Original Research Article

Awareness, Use, and Barriers to Artificial Intelligence Tools in Healthcare Service Delivery among Health Professionals in South-East Nigeria

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Abstract

Artificial intelligence (AI) is rapidly transforming healthcare delivery worldwide, offering promising solutions to improve diagnostics, treatment, and administrative efficiency. This study assessed the level of awareness and extent of utilisation of AI-based tools among healthcare professionals in South-East Nigeria. A descriptive cross-sectional survey was conducted using a structured questionnaire distributed via Google Forms to 450 healthcare workers, including doctors, nurses, laboratory scientists, physiotherapists, radiographers, and health information officers. Descriptive statistics and chi-square analysis were employed to analyse the data. Results showed that while 64.4% of respondents were aware of AI technologies, only 30% reported actively utilising these tools in clinical or administrative practice. A significant association was found between professional role and AI awareness (χ^2 = 12.35, p = 0.02), with doctors exhibiting higher awareness than other groups. Key barriers to adoption included inadequate infrastructure (66.7%), insufficient funding (60%), limited technical expertise (55.6%), data privacy concerns (44.4%), and lack of regulatory frameworks (33.3%). These findings highlight the need for targeted investments in infrastructure, capacity building, and policy development to accelerate AI integration into healthcare in resource-constrained settings. The study provides valuable insights for policymakers, healthcare administrators, and technology developers aiming to harness AI's potential to improve health outcomes in Nigeria and similar contexts.
Keywords: Artificial Intelligence, Healthcare Delivery, AI Awareness, AI Utilisation, Healthcare Professionals, South-East Nigeria, Health Technology Adoption, Infrastructure Challenges, Data Privacy, Healthcare Innovation.

INTRODUCTION

Artificial intelligence (AI) is rapidly transforming the landscape of various industries, and healthcare is no exception, offering the potential to revolutionise medical practices and healthcare delivery worldwide (Guo & Li, 2018). The ability of AI to analyse large datasets, recognise patterns, and provide real-time insights has garnered considerable attention from healthcare professionals, researchers, and policymakers (Pham, 2025). The rapid integration of AI into healthcare is primarily fuelled by the confluence of two critical factors: the exponential growth in healthcare data generated through electronic health records and advancements in computing power (Akingbola *et al.,* 2024). These elements collectively pave the way for AI algorithms to learn, adapt, and assist in diverse healthcare applications (Radanliev & Roure, 2022; Varnosfaderani & Forouzanfar, 2024).

AI technologies are increasingly being applied in diagnostic imaging, predictive analytics, patient monitoring, drug discovery, and telemedicine, among other areas (Etori *et al.,* 2023; Faiyazuddin *et al.,* 2025). By enabling early detection of diseases, supporting clinical decision-making, and optimising treatment strategies, AI holds promise for significantly improving the quality of healthcare delivery. Moreover, AI applications such as natural language processing and robotic process automation are streamlining administrative processes, reducing workload, and minimising human errors in medical practices. Consequently, these innovations contribute to improved efficiency and better patient outcomes.

Despite these advancements, the adoption and utilisation of AI in healthcare are not uniform across regions and institutions. Assessing the current state of AI adoption in a specific region is crucial for understanding the challenges and opportunities associated with its implementation. While developed countries have made considerable progress in integrating AI into routine healthcare practices, developing countries, particularly those in Sub-Saharan Africa, face significant hurdles in harnessing the benefits of AI. These challenges include limited access to advanced technology, inadequate infrastructure, financial constraints, and a shortage of skilled professionals capable of implementing and managing AI systems (Ciecierski-Holmes *et al.,* 2022; Sunarti *et al.,* 2021). Additionally, ethical concerns such as data privacy, algorithmic bias, and the potential for misuse of AI tools continue to spark debate and call for the establishment of robust regulatory frameworks.

