Original Article

Artificial Intelligence in Healthcare: Insights into Medical Doctors' Knowledge, Perceptions, and Attitudes in Sokoto, Nigeria

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ABSTRACT

Artificial intelligence is rapidly transforming many industries, and healthcare is one of the most promising areas. Its integration could fundamentally change how diseases are diagnosed, treated, and managed, as well as improve the overall operation and delivery of healthcare services worldwide. This study aimed to determine the knowledge, perception and attitude of medical doctors towards the use of Artificial intelligence. Using stratified sampling technique, we recruited medical doctors across all cadre of doctors in the clinical departments of Usmanu Danfodiyo University Teaching Hospital and Specialist Hospital in Sokoto, north-western Nigeria. Having obtained informed consent, the data was collected using self-administered questionnaires. It was then analyzed using SPSS V25 for windows and level of significance was set at $p<0.05$. Almost all (176, 98.9%) of the respondents have heard of artificial intelligence, but 50.0% never think it will reach clinical value. Also, (152, 85.4%) believed that AI will improve healthcare and (66, 37.1%) believed AI would not consider emotional well-being. More than half (95, 53.4%) believed AI will lead to loss of job. In addition, (83, 46.6%) believed AI will improve the efficiency of their practice and (143, 80.3%) were willing to embrace AI if trained. There was no significant association between the age, years of experience and familiarization with Artificial intelligence among the participants. Medical doctors generally indicated good knowledge and perception towards the use of Artificial intelligence in healthcare. However, the attitude towards AI utilization among medical doctors was affected by lack of formal training and sensitization programs.

Keywords: Artificial intelligence, Attitude, Knowledge, Medical doctors, Perception

INTRODUCTION

Artificial Intelligence (AI) denotes the science and engineering of creating intelligent machines using algorithms or rules, which the machines use to mimic human cognitive functions, namely, learning and problem solving[1]. AI is referred to as the computer technologies that emulate mechanisms supported by human intelligence, namely, adaptation, deep learning, reasoning, engagement, and sensory understanding[2,3]. It aims to imitate human cognitive functions, thus bringing paradigm shift in health care, driven by the increasing availability of health data and the rapid growth of analytical techniques[4]. This technology has potential for realizing sustainable development objectives, especially in Africa, where it may tackle healthcare issues. Despite historical pilot projects, AI adoption in African healthcare remains limited, with opportunities for growth and collaboration to leverage its potential effectively[5]. These may likely

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be due to poor knowledge, perceptions, and attitudes to AI.

The surge of COVID-19 has however, accelerated the rise in the use of AI in healthcare, thus enabling better patients' participation in decision-making. The recent advances in biomedical sciences, offer new opportunities for healthcare reform, thus creating more knowledge and better perception about AI. AI applications in African healthcare have since then, shown modest progress, improving diagnosis, treatment planning, predictive human resource planning, and drug authentication, highlighting potential innovation opportunities[5]. AI can be used to control or monitor chronic diseases like diabetes, hypertension, and asthma using non-invasive wearable sensors[6].

The smart sensor system is a form of AI that combines various sensors can be used to monitor physiological variables and sends data to the cloud for analysis, facilitating elderly care[7]. This is against the traditional patient monitoring method which relies on Health Care Professionals' time, management and often involves invasive methods. Remote Patient Monitoring (RPM) integrates novel Internet of Things (IoT) methods, such as contact-based sensors and wearable devices, to examine vital signs and physiological variables, supporting medical decision-making[8]. It can be used to search scientific research works, integrate various types of data, and support drug innovation[9].

AI is revolutionizing various aspects of medical practice, including diagnostic services, patient engagement, rehabilitation, virtual care, medical research, drug discovery, and administrative applications[10]. In medical imaging and diagnostics, AI aids in early disease detection by analyzing medical images with precision. For example, the Ultromics platform in Oxford can detect ischemic heart disease patterns in echocardiography scans[11]. AI also enhances diagnostic accuracy across various diseases, such as breast cancer, skin cancer, eye diseases, and pneumonia[12]. It can also predict psychotic episodes and screen for neurological conditions like Parkinson's disease[10]. In clinical decision-making, AI helps physicians to make informed decisions by processing vast patient data. AI-powered decision support systems can streamline workflow processes, enhance efficiency, and improve care quality[13].

