

Awareness, Perception and Usage of Artificial Intelligence Tools in Medical Research Among Nigerian Doctors

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ABSTRACT

Background: Artificial intelligence (AI) is revolutionizing medical research by enhancing data analysis, literature synthesis, and decision-making processes. While global adoption is growing rapidly, the extent to which Nigerian medical doctors are aware of, perceive, and utilise AI tools in research remains unclear.

Objective: To assess the awareness, perception, and usage of artificial intelligence tools among medical doctors involved in research in Nigeria, and to identify socio-demographic factors associated with their use.

Methods: A cross-sectional study was conducted using a structured, self-administered online questionnaire distributed among medical doctors across the six geopolitical zones of Nigeria. The questionnaire covered socio-demographic characteristics, awareness and usage of AI tools, perceptions regarding AI, and barriers to adoption. Data were analysed using SPSS version 27. Descriptive statistics were used to summarise variables, while Chi-square tests were applied to determine associations between socio-demographic factors and awareness or usage of AI tools. Statistical significance was set at $p < 0.05$.

Results: A total of 474 respondents participated in the study. The majority were male (72.4%), aged between 30 and 49 years, and practising in the North Central zone (54.2%). Most respondents (96.8%) were aware of AI tools for medical research, but only 64.3% of those aware had used them. The most recognised AI tool was ChatGPT (71.7%). The perceived benefits included faster data

processing (82.7%) and improved accuracy (71.1%), while major barriers were a lack of training (93.5%) and ethical concerns (63.7%). Gender ($p = 0.048$), region ($p = 0.011$), and field of practice ($p = 0.047$) were significantly associated with AI awareness and usage.

Conclusion: Awareness of AI tools among Nigerian medical doctors is high; however, actual usage remains low. Perceived benefits are strong, but significant barriers persist, particularly in training and ethical clarity. Targeted training and institutional support are recommended to facilitate broader and more effective AI knowledge and utilisation for medical research in Nigeria.

Keywords: Artificial intelligence, Medical Research, Awareness, Perception, Nigeria, AI tools, Healthcare innovation

Introduction

The integration of artificial intelligence (AI) into healthcare and medical research is transforming the landscape of modern medicine [1]. AI, defined as the ability of computer systems to perform tasks that normally require human intelligence, such as learning, reasoning, and problem-solving, is increasingly being used to augment various aspects of clinical practice and biomedical investigations [2]. In medical research, AI tools have shown remarkable promise in areas such as literature search automation, data analysis, natural language processing, diagnostic predictions, image recognition, and predictive analytics [3]. These tools are not only enhancing efficiency and accuracy but also offering insights that may have previously been difficult to uncover through traditional methods [4].

Globally, the adoption of AI in research is growing at an unprecedented pace. Institutions and individual researchers are leveraging AI technologies to manage large datasets,

optimise research workflows, and accelerate scientific discovery [5]. In high-income countries, AI has already been integrated into advanced diagnostic platforms, clinical trials, genomics, drug discovery, and personalised medicine [6], [7]. However, in low- and middle-income countries (LMICs) like Nigeria, the adoption of AI in medical research is still in its formative stages [8].

Nigeria, the most populous country in Africa with over 200 million people, currently has an estimated 55,000 licensed medical doctors, yielding a doctor-to-population ratio of approximately 1:3,636. This is significantly below the World Health Organization's recommendation of 1:600. Compounding this shortage is the ongoing "brain drain," which has seen over 16,000 doctors emigrate in the past five years in search of better working conditions and opportunities abroad [9], [10]. This creates an urgent need for innovative solutions to optimise the capacity of the available workforce.

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AI-powered clinical tools, if well understood and adopted, could bridge some of these gaps and could represent one way to increase the quantity and quality of medical care [8].

While several studies have explored the awareness, perception, and usage of artificial intelligence (AI) in healthcare and medical education globally, there remains a significant gap in research focusing specifically on the use of AI tools in medical research among Nigerian doctors. Most existing studies, such as a Nigerian cross-sectional study conducted among medical students and lecturers in universities [11], and a tertiary-institution study among medical students [12], have focused on medical students and academic institutions. Similarly, broader Nigerian healthcare workforce studies assessing the perceptions of AI in service delivery and healthcare systems [13], [14] evaluated healthcare professionals generally without specifically addressing research applications.

However, AI has become an increasingly powerful tool in medical research as it enhances literature reviews, data analysis, manuscript writing, and evidence synthesis [15]. Despite this, no comprehensive national study has assessed how Nigerian medical practitioners use AI tools in their research work. Given Nigeria's growing research output and the global shift toward AI-assisted scientific investigation, this study is both timely and necessary. It provides insights into current levels of awareness, usage, and barriers to AI integration in medical research among Nigerian doctors, and offers data that can inform targeted training, policy development, and investment in AI capacity-building for Nigerian researchers.