In the context of Nigeria, the healthcare system is already grappling with challenges such as inadequate funding, poor infrastructure, and a shortage of healthcare workers. The integration of AI-based tools presents both opportunities and obstacles in addressing these systemic issues. There is a growing need to examine how AI technologies are being adopted, the extent to which they are utilised, and the factors influencing their implementation in healthcare facilities. Such assessments are essential for informing policy decisions, guiding investment in infrastructure, and enhancing the capacity of healthcare professionals to effectively leverage AI solutions.

This study, therefore, focuses on assessing the awareness and extent of utilisation of AI-based tools in healthcare service delivery in South-East Nigeria. By exploring the perceptions, knowledge, and adoption levels of AI technologies among healthcare providers in this region, the research seeks to highlight gaps, identify challenges, and provide recommendations that can facilitate the effective integration of AI into healthcare delivery systems.

The primary objective of this study is to assess the adoption of AI-based tools in healthcare service delivery in South-East Nigeria.

Specifically, the study aims to:
1. To assess the level of awareness of healthcare professionals regarding AI-based tools in healthcare service delivery in South-East Nigeria.
2. To determine the extent of utilisation of AI-based tools in healthcare facilities within the region.
3. To identify the major challenges hindering the effective adoption of AI technologies in healthcare service delivery.

The study seeks to answer the following questions:

1. What is the level of awareness of healthcare professionals regarding AI-based tools in healthcare service delivery in South-East Nigeria?
2. To what extent are AI-based tools utilised in healthcare facilities within the region?
3. What challenges hinder the effective adoption and use of AI technologies in healthcare service delivery?

METHODS
Study Design
This study adopted a descriptive cross-sectional survey design to examine the adoption and application of AI-based tools in healthcare service delivery in South-East Nigeria. According to Nworgu (2015), a descriptive survey design is used to systematically collect information from a sample to describe the existing status of phenomena as they occur in their natural setting without manipulation. The design is appropriate because it enables the researcher to gather quantitative data from a wide range of healthcare professionals efficiently, providing insights into the prevalence and patterns of AI tool adoption. Furthermore, it allows for the assessment of relationships between variables such as demographic factors and AI use, facilitating evidence-based recommendations for enhancing healthcare delivery within the region.

Study Area
The study area is the South-East geopolitical zone of Nigeria, which comprises five states: Abia, Anambra, Ebonyi, Enugu, and Imo, covering about 29,525 square kilometres. According to the 2006 National Population Census, the region had approximately 16.3 million people, with projections estimating over 19 million by 2012 and more than 23 million by 2023, making it one of Nigeria's most densely populated zones. Historically, the South-East was part of the former Eastern Region and played a central role in Nigeria's civil war (1967–1970) through the Biafran secession. Despite this, the region rapidly recovered, largely due to the entrepreneurial spirit and rich cultural heritage of the predominantly Igbo ethnic group, known for their strong emphasis on education, innovation, and community development. Economically vibrant urban centres like Onitsha, Aba, Enugu, Owerri, and Abakaliki serve as hubs for trade, industry, and healthcare services. This region is predominantly inhabited by the Igbo ethnic group and is known for its high population density, rapid urbanisation, and diverse socio-economic activities. South-East Nigeria has a mix of public and private healthcare facilities ranging from primary health centres to tertiary hospitals, providing an ideal context for examining the adoption of emerging health technologies.

Sampling and Sampling Size
A total of 450 healthcare professionals were selected for this study using a multistage sampling technique. This method was adopted because it enables

the systematic selection of respondents from a large and geographically dispersed population, thereby enhancing representativeness (Creswell, 2014). In the first stage, major healthcare institutions, such as teaching hospitals, general hospitals, were purposively selected based on their higher likelihood of adopting AI-based tools in service delivery. In the second stage, healthcare professionals, including doctors, nurses, medical laboratory scientists, and health information officers, were randomly sampled from the chosen institutions to minimize selection bias and ensure a fair representation of different professional categories.

