcare. These countries not only face technical and resource challenges but also need to develop region-specific regulations and frameworks to address ethical and privacy concerns. Therefore, it is vital to assess local conditions and identify potential hurdles to adopting AI in healthcare.[12]

In the context of Nigeria, the healthcare system has steadily declined, leading to poor service delivery and growing challenges for its burgeoning population. Limited resources, brain drain, weak infrastructure, and a shortage of medical personnel have worsened the situation, creating significant gaps in healthcare access and quality.[13] AI could help address these gaps by improving diagnostics, patient care, and overall efficiency.[14] However, AI is still in its early stages or almost non-existent in Nigeria's healthcare.[15] Thus, it is crucial to understand how local professionals view AI adoption and what challenges may arise. This study, therefore, focuses on consultant doctors from five tertiary hospitals to explore their perceptions and the potential obstacles to integrating AI into Nigeria's healthcare system. By doing so, it provides valuable insights that could guide future efforts to implement AI and improve healthcare in the country.

2. Methodology

This study was conducted across five tertiary teaching hospitals in Southwest Nigeria in five states (Lagos, Oyo, Osun, Ondo, and Ekiti States). These government-owned public hospitals were purposively selected to ensure a broad representation of the healthcare landscape and capture varying perspectives on the adoption and use of AI in healthcare. They were not randomly selected, as the study aimed to include major tertiary institutions with diverse patient populations and specialties. Public hospitals were chosen because they serve a large and diverse patient population, making them well-suited for observing general trends and identifying concerns around AI adoption in healthcare delivery and research.

2.1. Participant selection

A purposive sampling approach was used to recruit 15 consultant doctors from various specialities, ensuring a broad representation of medical fields and levels of familiarity with AI. Three participants were chosen per state from departments where AI applications could significantly impact diagnostics, patient care, or research, including radiology, internal medicine, cardiology, and emergency medicine. While this sample size is relatively small for broad generalization, the current sample of 15 participants allowed for in-depth qualitative exploration across five different states and multiple specialties. This approach prioritized depth of insights over statistical generalizability, which aligns with the exploratory nature of this study.

2.2. Data collection

Data was gathered through semi-structured interviews guided by an interview protocol designed to explore three main areas: knowledge and perceptions of AI in healthcare, challenges and opportunities, and trust and regulatory concerns. The protocol included 12 open-ended questions, allowing participants to provide in-depth responses on specific aspects of AI's role in healthcare delivery and research. Each interview lasted approximately 45–60 min and was conducted either in-person or via secure online platforms, depending on participant availability.

2.3. Data analysis

Thematic analysis was employed to examine the data, following Braun and Clarke's six-phase framework. Interviews were transcribed verbatim, and codes were systematically generated to identify recurring patterns and themes. These themes were then reviewed and refined to highlight consultant doctors' perspectives on AI adoption in the public healthcare sector. Selected quotes were used to illustrate specific themes, providing authentic reflections of participant views. This approach allowed for a comprehensive understanding of both the potential benefits and challenges of AI adoption in Nigerian tertiary healthcare institutions, including any disparities in concerns across the selected states.

3. Results

3.1. Participant demographics

The study participants encompassed a diverse range of medical specialties, ensuring a comprehensive representation of perspectives on AI adoption within Nigerian public tertiary hospitals. Table 1 provides a snapshot of the sociodemographic details for the 15 consultant doctors interviewed.

Table 1
Demographic profile of consultant doctors participating in the study.