METHODOLOGY

Study Setting

The study was conducted in Nigeria, which is in West Africa and is the continent's most populous nation, with an estimated population exceeding 200 million people [9]. The country is divided into six geopolitical zones: North-Central, North-West, North-East, South-East, South-South, and South-West. Each zone encompasses a diverse range of medical institutions, including teaching hospitals, federal medical centres, state-owned hospitals, and private healthcare facilities, where medical research activities are conducted. As of 2024, Nigeria had approximately 55,000 licensed medical doctors [10].

Study Design

A descriptive cross-sectional study design was employed for this research.

Study Population

The study population comprised licensed medical doctors practising in Nigeria. Eligible participants included general practitioners, resident doctors, consultants, and academic staff involved in medical research activities.

Inclusion and Exclusion Criteria

Inclusion criteria included medical doctors who were currently involved in or had previously participated in medical research were eligible to participate. Only respondents who provided informed consent and completed the questionnaire in full were included. House officers and interns not yet engaged in research activities were excluded. Also, any questionnaire with incomplete responses was excluded from the analysis.

Sampling Technique

The study utilised a non-probability purposive sampling technique. This method was considered suitable due to the specific target population which includes medical doctors with research experience, who are relatively accessible via professional platforms. The questionnaire was distributed electronically through various medical forums, including WhatsApp groups, emails, and professional social media platforms frequented by Nigerian doctors.

Sample Size Determination

The sample size is calculated using the Kish-Leslie formula for cross-sectional studies [16].

$$n = \frac{Z^2 Pq}{d^2}$$

Where n is the desired sample size, and Z is the standard normal deviation, usually set at 1.96, which corresponds to the 95% confidence interval and 0.05 degree of accuracy (d). The proportion (P) of Nigerian doctors aware of AI tools in medical research was 57.2%, obtained from a nationwide Nigerian healthcare workforce study on knowledge and perception of artificial intelligence in healthcare [13]. To compensate for non-response, 10% is assumed as the attrition factor. Therefore, the minimum sample size is 420; however, 474 medical doctors participated in the study.

Data Collection

Data collection was carried out using a structured, self-administered online questionnaire developed by the researcher, incorporating elements from previously validated instruments to ensure content validity and comparability. The questionnaire was hosted on a secure online survey platform and distributed electronically over twelve weeks. The survey instrument included sections adapted from relevant literature and validated tools used in studies assessing digital health literacy and technology acceptance among healthcare professionals. Key components of the questionnaire were informed by the Technology Acceptance Model (TAM), which evaluates perceived usefulness and ease of use, two core determinants of technology adoption [17]. Also, items related to awareness and integration of AI tools in research were designed regarding questionnaires used in prior studies assessing AI use in clinical and academic settings. To further ensure the validity of the instrument, a pretest was conducted with a small group of 15 medical doctors across different specialities who were not part of the final sample. Feedback from this pilot test was used to refine ambiguous items and improve the clarity of the questionnaire.

The first section of the questionnaire captured socio-demographic details such as age, gender, region of practice, years of experience, and medical speciality. The second section assessed awareness and usage of AI tools, including specific tools used for literature search, data analysis, image recognition, and natural language processing (NLP). The third section focused on perceptions of AI, exploring beliefs about its benefits, potential risks, and future integration in research. The final section addressed barriers to AI adoption and factors that could encourage its use. The questions were predominantly closed-ended, with multiple-choice options and Likert-scale formats where appropriate.

Data Analysis

Data were exported from the online survey tool, cleaned using Microsoft Excel software version 365 and analysed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics, such as frequencies and percentages, were used to summarise the data. These included the distribution of respondents by age, gender, region, and level of experience, as well as patterns of AI awareness and usage. The Chi-square (χ^2) test of independence was used to determine whether variables such as gender, age, region, academic qualification, and years of practice were significantly associated with AI awareness and utilisation. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval for this study was obtained from the appropriate Health Research Ethics Committee with reference number BSUTH/MKD/HREC/2024/092. Participation in the study was voluntary, and electronic informed consent was obtained from each respondent. The survey was designed to maintain anonymity, and no personal identifiers were collected. Participants were informed that they could decline participation or withdraw from the study at any time without any consequences. Data collected were stored securely and used solely for the purpose of this research.