Study Procedure and Data Collection

The study was conducted in selected healthcare facilities within South-East Nigeria. Following approval from relevant institutional and ethical review boards, permission was sought and obtained from the management of the selected healthcare institutions to engage healthcare professionals in the study.

The instrument used for data collection was a self-structured questionnaire titled "Adoption of AI-Based Tools in Healthcare Service Delivery Questionnaire (AABTHSDQ). Data were collected using the structured questionnaire administered electronically via Google Forms. The questionnaire was designed to capture respondents' demographic information, awareness of AI-based healthcare tools, extent of utilisation, and perceived challenges to adoption. The Google Form platform allowed for easy distribution, efficient data collection, and automatic compilation of responses, which was particularly useful given the geographic spread of respondents across multiple states.

The link to the questionnaire was distributed through official emails, professional groups, and WhatsApp platforms commonly used by healthcare professionals. To maximise response rates, reminders were sent periodically. Participants were informed about the purpose of the study, assured of confidentiality, and their consent was obtained before filling out the questionnaire.

Data Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) software for analysis. Descriptive statistics such as frequencies, percentages, means, and standard deviations were computed to summarise respondents' demographic characteristics, levels of awareness, extent of utilisation of AI-based tools, and perceived challenges.

To examine relationships between demographic variables (such as age, profession, and years of experience) and AI adoption levels, inferential statistics, including chi-square tests, were conducted. The results were presented using tables and charts to facilitate clear interpretation.

RESULTS

Table 1: Socio-demographic information respondents (n=450)

| Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	230	51.1
	Female	220	48.9
Profession	Doctors	120	26.7
	Nurses	160	35.6
	Medical Laboratory Scientists	80	17.8
	Physiotherapists	35	7.8
	Radiographers	25	5.6
	Health Information Officers	30	6.7
Age	30–39 years	190	42.2
	40–49 years	150	33.3
	50 years and above	110	24.5
Years of Experience	≤ 5 years	170	37.8
	> 5 years	280	62.2

Table 1 shows that healthcare professionals in South-east, Nigeria were predominantly young (42.2% were 30-39 years old, 33.3% were 40-49 years old, 24.5% were 50 years and above) and highly experienced, with 62.2% having more than five years of work experience. Gender distribution was nearly equal (51.1% male, 48.9% female).
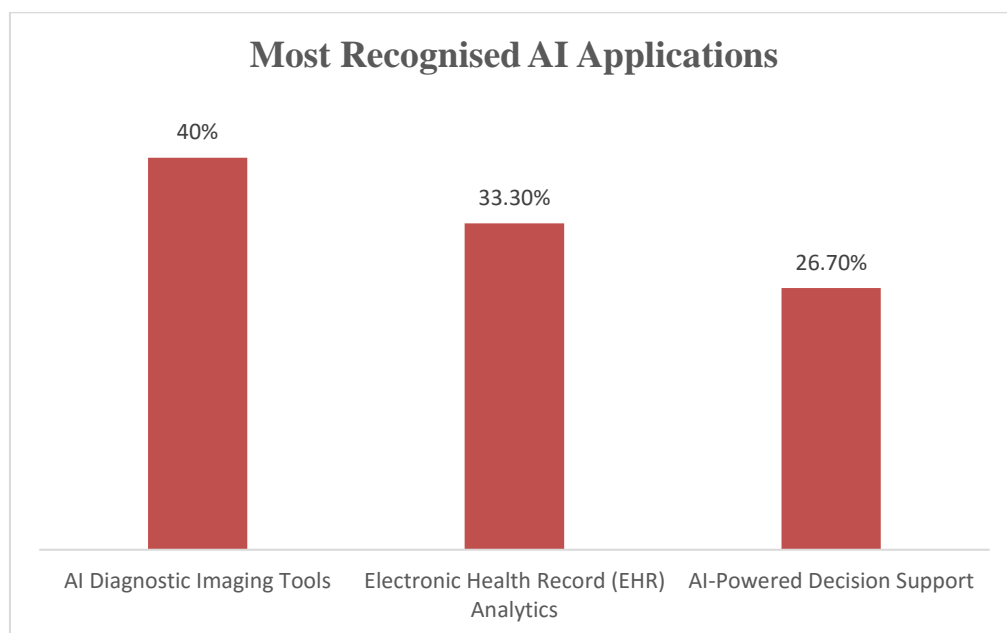
Table 2: Awareness of AI-Based Tools in Healthcare