Patient engagement and compliance are crucial in healthcare, and AI interventions, such as mobile apps, online portals, and wearable devices, may help establish continuous communication channels with patients, promoting better self-management of chronic conditions and overall wellness[14]. AI technologies are revolutionizing rehabilitation, healthcare, and drug discovery. Rehabilitation programs are integrating physical and virtual interventions, empowering individuals with disabilities to regain mobility and independence[10]. Virtual patient care is a paradigm shift, allowing healthcare providers to deliver timely interventions and monitor patient health remotely[6].

AI algorithms analyze physiological data from wearable sensors, enabling early detection of disease trends and proactive interventions[6]. In medical research and drug discovery, AI enables researchers to analyze complex datasets, identify novel targets, and accelerate drug development. Virtual screening techniques can expedite lead compound identification, reducing time and cost associated with traditional methods[10].

The burning questions incudes how much do the medical doctors know about the use of AI in medical practice? what are their perceptions about it and what is their attitude towards the use of AI in medical practice in Sokoto? These questions are yet to be answered, despite the increasing global integration of AI into medical practice. This study therefore, explored the knowledge, perception and attitude of medical doctors towards the use of Artificial intelligence in Sokoto, Nigeria.

MATERIALS AND METHODS

Study settings

The study was conducted in Sokoto metropolis, Sokoto state, Nigeria, with an estimated population of 858,005 in four local government areas. The predominant tribes are Hausa and Fulani, and Islam is the main religion of her inhabitants[15]. The tertiary health facilities within the metropolis includes Usmanu Danfodiyo University Teaching Hospital

and Specialist hospital, Sokoto.

Study design

This was a descriptive cross-sectional study.

Study population

The study population comprised of medical doctors who work in various departments of Usmanu Danfodiyo University Teaching Hospital (UDUTH) and Specialist hospital, Sokoto (SHS).

Inclusion and exclusion criteria

Medical doctors who have been working in Usmanu Danfodiyo University Teaching Hospital and Specialist hospital Sokoto, for at least six months. They must have consented to take part in the study. Doctors on annual leave and those working in the administrative departments were excluded from the study.

Sample size determination

The sample size was determined using the formula for determining proportion of a population less than 10,000.[16] One hundred and seventy-eight (178) eligible medical doctors were enrolled into the study.

Sampling technique

A stratified sampling technique was used to select the respondents. The study population was divided into two; faculty of surgery which consist of departments of surgery, obstetrics and gynecology, and anesthesiology and faculty of medicine which consists of departments of internal medicine, psychiatry and community medicine.

In each of the departments, the respondents were stratified into various cadre (consultants, resident doctors, medical officers, and house officers). Within each cadre, proportionate sampling was done using simple random sampling to select the respondents.

Data collection

Instruments of data collection

A semi structured interviewer administered questionnaire was used to collect data from the study participants adapted from previous studies.17,18 The questionnaire was used to collect participant's demographic information, knowledge, perception and attitude to AI use in medical practice. The questionnaire was built in excel (xlsx format) and loaded into the ODK (xml format) for android phones which was used by the researchers for data collection.

Pretesting of study instruments

The research instruments were pretested among 20 medical doctors who work as academic staffs of the basic pre-clinical and basic clinical sciences of Usmanu Danfodiyo University, Sokoto. This led to good understanding of the questionnaire and adjustments were made where necessary.

Data analysis

The data was transferred from ODK server into IBM® Statistical Package for Social Sciences (SPSS) version 25 for analyses. Descriptive statistics (mean, standard deviation, frequency and percentage) was used to summarize the socio-demographic and knowledge, perception and attitude of the respondents towards Artificial intelligence use. Chi-square was used to analyse at bivariate level to determine the association between the variables. The level of significance was set at 5% ($p<0.05$).