Participant ID	Age Range	Gender	Years of Experience	Specialization	State
R1	45–50	Male	12	Radiology	Osun
R2	45–50	Female	20	Internal Medicine	Oyo
R3	40–45	Male	11	Cardiology	Lagos
R4	40–45	Female	15	Pediatrics	Osun
R5	50–55	Male	25	Surgery	Ekiti
R6	40–45	Female	12	Neurology	Ondo
R7	45–50	Male	10	Oncology	Oyo
R8	45–50	Male	22	General Medicine	Ekiti
R9	40–45	Female	14	Emergency Medicine	Lagos
R10	40–45	Female	18	Obstetrics & Gynecology	Ondo
R11	50–55	Male	27	Pediatrics	Ekiti
R12	45–50	Female	12	Psychiatry	Lagos
R13	45–50	Male	20	Family Medicine	Oyo
R14	40–45	Female	10	Obstetrics & Gynecology	Osun
R15	40–45	Male	16	Surgery	Ondo

3.2. Thematic overview

The thematic analysis identified several key themes, with the frequency of their mentions illustrated in Fig. 1, while Fig. 2 summarizes how the themes influence AI adoption. Prominent themes included "Limited Awareness," "Familiarity with Applications," "Perception of Adoption," "Benefits of AI," "Concerns of Reduced Interaction," "Secondary Data Concerns," "Trust Issues," "Regulatory Responsibility," "Knowledge Gaps," and "Challenges & Opportunities." The distribution of mentions highlights a significant emphasis on the potential impact of AI on human interaction, data privacy concerns, and trust-related issues. Concurrently, the analysis revealed considerable discussion surrounding the anticipated benefits of AI and the need for robust regulatory frameworks. Details of each theme are provided subsequently.

3.2.1. Nascent and uneven awareness of AI in healthcare

The study revealed a nascent but evolving understanding of AI's applications among consultant doctors, characterized by a generally limited awareness that was, nonetheless, punctuated by pockets of familiarity with specific use cases. While many participants demonstrated a basic familiarity with AI concepts, their knowledge often lacked depth, particularly regarding practical implementation within their specific clinical contexts. Senior consultants generally exhibited a greater awareness of AI's theoretical underpinnings compared to their junior colleagues, even though their understanding tended to be more conceptual than operational. Despite this generally limited awareness, some consultants, particularly those working in urban settings, demonstrated familiarity with specific AI applications relevant to their fields, likely due to greater exposure to advanced technologies and potential pilot implementations. Applications such as AI-driven image analysis in radiology, automated data entry, and predictive analytics for patient management were acknowledged, albeit with varying degrees of perceived implementation. The following quotes illustrate this varied landscape of awareness:

- *"Some team members know AI can assist with pattern recognition in scans, but they're unsure how it integrates into our current workflows" (R3).*
- *"While I've read about AI in journals, it's mostly abstract for us without real-life examples in our setting" (R8).*
- *"We're aware of AI tools in radiology, especially for analyzing CT and MRI scans, which speeds up diagnosis considerably" (R1).*
- *"AI has shown promise in data analysis for managing patient histories and predicting outcomes, but it's rarely fully utilized" (R6).*

3.2.2. Perception and potential benefits of AI adoption

Perceptions regarding the adoption of AI varied significantly among clinicians and were also influenced by assumptions about patient acceptance. While some consultants, particularly those in urban hospitals, reported a degree of acceptance of AI as a supplementary tool, this was often tempered by concerns surrounding inadequate training and potential overreliance. Notably, perceptions of patient trust in AI were generally low, with concerns that AI might be perceived as a replacement for human doctors or a source of diagnostic errors. Furthermore, a generational divide was observed among clinicians, with younger professionals demonstrating greater openness to AI adoption compared to their more senior colleagues, who expressed concerns about the potential erosion of clinical judgment and expertise.