Awareness Level	Frequency (n)	Percentage (%)
Aware	290	64.4
Low/Not Aware	160	35.6
Most Recognised AI Applications		
AI Diagnostic Imaging Tools	180	40.0

Electronic Health Record (EHR) Analytics	150	33.3
AI-Powered Decision Support	120	26.7
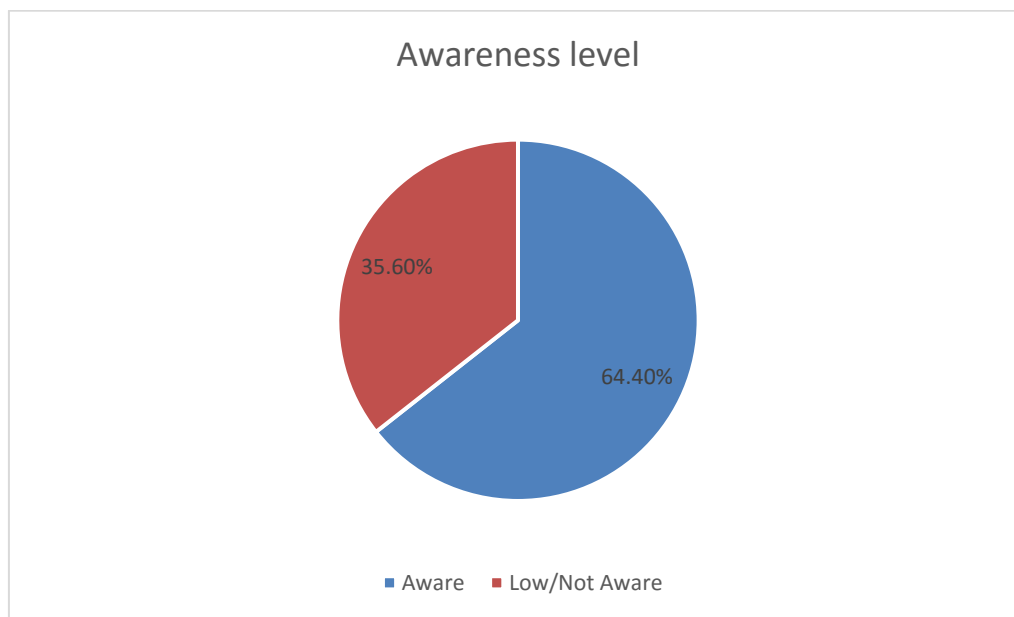
**Figure 1: Awareness level of AI-based tools**

Figure 2: Most Recognised AI Applications

The data from Table 2 reveals that a high percentage of healthcare professionals in the South East geopolitical zone in Nigeria are aware of AI-based Tools in Healthcare (64.4%). 40% are familiar with AI Diagnostics tools, 33.3 % recognised Electronic Health Record (EHR) Analytics, and 26.7% agreed that AI-Powered Decision Support are recognised AI Application.

