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An Assessment of Knowledge, Perception and Barriers to the Use of Artificial Intelligence in Medical Practice among Doctors in A Nigerian Tertiary Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Artificial intelligence (AI) is the application of machine-based systems designed to replicate human problem-solving and decision making processes. The relevance of AI cuts across hospital data management, consultation and treatment recommendations, patient engagement and adherence, and administrative undertakings. Application of AI in healthcare is meant to improve the

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quality of healthcare and not to replace the health workers. This study examined the knowledge, perception and barriers to the use AI in medical practice among physicians in a Nigerian tertiary hospital with the aim of exploring the prospects and future of AI in clinical practice in our environment.

Materials and Methods: This was a descriptive cross-sectional study among 110 physicians. A multistage sampling technique was employed, where a simple random sampling and stratified random sampling methods were adopted for stage 1 and 2 respectively. All the statistical analyses were done using IBM statistics package for social sciences (SPSS) version 21. Associations between the variables were tested for statistical significance using appropriate statistical tools. The level of significance was set at $p<0.05$.

Results: The mean age of the respondents was 38.3±11.1 years. The majority (94.5%) of the participants have heard of AI and the internet was the main source of information (58.2%). Majority (81.8%) of the respondents had interest in training in AI and 83.6% were willing to use AI. Poor funding (38.2%) was the major barrier in the application of AI. Majority (86.4%) of the respondents had a good perception about AI, have heard of the application of AI in medical practice (85.5%), and believed AI can improve health services delivery (80%). However, few of the respondents (25.5%) had applied AI to their medical practice.

Conclusion: This study showed that majority of the physicians were aware of AI and were also willing to use it in their medical practice. Also, it was observed that majority of the physicians had good perception about AI. However, only a quarter of the participants have applied AI in their clinical practice.

Keywords: Artificial intelligence; doctors; knowledge; willingness; perception.

1. INTRODUCTION

Artificial intelligence (AI) embodies the utilization of machine-based systems created to mimic human problem-solving and decision-making processes [1]. AI, specifically deep learning-enabled systems, can offer numerous advantages in clinical care [2]. AI is like a smart tool in computers that helps them understand information just like how our brains do [3]**.** In today's healthcare system, there is an increasing use of AI to ehance the quality of health service delivery and healthcare outcomes for patients and healthcare professionals [4].

Numerous applications of AI are already integrated into the medical field, encompassing tasks such as online appointment scheduling, check-ins at medical centers, digitalization of medical records, reminder calls for follow-up appointments, and alerts for immunization dates for children and pregnant women. Drug dosage algorithms and warnings about adverse effects when prescribing multidrug combinations also benefit from AI technology [2,4-8]. These systems can effectively address challenges such as workforce shortages, ensuring consistency in medical practice, and standardizing the quality of care. In addition, the anticipated benefits of AI include cost reduction, improved treatment, and enhanced healthcare accessibility.

However, clinicians expressed some unwillingness to use AI for obtaining medical history and requesting laboratory tests. Concerns were raised about potential dehumanization of healthcare, reduced ability to improvise, and risks to privacy [6,9-15]. The fear that patients might perceive AI systems as the primary caregivers, relegating physicians to mere signatories, accentuated the concerns expressed by the GPs. Furthermore, the introduction of AI into healthcare raised serious questions about data privacy and security [12,13]. The interconnectedness of AI-enabled systems with the internet rendered patient and physician data vulnerable, potentially leading to unauthorized access and misuse [7,8,12,13].

While theAI technological advancements promise groundbreaking solutions to long-standing healthcare challenges, ensuring responsible deployment is imperative. Addressing the anxieties of healthcare professionals requires robust regulations, transparent guidelines, and ethical frameworks that safeguard patient privacy, maintain the integrity of the physician-patient relationship, and preserve the unique expertise of healthcare professionals. This research holds significance in evaluating physicians' understanding and willingness to incorporate artificial intelligence into medical practice, specifically in patient management and the treatment of various medical conditions. By

assessing the knowledge, perception and barriers to the use AI in medical practice among physicians, this study aimed to enhance better patient care, overall improvement of healthcare services, and increased accessibility to medical assistance in our environment.