Despite these reservations, consultants acknowledged the significant potential of AI to transform healthcare delivery. They highlighted its promise in enhancing diagnostics, optimizing time management, and ultimately improving patient outcomes. The potential for AI to augment predictive capabilities and enhance efficiency in diagnosing and managing complex cases was particularly emphasized. The following quotes illustrate these varied perspectives, encompassing both the concerns and the anticipated benefits:

- *"Clinicians see AI as a helpful adjunct tool, but there's skepticism due to a lack of training on using it properly" (R14).*
- *"I feel patients would not trust AI; they might have fear that it may replace doctors or lead to errors in diagnosis" (R2).*
- *"Younger clinicians are more open to adopting AI, whereas senior staff are wary, fearing it might replace skilled decision-making" (R7).*
- *"AI could be transformative by reducing diagnosis time, allowing us to see more patients and focus on severe cases" (R1).*
- *"AI could provide insights into patient trends that would take us much longer to identify manually" (R13).*

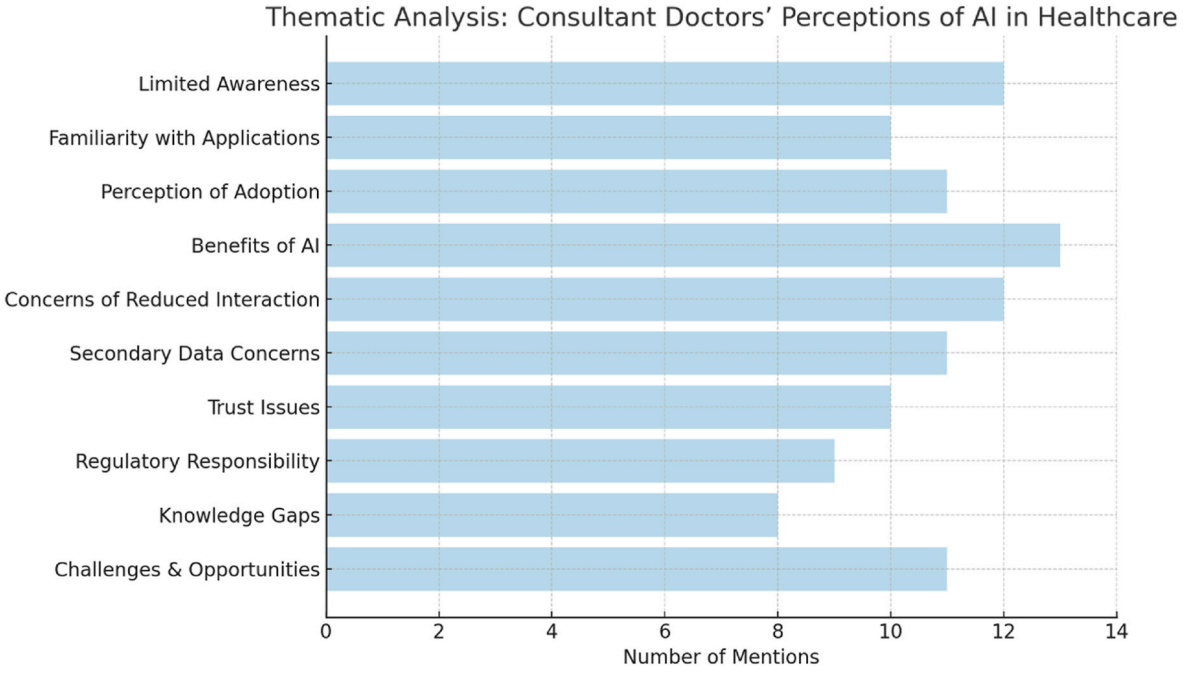

Fig. 1. Thematic analysis bar chart (AI- artificial intelligence).