Table 3: Extent of Utilisation of AI-Based Tools

Utilisation Level	Frequency (n)	Percentage (%)
Frequently Used	135	30.0
Rarely/Never Used	315	70.0
Commonly Utilised AI Applications		
Telemedicine Platforms	70	15.6
Chatbots for Patient Interaction	40	8.9
AI-Assisted Diagnostic Imaging	25	5.5
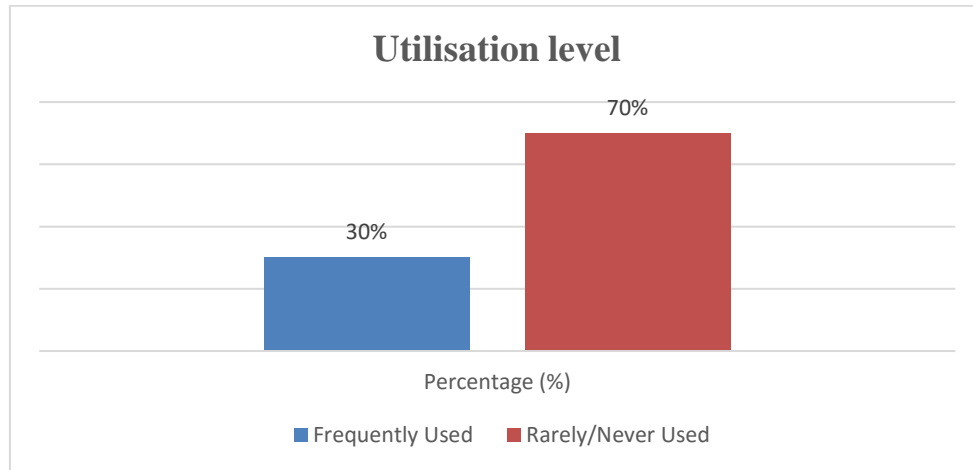
Figure 3: Utilisation level
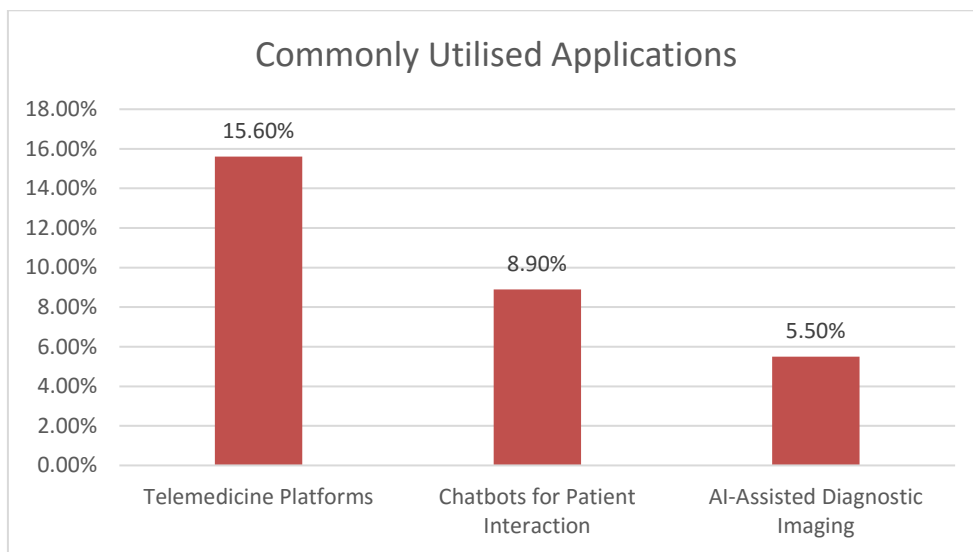
Figure 4: Commonly used AI Applications

The data from Table 3 reveals that a substantial majority 70% rarely/never used AI applications. Conversely, 30% of respondents frequently used some of the recognised AI applications in healthcare. 15.6% utilised telemedicine platforms, 8.9% commonly used Chatbots for Patient Interaction, while 5.5% used AI-Assisted Diagnostics Imaging