Ethical consideration

Ethical clearance was obtained from the Health Research and Ethics Committee of both Specialist hospital Sokoto and Usmanu Danfodiyo University teaching hospital, Sokoto. Permission was obtained from various heads of departments where the study took place. Respondents were informed about the objectives of the study as well as their rights to refuse participation with no negative consequences. Written informed consent was obtained.

RESULTS

Knowledge of Artificial Intelligence among the participants

A total of 178 medical doctors responded to the questionnaire. Nearly all (176, 98.9%) have heard of artificial intelligence, (89, 50.0%) didn't think it will reach clinical practice and (5, 2.8%) were not familiar with the use of artificial intelligence in healthcare. (Table 1)

Perception towards the use of Artificial

intelligence among the participants

The majority (152, 85.4%) perceived that AI will improve healthcare, (66, 37.1%) alleged that AI doesn't have emotional well-being and cannot be applied to every patient, (95, 53.4%) thought that AI will lead to loss of job. (Table 2)

Attitude towards the use of AI in healthcare among the participants

Majority (91, 51.4%) of the respondents were not concerned about the replacement of clinical specialists by Artificial intelligence, (83, 46.6%) had confidence that AI will improve the efficiency of their practice and (143, 80.3%) were willing to embrace AI if appropriate training is provided. (Table 3)

Table 1: Knowledge of Artificial Intelligence among the participants

Variables	Frequency (N)	Percentage (%)
Have you heard of artificial intelligence?		
Yes	176	98.9
No	2	1.1
I don't know	0	0
Have heard of deep machine language?		
Yes	105	59.0
No	66	37.1
I don't know	7	3.9
Is AI sometimes called machine intelligence?		
Yes	124	69.7
No	20	11.2
I don't know	34	19.1
Can AI function in learning and problem solving?		
Yes	136	76.4
No	15	8.4
I don't know	27	15.2
Is the intelligence demonstrated by machines different from the intelligence displayed by humans?		
Yes	133	75.0
No	25	14.0
I don't know	20	11.2
How familiar are you with AI use in healthcare?		
I know of research application of AI in my specialty but I don't think it will reach clinical practice	89	50
I have heard of AI before but I did not realize it has application to my specialty	63	35.4
I have never heard of AI before	5	2.8
Others	21	11.8

Table 2: Perception towards the use of Artificial Intelligence among the participants

Variables	Frequency (N)	Percentage (%)
Do you think that ai will improve health care?		
Yes	152	85.4
No	12	6.7
I don't know	14	7.9
Do you think it will eliminate the human factor?		
Yes	74	41.6
No	91	51.1
I don't know	13	7.3
Will it lead to loss of job?		
Yes	95	53.4
No	68	38.2
I don't know	15	8.4
What do you think are the advantages of using AI in health care?		
AI can help in reducing the number of medical errors	64	36.0
AI can speed up the management process in healthcare	67	37.6
AI can deliver clinically relevant and high -quality data in real time	44	24.7
Others	3	1.7
Do you envisage any challenge with AI practice in developing country?		
Yes	135	75.8
No	21	11.8
I don't know	22	12.4
Which problems are you concerned regarding the application of AI in healthcare		
Does not consider the emotional wellbeing of patient	66	37.1
Not flexible enough to be applied to every patient	66	37.1
Cannot be used to provide opinions in an unexpected situation	37	20.8
Others	9	5.1