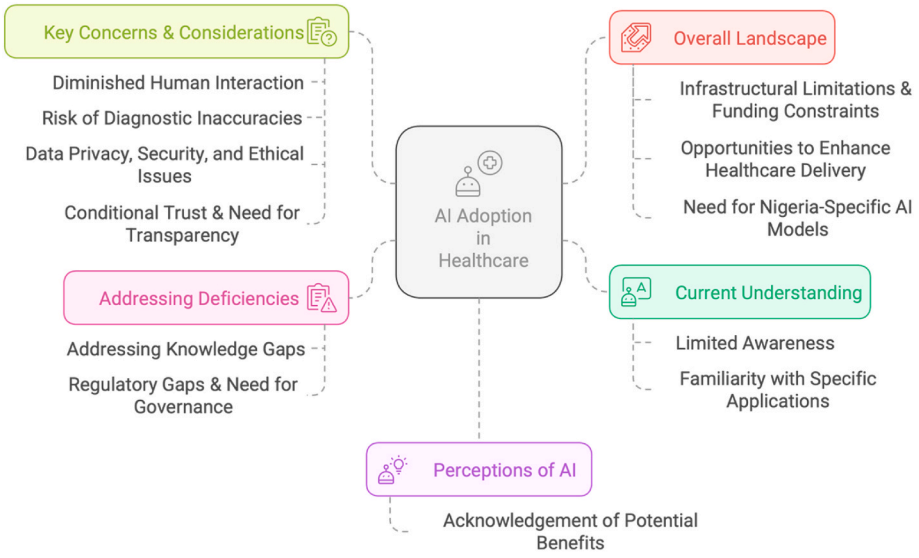

Fig. 2. Summary of major themes influencing AI adoption in Nigeria's public healthcare (AI- Artificial Intelligence).

3.2.3. Concerns over diminished human interaction and potential diagnostic inaccuracies

A prominent theme that emerged was the apprehension surrounding the potential for diminished human interaction in healthcare delivery and the risk of diagnostic inaccuracies associated with AI. Consultants expressed concerns that an overreliance on AI could erode the patient-doctor relationship, which is built on trust, empathy, and personalized care. They emphasized the inherently human element of healthcare, highlighting the importance of the doctor-patient bond and the potential for AI to be perceived as impersonal or detached. Furthermore, anxieties were raised regarding the possibility of misdiagnoses or over-reliance on AI-driven diagnostic tools, potentially leading to a decline in clinicians' critical assessment skills. These concerns are captured in the following quotes:

- *"Healthcare is personal. Patients may fear that an AI, rather than a human doctor, may someday handle their care, which might feel cold or impersonal" (R10).*
- *"Our biggest worry is misdiagnoses; AI can be a powerful tool, but it should always be validated by a human clinician" (R5).*
- *"There's this fear that reliance on AI could make doctors overly dependent on technology, possibly affecting their clinical judgement skills" (R12).*

3.2.4. Data privacy, security, ethical, and regulatory concerns in AI research and application

Significant concerns were raised regarding data privacy, security, and the ethical implications of using secondary data for AI research and application. Regulatory concerns were also raised. Consultants highlighted the risks associated with potential patient re-identification, even with anonymization, and expressed anxieties about the potential for data misuse or breaches. While AI was generally viewed as beneficial for research, worries about data transparency, control, and the need for stricter regulations, particularly concerning patient consent and data sharing across platforms or with third parties, were voiced. These concerns are reflected in the following responses:

- *"Using patient data for AI research, even anonymously, still feels invasive without proper consent" (R9).*
- *"Secondary data could be misused, and despite anonymization efforts, patients may still wary about how their data is managed" (R3).*
- *"In theory, the Ministry of Health oversees AI usage, but enforcement and policy clarity are lacking" (R2).*
- *"We need stricter rules for pseudonymization, especially when data is shared across platforms or with third parties" (R15)*
- *"AI could revolutionize healthcare research, but without strict oversight, it's easy for it to be misused" (R4).*
- *"We are supportive of AI in research, yet we worry about the transparency of data use, especially when there's a risk of breaching patient privacy" (R8).*
- *"We're hesitant to adopt AI widely until there are clearer guidelines on patient data usage in research" (R15).*
- *"Without strict regulations on secondary data, there's a real concern about unintended data misuse or leakage" (R5).*

4. Discussion and conclusion

The findings from this study offer a detailed perspective on consultant doctors' perceptions regarding AI adoption in public healthcare across five tertiary hospitals in Southwestern Nigeria. Overall, there is cautious optimism about AI's potential, balanced by practical concerns, trust issues, and regulatory uncertainties.