RESULTS

A total of 474 medical practitioners participated in the study. The mean age of the respondents was 41.2 (7.6), with the majority between the ages of 30 and 49. Males constituted 72.4% of the participants, while females made up 27.6%. Respondents were predominantly from the North Central region of Nigeria (54.2%), followed by the Southwest (16.2%), and the Northeast (9.5%). Regarding academic qualification, most held an MBBS degree (34.2%) as their highest qualification, followed by Membership (29.5%) and Fellowship (21.9%). A minority had PhDs (2.3%) or master's degrees (10.8%). The field of medical practice was most commonly Obstetrics and Gynaecology (25.3%), followed by Surgery (12.4%) and Family Medicine (9.9%). In terms of experience, 40.3% had practised for 11–20 years, while only 11.8% had over 21 years of experience (Table 1).

Most respondents (96.8%) reported being aware of AI tools used in medical research, although only 9.2% described their knowledge as very good, while 19.0% rated it as poor. Tools such as NLP (e.g., ChatGPT) were the most recognised (71.7%), followed by literature search tools (39.9%) and data analysis tools (38.4%). Despite high awareness, actual usage was lower. Among those aware, only 64.3% had ever used AI tools in their research. Regarding current involvement in research, 71.9% reported being actively involved. Of those, only 12.9% fully integrated AI into their ongoing research, while 56.0% used it partially and 31.1% did not at all. Satisfaction with AI usage was mixed, with 48.9% remaining neutral. Only 14.9% were very satisfied, and 6.0% expressed dissatisfaction (Table 2).

A large proportion of respondents (93.5%) believed that AI would become essential in medical research, while 75.9% felt it could replace some human tasks. The perceived benefits of AI included faster processing (82.7%), improved accuracy (71.1%), enhanced decision-making (65.4%), and trend identification (62.0%). Major barriers identified were lack of training (93.5%), ethical concerns (63.7%), and resistance to change (69.6%).

Factors that would encourage adoption included training/workshops (88.0%) and availability of affordable tools (62.9%). Concerns regarding AI use included over-reliance (78.5%), ethical/legal issues (71.3%), and job displacement (42.8%). Despite this, 77% indicated they were likely or very likely to use AI in their next research (Table 3).

Statistically significant associations were found between gender and awareness of AI tools ($\chi^2 = 3.876, p = 0.048$), with a higher percentage of awareness among females (98.5%) compared to males (96.2%). There was also a significant association with the region of practice ($\chi^2 = 14.752, p = 0.011$), with North Central showing the highest awareness (98.8%). Other socio-demographic factors like age, qualification, years of practice, and field of practice did not show statistically significant associations with awareness (Table 4).

Among respondents who were aware of AI tools, the field of medical practice showed a statistically significant association with AI tool usage ($\chi^2 = 21.206, p = 0.047$). All anaesthetists and radiologists reported using AI, while fields such as pathology and paediatrics reported lower use. Other factors, including gender, age, region, qualification, and years of practice, were not significantly associated with AI use (Table 5).

DISCUSSION

Our study revealed a high level of awareness (96.8%) of AI tools among Nigerian medical practitioners, with ChatGPT being the most recognised (71.7%). However, only 9.2% rated their knowledge as “very good”, while 19.0% considered it poor. These findings are consistent with a Nigerian tertiary-institution study among medical students which found that although 99.4% had heard of AI, only 3.2% were familiar with its real-world applications [12]. Similarly, a multi-institutional Nigerian university study involving medical students and lecturers reported average AI knowledge levels, with students outperforming lecturers [11]. The higher awareness among Nigerian doctors in our study may reflect the increasing public exposure and accessibility of AI platforms such as ChatGPT, which have become widely used. The limited depth of knowledge despite high awareness may be explained by the absence of structured training in AI, as also reported in both the tertiary-institution student study and the Nigerian medical education study [11], [12], [18]. This mismatch implies that while doctors are aware of AI tools, many lack the foundational competencies required to apply them confidently in medical research. It therefore points to the need for structured AI education programmes targeted at healthcare professionals.

While 64.3% of doctors aware of AI tools had used them in research, only 12.9% reported full integration into ongoing research projects. This limited adoption aligns with findings from a Nigerian healthcare workforce perception study where awareness of AI was relatively high but practical utilisation remained emerging [13]. Our usage rate is higher than the 44% reported among medical students in a South-South Nigerian tertiary institution, suggesting that practicing doctors may be more inclined to experiment with AI in real research activities compared with students still in training [18]. However, barriers such as limited institutional support, inadequate infrastructure, and insufficient guidance on integrating AI into research workflows likely limit full implementation. This discrepancy between awareness and actual usage highlights the need for translational initiatives that convert theoretical awareness into practical research skills, particularly in settings where AI can significantly improve efficiency and analytical capability.