Table 3: Attitude towards the use of AI in healthcare among the participants

Variables	Frequency (N)	Percentage (%)
Do you think AI will replace some clinical specialists?		
Yes	79	44.4
No	91	51.1
I don't know	8	4.5
Do you think integration of AI will affect your efficiency?		
With appropriate training AI could increase the efficiency of my practice	83	46.6
AI will increase the efficiency of my practice	55	30.9
AI will decrease the efficiency of my practice	25	14.0
I am unsure	15	8.4
If AI is proven to be valuable and safe decision support tool in your field, will you be comfortable using AI in your practice		
I can learn it with a dedicated course and workshop	134	75.3
I lack knowledge about AI and I can't learn it right now	18	10,1
I don't use computers beyond basic use	24	13.5
Others	2	1.1
Is there any form of AI in your facility?		
Yes	32	18.0
No	109	61.2
I don't know	37	20.8
Do you know anywhere in your environment where AI is practiced?		
Yes	53	29.8
No	82	46.1
I don't know	43	24.2
Has there been any form of formal training regarding AI in your facility?		
Yes	37	20.8
No	95	53.4
I don't know	46	25.8
Has there been any form of training regarding AI in your facility?		
Yes	47	26.4
No	74	41.6
I don't know	57	32.0
Has there been any form of awareness or sensitization of AI practice in your facility?		
Yes	68	38.2
No	50	28.1
I don't know	60	33.7
Are you willing to embrace AI if training is provided?		
Yes	143	80.3
No	17	9.6
I don't know	18	10.1

DISCUSSION

The study reveals that nearly all respondents have heard of AI, with a substantial proportion who were aware of deep machine learning. This suggests a high level of general AI awareness but potentially limited understanding of more specific AI subfields. Furthermore, about two-third correctly identify AI as machine intelligence, and three-quarter recognized its ability to learn and solve problems. However, a noticeable gap remained in deeper AI understanding, as evidenced by the one-fifth who were uncertain about AI's classification and a few who were unsure of its problem-solving capabilities. These findings align with global trends where healthcare professionals were found to be aware of

AI use but lacked in-depth knowledge of its technical aspects.[19]

Although nearly all the respondents believed AI will improve healthcare, half of the participants did not think it will enrich clinical practice. This skepticism might stem from infrastructural deficiencies or lack of training regarding AI's practical implementation in resource-limited settings.[20] Moreover, only a third of respondents acknowledged AI's applications in their specialties, highlighting the need for targeted educational interventions.

The primary perceived benefits of AI in healthcare include reducing medical errors, expediting management processes and delivering real-time clinically relevant data. These findings are consistent with studies indicating that AI can enhance diagnostic accuracy and operational efficiency.[21] However, significant concerns persist regarding AI's emotional insensitivity, inflexibility and inability to handle unexpected situations. Such concerns emphasize the necessity of integrating human error into AI-driven medical decision-making.

AI's impact on employment remains a contentious issue. While more than half feared job losses due to AI, half did not believe it will replace clinical specialists. These mixed sentiments highlight the need for workforce adaptation strategies, such as AI-assisted rather than AI-replacement models.[22] Importantly, majority of respondents were willing to embrace AI if adequate training is provided, reinforcing the role of capacity-building initiatives in fostering AI adoption.

The study indicates that only few of respondents reported AI presence in their facilities and a meagre amount of the participants acknowledged formal AI training. This lack of structured AI education could explain why more than half of the participants were unaware of any AI training programs. Addressing these gaps through AI-focused curricula and professional workshops is essential for seamless AI integration into healthcare practice.[23]

CONCLUSION AND RECOMMENDATIONS

The findings suggest that while AI awareness is high among healthcare professionals in Sokoto, there are significant gaps in understanding of its details and confidence regarding its clinical applications. The worries regarding AI's emotional intelligence, flexibility and impact on employment highlight the importance of targeted education and regulatory frameworks. Increased AI training programs, institutional AI implementation and policy-driven AI integration strategies will be crucial for maximizing AI's benefits in the Nigerian healthcare sector. Government should therefore, provide modern infrastructures in hospitals to enhance AI utilization among medical doctors. Also, there should be regular capacity building on information and communication technologies as well as the basics of Artificial intelligence.

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Conflict of Interest

There is no conflict of interest in this study

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