2. MATERIALS AND METHODS

A descriptive cross-sectional study design was used for this study. The study involved consenting doctors (house officers, medical officers, registrars, senior registrars and consultants) who practicing in our health facility. Doctors who did not give consent and unwilling to participate in the studywere excluded. Sample size was estimated using the Cochran's formula for cross sectional surveys [10]. The estimated sample size was 105. Ten percent (10%) sample size was added to cover for possible non-response during the course of the study. Therefore, a total of 116 respondents was used. A multistage sampling technique was used. Stage 1**: s**imple random sampling method (balloting) was adopted. The names of the various departments in the hospital (19 departments) were written on pieces of papers, folded and placed inside a container. The container was shaken together, then ten departments were selected at random. Stage 2**:** stratified sampling. It involves proportional allocation of doctors from selected departments. The selected ten departments had a total population of 249. The sample size of 116 was calculated from the total population as follows: (number of doctors in a particular department/total population of 249) x sample size of 116. A well-structured questionnaire was employed for the study, after obtaining approval from the hospital Ethics and Research Committee.The questionnaire covered the following sections:section A, sociodemographic characteristics; section B, the knowledge of artificial intelligence for medical diagnostic support, section C, the willingness among physicians in the application of artificial intelligence in medical practice, section D, perceived barriers among physicians in the application of artificial intelligence; section E, factors affecting the use of artificial intelligence among physicians. Data were entered in a spread sheet and analysed using statistics package for social sciences(IBM SPSS) version 21. Data were presented using frequency tables. Sociodemographic characteristics were tabulated with the knowledge, perception and willingness to use artificial intelligence in medical practice. Association between the dependent and independent variable were tested using Chi-square. Statistical level of significance was set at $p < 0.05$.

3. RESULTS

A total of 116 respondents were recruited for this study but 110 participated, giving a response rate of 94.8%. The majority of the respondents were from the age group of 31-40 years (47.3%) and the mean age was 38.3±11.1 years. There were more male (63.6%) participants than females (36.4%). Table 1 shows the sociodemographic characteristics of the study participants.

Table 1. Sociodemographic characteristics of respondents

Variable		Freguency (n=110)	Percent (%)
Age group (in years)	21-30	21	19.1
	31-40	52	47.3
	41-50	21	19.1
	51-60	16	14.5
Sex	Male	70	63.6
	Female	40	36.4
Religion	Christian	89	80.9
	Islam	19	17.3
	African Traditional Religion	2	1.8
Cadre	Consultant	29	26.4
	Senior Registrar	29	26.4
	Registrar	32	29.1
Departments	Obstetrics & Gynecology	23	20.9
	Opthalmology	8	7.3
	Orthopaedics	5	4.5
	Paediatrics	20	18.2
	General Surgery	13	11.8

Variable	Freguency (n=110)	Percent (%)
Urology	5	4.5
Plastic surgery	5	4.5
Mental health	7	6.4
Radiology	14	12.7
Anaesthesia	10	9.2

Table 2. Knowledge, significance of, and the willingness among physicians in the application of AI for medical diagnostic support

Variable		Frequency (n=110)	percent (%)
Have you ever heard of artificial intelligence before?	Yes	104	94.5
	No	6	5.5
Source of information on AI?	Internet	64	58.2
	Television	14	12.8
	Newspapers	12	10.9
	Friends	15	13.6
	No response	5	4.5
Is AI essential in the field of medicine?	Yes	95	86.4
	No	15	13.6
Do you think AI can improve delivery of health services?	Yes	88	80.0
	No	22	20.0
	No	18	16.4

Table 3. Significance and perceived barriers in the application of AI on patient management

Variable		Frequency (n=110)	Percent (%)
Do you know about the application of AI in medical practice?	Yes	94	85.5
	No	16	14.5
Have you applied AI to your medical practice?	Yes	28	25.5
	No	82	74.5
Did the application of AI to your medical practice improve the patient's condition?	Yes	25	22.7
	No	3	2.7
	No response	82	74.5
Major barrier in the application of AI in medical practice?	Poor funding	42	38.2
	Lack of awareness	40	36.4
	Scarcity of trainers	17	15.4
	High cost of training	11	10.0

The majority (94.5%) of the participants were aware of AI and more than half (58.2%) knew about AI through the internet. Table 2 shows the knowledge, significance of, and the willingness among doctors to apply artificial intelligence for medical diagnostic support.

As shown in Table 3 above, most (38.2%) of the respondents think poor funding is the major barrier in the application of AI in medical practice, followed by lack of awareness (36.4%), and then scarcity of trainers (15.4%). Also, majority (81.8%) of the respondents have interest in undergoing training on the use of AI and 83.6% will like to use AI for their medical practice.

Majority (86.4%) of the respondents believe AI is essential in the field of medicine and 80% of the respondents also think AI can improve delivery of health services. While most of the participants (n=94; 85.5%) of the participants know about the application of AI in medical practice, only a handful (n=28, 25.5%) had applied AI in their medical practice.