The findings from this study align with previous research in other developing countries. For example, a study on nurses in Bengal highlighted that healthcare professionals are viewed as the guardians of patients' confidential medical information.[16] Similarly, a large-scale study conducted in the United States involving over a thousand patients revealed that three out of every four patients expressed distrust toward AI in healthcare settings.[17] This reinforces the global nature of trust issues surrounding AI in medicine.[10] In Pakistan, a study found that only 21.3 % of 351 medical professionals had good familiarity with AI, and just 16 % understood its role in medicine.[18] Another study noted that only a handful of African countries such as Ghana, Morocco, and South Africa have made notable advancements in healthcare AI research and application.[19]

Even when healthcare workers are aware of AI's benefits, they may still hesitate to embrace it. For example, a study conducted in Saudi Arabia reported that while 74 % of healthcare workers in Jeddah private clinics believed they understood AI's computational principles, only half were willing to use AI in medical decisions.[20] This points to a key issue: knowledge does not necessarily translate to acceptance, with concerns about AI's limitations and ethical implications driving this hesitancy.

Despite the recognized potential of AI in healthcare, several secondary concerns were highlighted by the consultants. One major concern is the potential reduction of human interaction, which they believe is fundamental to building patient trust and ensuring high-

quality care. This concern has been echoed in other studies, which emphasize that patient-centred care is crucial for high-quality healthcare delivery, and AI has the potential to dehumanize this aspect of care.[20–22] Therefore, it is essential to prioritize maintaining human interaction with patients while leveraging AI primarily to handle backend tasks and support healthcare professionals without replacing direct patient engagement.

In addition, many participants feared that as AI becomes more integrated into healthcare, there could be an over-reliance on these technologies, potentially undermining clinical judgment, which is essential for nuanced decision-making. Consultants also emphasized the importance of validating AI-generated diagnoses through human oversight, expressing concerns about the accuracy of AI in certain diagnostic contexts. Our study's findings align with the reports from recent studies, who highlighted the risks of both over-reliance and excessive skepticism toward AI in healthcare.[23,24] They noted that placing too much trust in AI systems might lead to short-term efficiency but could result in more mistakes and patient harm over time. Conversely, a lack of trust, particularly due to AI's tendency for false positives, may lead to unnecessary tests and reduced efficiency.[20]

Also, the emphasis on regulatory oversight aligns with a recent study that examined AI adoption among Information Governance professionals in the UK, which found that despite AI's potential benefits, implementation must be underpinned by robust governance structures, with experts highlighting the critical importance of enhancing AI literacy among governance teams and establishing clearer regulatory frameworks to ensure safe and ethical deployment.[25] To address these concerns, it is crucial that any AI integration in healthcare includes a mandated layer of human oversight to ensure balanced and accurate decision-making.

AI models must be customized to address Nigeria-specific healthcare challenges. This adaptation should include developing systems that can function with intermittent power and internet connectivity, which remain significant challenges in many Nigerian healthcare facilities.[15] Additionally, AI solutions should be designed to address the specific disease burden prevalent in Nigeria, such as malaria, tuberculosis, and HIV/AIDS, rather than simply importing models trained on Western populations with different health profiles. Localized data collection strategies are essential to ensure AI systems are trained on representative Nigerian patient populations, accounting for genetic, environmental, and socioeconomic factors specific to the region. Recent findings from the successful implementation of a Gated Recurrent Unit (GRU) model for stroke prediction in Nigeria and other Sub-Saharan African countries, which achieved 77.48 % accuracy by focusing on locally relevant phenotypes and optimizing for computational efficiency demonstrates how AI systems can be effectively tailored to address region-specific challenges.[26] Furthermore, integration with existing healthcare workflows must be prioritized, with AI systems designed to complement rather than disrupt current practices in resource-constrained settings. This contextualized approach to AI development is critical for successful adoption in the Nigerian healthcare landscape.