A significant majority (93.5%) believed AI would become essential in medical research, and about three-quarter agreed it could replace some human tasks. This optimism is comparable with findings from a Nigerian healthcare professionals' perception study where most respondents believed AI would augment human intelligence and enhance healthcare delivery [19]. Similarly, the nationwide Nigerian healthcare workforce study reported that about 77% of participants believed machine learning could improve healthcare service delivery and complement human decision-making [13]. Another Nigerian study examining healthcare workers' perception of AI adoption also demonstrated strong confidence in the potential of AI to reduce medical errors and support clinical practice across specialties [14]. However, concerns about over-reliance on AI (78.5%) and ethical or legal challenges (71.3%) are consistent with findings from the Nigerian healthcare professionals' perception study where many respondents expressed ethical concerns regarding AI implementation [19]. Similar concerns were also observed in the Nigerian medical education study where students and lecturers feared that AI could dehumanise healthcare and erode clinical skills [11]. This dual perception, enthusiasm combined with caution, emphasises the need for responsible AI integration that maintains ethical safeguards and preserves clinical judgment.

The dominant barrier identified in this study was lack of training, followed by resistance to change and ethical concerns. Comparable findings were reported in an international study of healthcare professionals' readiness for artificial intelligence, where nearly four-fifths of respondents had never attended any formal AI training and identified training as the most important facilitator for adoption [20]. The consistency of this finding across different professional groups suggests that inadequate training is a systemic challenge rather than an issue restricted to specific regions or specialties. Resistance to change may also be influenced by unclear regulatory frameworks and the absence of institutional policies guiding AI integration in research and clinical practice. Addressing these gaps would require multi-level strategies including policy-driven training mandates, incorporation of AI into continuing professional development programmes, and advocacy by professional medical bodies.

In our study, females demonstrated significantly higher awareness than males, which contrasts with findings from the Nigerian university-based study of medical students and lecturers where gender was not significantly associated with AI awareness [11]. This difference may be attributable to sampling distribution or greater digital engagement among female practitioners in the North-Central region, which recorded the highest awareness level in this study. Regional variation in AI awareness is also consistent with findings from the nationwide Nigerian healthcare workforce study that documented differences in AI literacy across geopolitical zones, likely reflecting disparities in technological infrastructure and access [13]. These findings highlight the importance of region-specific strategies to ensure equitable dissemination of AI knowledge across Nigeria.

The field of medical practice demonstrated a statistically significant association with AI usage, with anaesthetists and radiologists showing the highest usage rates. This observation aligns with findings from a Nigerian radiology-focused study which identified radiologists as early adopters of AI due to the technology's strong applicability to imaging-based diagnostics [21].

Conversely, specialties such as pathology and paediatrics exhibited lower adoption rates, possibly because fewer AI tools are currently tailored to their routine clinical and research workflows. Machine learning applications in medical imaging have existed since the 1980s, and more recently deep learning algorithms have become widely used in imaging modalities such as CT, MRI, PET, and ultrasonography [22]. This pattern indicates that AI integration strategies should be tailored to specific specialties, addressing their unique research workflows and technological needs.

In our study, over three-quarters of respondents indicated they were likely or very likely to use AI in future research. This strong intention demonstrates substantial readiness within the medical community for broader AI adoption. Similar enthusiasm has been reported in the Nigerian university-based study of medical students and lecturers where respondents expressed willingness to use AI despite limited training [11]. Likewise, the nationwide Nigerian healthcare workforce study reported that more than two-thirds of healthcare professionals supported future AI adoption in healthcare [13]. These findings suggest that the medical community is receptive to AI innovation; however, successful implementation will depend on the availability of structured training, supportive institutional policies, and accessible AI platforms.

This study has several limitations. Being cross-sectional, it captures a snapshot in time, limiting causal interpretations. Data were self-reported, which may be subject to recall or social desirability bias. Although geographically diverse, the sample was skewed toward North Central Nigeria, which may limit national representativeness. Also, the questionnaire for the study was distributed mainly online and may have excluded doctors with limited internet access or digital literacy.

In conclusion, the study found high awareness but relatively limited knowledge and usage of AI tools in medical research among Nigerian doctors. While most participants acknowledged the value of AI, particularly in enhancing research speed, accuracy, and decision-making, actual integration into research was low. Lack of training, ethical concerns, and resistance to change were major barriers. However, the strong interest in future use suggests significant potential for growth, especially with targeted support and education.

We recommend that, to bridge the gap between awareness and usage, structured AI training should be introduced through workshops and professional development programs. It's important to emphasize applications specific to different medical specialties, especially in areas with less frequent use, like pediatrics and pathology. In addition, healthcare organizations should work to improve access to affordable AI tools and the necessary infrastructure.

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