4. DISCUSSION

Healthcare is one of the fastest growing area of sciences open to cutting edge technological innovations like AI [16-18]. With the phenomenal surge in the out-migration of skilled health

personnel in Nigeria, and sub-Saharan Africa in general, AI is beginning to take a central place among clinicians and health services providers.This study assessed the knowledge, perception and willingness to use AI in medical practice among physicians in a tertiary health facility in Nigeria.

About two third of the respondents were below 40 years of age. This finding is similar to that of a study done in Sydney, Australia where most of the participants were below 39 years [16]. However, this is in contrast with a research carried out in UK, where about two third of the participants were greater than 45 years in age [19]. The majority of the participants are junior physicians. This is in consonance with a study carried out in Malaysia, where majority (86.6%) of the participants were medical officers [12].

There was a substantial gender difference among medical doctors in this study, with more men than women. This male predominance is similar to a research done in United Kingdom (UK) and Miami, USA where majority of the respondents were males [13,19] and in contrast to a study done in Malaysia, where majority (67.9%) of the participants were females [12]. This differences may indicate a bigger challenge of gender discrepancy in the health sector.

Majority (94.5%) of the participants recruited for this study are aware of artificial intelligence with the most common medium of first contact with AI among the clinicians being the internet/social media.This is consistent to the views reported in previous study from Malaysia, where majority (82%) of the respondents are aware of artificial intelligence [12]. Similarly, a study done in India and Oman reported about a two third of the respondents being familiar with the concept of artificial intelligence [11,14]. On the contrary, an earlier research done in the UK revealed that only about on third knew about AI and its clinical application [10].

As previously reported by researchers in Oman [14], most of the respondents recruited for this study are interested in undergoing training on the use of artificial intelligence in medical practice. In addition, majority of the participants expressed interest in using AI in their cliical practice. This is closely related to other studies carried out in Southampton, UK [17] and in India [11] where about two third (67% and 69% respectively) of the participants were willing to use AI in their medical practice. A contrasting report was documented in a study was carried out in Oman, where onlyabout one third (30.5%) of the participants were willing to apply artificial intelligence to their clinical practice [14].

Despite the numerous anticipated advantages of AI-based innovations in clinical medicine, there are also many barriers to their acceptance. Of the respondents recruited for this study, about a third believe that poor funding and lack of awareness are the major barriers among physicians in the application of artificial intelligence. This is in contrast to a research done in Slovakia, where majority (66%) of the participants believe scarcity of trainers is the major barrier in the application of artificial intelligence in medical practice [20]. These barriers to the acceptance of AI in clinical practice could be the reason for the wide gap between the awareness of AI (94.5%) and its application in practice (25.5%) as similarly observed in related studies in Africa and other parts of the world [2,5,6,12,16]. To improve the acceptance of AI technology among physicians in their practice, AI should be included both in the the undergraduate medical curriculum and the continuous medical education programmes of the doctors. Also, encouraging AI-based mentorship among physicians can sharpen their interest in AI research and improve their competence in integrating these innovations into clinical practice.

The application of AI in healthcare has the potential to address many of the health service delivery challenges. At the moment, AI is beginning to occupy a central place in health service delivery with a paradigm shift towards AI-augmented healthcare systems. In addition, AI can foster cost-effective healthcare solutions and improve overall patient outcomes. Majority of the participants in this study believe AI is essential in medical practice. This is similar to a study carried out in UK, where majority (79%) of the participants believe AI is essential in their clinical practice [8]. Also, similar to related studies in Australia and Asia [11,16,21], most of the participants believe artificial intelligence can improve of health service delivery.

Majority (85.5%) of the participants in this study are aware of the application of AI in medical practice, this is in contrast to a study done in India, where less than half (42%) of the participants were aware of the application of AI in medical practice [11]. On the contrary, most (74.5%) of the participants have not applied AI in their medical practice. This is similar to the study done in Germany, where more than half had not

applied artificial intelligence in their medical practice [15]. AI holds the promise of enhancing the precision of diagnostic accuracy, reducing administrative tasks, and individualizing treatment plans. While there is still alot to be explored and developed in the application of AI in clinical practice, it is necessary that we create awareness on the the usefulness and the full potentials of AI-enhanced health service delivery.

5. CONCLUSION

This study revealed that majority of the medical doctors had above average knowledge of AI,had previous exposure to AI,and were receptive to its use in clinical practice. However, only a few had applied AI in their practice and lack of awareness, scarcity of trainers, and high cost of training were the main identified barriers. We advocate policy changes, increased training programs, and better funding to enhance the applicability of AI in clinical practice in the West African subregion.

6. LIMITATIONS

The limitations, such as the small sample size, potential response bias, or the single-center design. A brief mention of how these limitations could affect the generalizability of the results would be helpful."

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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