Table 4: Challenges Hindering AI Adoption

Challenge	Frequency (n)	Percentage (%)
Lack of Adequate Infrastructure	300	66.7
Insufficient Funding	270	60.0
Limited Technical Expertise	250	55.6
Concerns over Data Privacy and Security	200	44.4
Algorithmic Bias/Absence of Clear Policies	150	33.3

The data from Table 4 reveals that healthcare professionals in South-East, Nigeria, identified multiple factors hindering the adoption of AI-based tools in healthcare delivery. The most significant barrier was a lack of adequate infrastructure, such as unreliable internet connectivity, insufficient diagnostic equipment, which was reported by 66.7% of respondents. This was closely followed by insufficient funding, 60% indicating that financial constraints remain a critical obstacle to procuring and maintaining AI technologies. Limited technical expertise among healthcare workers was also highlighted by 55.6% of respondents, suggesting a need for targeted training and capacity building. Ethical and security concerns, such as data privacy, cybersecurity risks, and patient confidentiality, were cited by 44.4% of respondents, reflecting apprehension about trust and responsible use of AI. Lastly, 33% pointed to policy and regulatory gaps, including algorithmic bias and the

absence of clear government policies, as factors that limit the structured implementation of AI in the healthcare sector.

Table 5: Chi-square Analysis of AI Awareness and Utilisation by Profession

Profession	Aware (n)	Not Aware (n)	χ^2 Value	p-Value	Interpretation
Doctors (n = 120)	100	20			Significant association (p < 0.05)
Nurses (n = 160)	95	65			
Medical Laboratory Scientists (n = 80)	50	30	12.35	0.02	
Physiotherapists (n = 35)	20	15			
Radiographers (n = 25)	15	10			
Health Information Officers (n = 30)	10	20			

Note: χ^2 = 12.35, df = 5, p = 0.02

The data analysis indicates a statistically significant association between profession and awareness of AI-based tools, with professionals in tertiary-care roles (e.g., doctors) showing higher awareness than those in information management or supporting roles.

DISCUSSION OF FINDINGS

The findings revealed that a significant majority of healthcare professionals (64.4%) reported being aware of AI technologies and their potential applications in healthcare. This level of awareness aligns with recent studies such as those by Etori *et al.,* (2023) and Faiyazuddin *et al.,* (2025), which documented increasing recognition of AI tools among healthcare workers in developing countries. Such awareness is likely driven by global advancements in AI applications and the growing availability of digital health platforms. It reflects a positive trajectory toward embracing emerging technologies that could improve diagnostics, treatment planning, and patient care. Nonetheless, awareness alone does not guarantee adoption or effective use, and this distinction is critical in understanding technology uptake in healthcare.

Despite the encouraging awareness levels, the study found that the actual utilisation of AI-based tools remained relatively low, with only 30% of respondents indicating regular use of AI technologies in their healthcare practices. This finding echoes the observations of Ciecierski-Holmes *et al.,* (2022), who noted that AI adoption in resource-limited settings is still in its early stages, hindered by a variety of barriers. The gap between awareness and utilization suggests that healthcare providers recognize the benefits of AI but face significant constraints that prevent widespread implementation. This disparity highlights the need to move beyond awareness campaigns toward concrete strategies that facilitate the integration of AI tools into everyday healthcare workflows.

The chi-square analysis further underscored a significant association between healthcare professionals' roles and their level of AI awareness. Doctors exhibited the highest awareness levels compared to other healthcare professionals, such as nurses, laboratory scientists, and allied health workers. This disparity can be attributed to doctors' frequent interaction with diagnostic technologies and their involvement in continuous professional development programs, which often introduce emerging technological innovations. This finding aligns with the work of Radanliev and Roure (2022), who linked professional specialisation and exposure to technology as key drivers of AI readiness among healthcare workers. It also underscores the importance of targeted training and capacity building tailored to various healthcare roles to bridge awareness gaps.