In addition to these concerns, the consultants identified significant challenges related to the infrastructure and funding necessary for AI adoption (e.g. comprehensive training in AI ethics, data handling, and understanding AI's limitations). They believed that without proper education in these areas, there is a risk of healthcare professionals placing too much trust in AI systems, which could lead to adverse outcomes. These concerns are well-founded, as government allocation to healthcare has historically been less than 6 % of the total budget.[27] This underfunding has contributed to the ongoing deterioration of the healthcare system, leading to high out-of-pocket expenses in a country where nearly 50 % of the population lives in poverty.[28] For AI to be successfully implemented in healthcare, adequate funding structures must be established to ensure sustainable integration and access without additional burden on the public. Fig. 3 outlines recommendations for AI implementation in Nigerian healthcare.

Ultimately, harnessing AI's substantial promise for transforming Nigerian healthcare will necessitate addressing infrastructural limitations and regulatory gaps while simultaneously ensuring ethical practices in data handling and AI implementation. Future efforts must prioritize the development of comprehensive training programs tailored to the specific needs of healthcare providers, coupled with the establishment of robust regulatory frameworks that address the unique challenges posed by AI. Crucially, these regulatory frameworks should not only focus on mitigating risks but also on actively facilitating responsible AI innovation and integration within the healthcare ecosystem. Policy prescriptions should consider mechanisms for ongoing evaluation and adaptation of AI systems, ensuring their continued safety, efficacy, and alignment with ethical principles.

CRediT authorship contribution statement

David B. Olawade: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Conceptualization, Project administration, Supervision. **Aanuoluwapo Clement David-Olawade:** Writing – review & editing, Writing – original draft, Validation, Software, Methodology. **Manisha Nitin Gore:** Writing – review & editing, Writing – original draft, Methodology. **Ojima Z. Wada:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation.

Ethical considerations

Ethical approval for this study was granted by the Research Ethics Committee of Bowen University Teaching Hospital (Approval No:

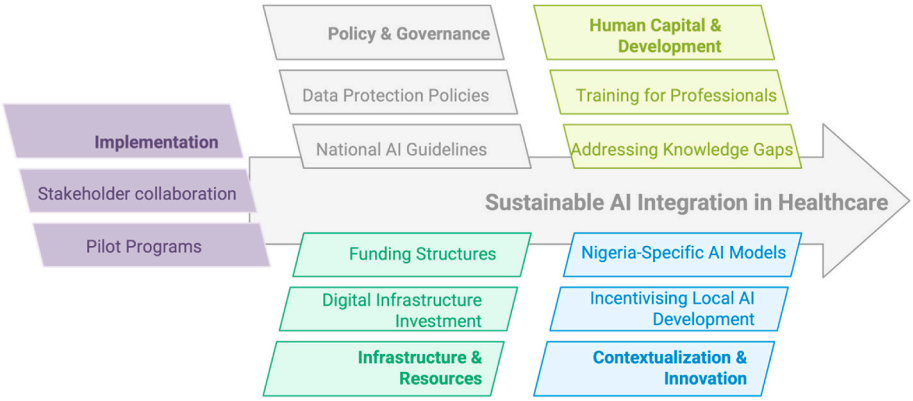

Fig. 3. Recommendations for AI implementation in Nigerian healthcare (AI- Artificial Intelligence).

BUTH/REC-1134). Before participation, written informed consent was sought and obtained from all individuals, with a clear explanation that their personal details would remain strictly confidential and no identifying information would be collected. The purpose, procedures, possible risks, and benefits of the study were carefully explained, and participants were reassured of their freedom to withdraw at any point without any negative consequences. To ensure confidentiality, participants were assigned unique codes rather than personal identifiers, and all data were securely stored. Throughout the research process, the emphasis remained on protecting participants' rights, privacy, and dignity.

Funding

None.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

None.

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