Beyond individual knowledge, the study identified critical systemic challenges that hinder AI adoption in healthcare delivery. Among these, lack of adequate infrastructure was the most frequently cited barrier, reported by 66.7% of respondents. This includes deficiencies in reliable internet connectivity, power supply, and access to compatible diagnostic devices necessary for AI integration. Such infrastructural gaps are common in many low- and middle-income countries and severely limit the operational feasibility of AI tools. Insufficient funding, noted by 60% of respondents, compounds this problem, as healthcare facilities struggle to allocate resources for acquiring, maintaining, and upgrading AI-enabled technologies. These findings mirror those of Sunarti *et al.,* (2021), who emphasized that financial constraints and infrastructural inadequacies are major obstacles to digital health innovation in developing contexts.

Ethical concerns, particularly regarding data privacy and security, were also prominent, with 44.4% of respondents highlighting apprehensions around patient confidentiality and cybersecurity risks. These issues are critical because AI applications often require large volumes of sensitive patient data, making robust data governance frameworks essential to protect individuals' rights and maintain trust in the healthcare system. The absence of clear regulatory policies and legal frameworks, noted by 33.3% of respondents, further complicates AI implementation. Without well-defined guidelines, healthcare providers may be reluctant to

adopt AI tools due to fears of liability, misuse, or unintended biases embedded in algorithms. This policy vacuum calls for urgent government and institutional action to develop comprehensive AI governance frameworks that address ethical, legal, and social implications.

The study illustrates a complex interplay between individual awareness, professional exposure, and systemic factors in shaping AI adoption in healthcare. While knowledge and interest in AI technologies are growing among healthcare workers in South-East Nigeria, substantial infrastructural, financial, ethical, and regulatory barriers persist. Addressing these challenges requires a multi-pronged approach that includes investment in health infrastructure, sustainable funding models, capacity building for diverse healthcare professionals, and the establishment of clear regulatory frameworks. Such efforts are critical to unlocking AI's potential to enhance healthcare quality, efficiency, and equity in the region.

CONCLUSION

This study has shown that while there is a growing awareness of artificial intelligence (AI) tools among healthcare professionals in South-East Nigeria, the actual use of these technologies in healthcare delivery remains limited. The high level of awareness reflects increasing recognition of AI's potential to improve diagnostics, treatment, and overall patient care. However, the gap between awareness and utilisation highlights persistent challenges such as inadequate infrastructure, insufficient funding, limited technical expertise, and concerns around data privacy and ethical governance. The significant association between professional role and AI awareness further emphasises the need for tailored training and education to equip all healthcare workers with the skills required to effectively adopt AI tools. To harness the full benefits of AI in healthcare, concerted efforts must be made to address these systemic barriers through improved investment, policy development, and capacity building. Ultimately, such measures will enhance the integration of AI into healthcare services, contributing to better health outcomes across the region.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed to enhance the awareness, adoption, and effective utilisation of AI-based tools in healthcare service delivery in South-East Nigeria:

1. Government and healthcare stakeholders should prioritise the development of robust infrastructure, including reliable internet connectivity, stable power supply, and modern diagnostic equipment, to create an enabling environment for AI integration in healthcare facilities.
2. Tailored training programs and continuous professional development initiatives should be designed for healthcare workers at all levels to improve their technical skills and confidence in using AI tools. Special attention should be given to non-physician health professionals to bridge existing awareness and utilisation gaps.
3. Healthcare institutions should explore partnerships with private sector organisations, international donors, and government agencies to secure funding for acquiring and maintaining AI technologies. Innovative financing strategies could help overcome resource limitations.
4. Policymakers need to establish clear guidelines and legal frameworks that address data privacy, ethical considerations, algorithmic transparency, and liability issues related to AI use in healthcare. This will foster trust among healthcare providers and patients alike.
5. Continuous advocacy and sensitisation programmes should be implemented to raise awareness about the benefits and limitations of AI in healthcare among healthcare professionals, patients, and the general public to encourage acceptance and responsible use.

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