University of Dongola

Faculty of Medicine and Health Sciences

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Title:

Knowledge, Attitudes, and Practices Regarding the Use of Artificial Intelligence in Diagnosis and Management Among physicians at Main Hospitals in Dongola ,Northern State, Sudan,2026

A Research proposal Submitted in Partial Fulfillment of the Requirements

for the Degree of Bachelor of Medicine and Health Sciences (MBBS)

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1.Introduction:

1.1.Background:

Artificial intelligence (AI) is a field of computer science that seeks to replicate human cognitive abilities such as learning, reasoning, and decision-making [1]. Regarded as a driving force of the global technological revolution, AI has entered many areas of medicine, starting with its first use in disease diagnosis in the 1960s [2]. Today, AI is applied across the whole healthcare system, from optimizing preventive care and improving diagnostic accuracy to personalizing treatment protocols, monitoring rehabilitation, building prognostic models, and streamlining healthcare management [3,4]. However, integrating AI successfully into clinical practice demands more than technological progress. Even though AI has been used in many medical specialties, wider clinical adoption is still held back by several barriers. These include physicians' limited AI-specific knowledge, fears of job displacement, ethical dilemmas in clinical decision-making, and data security risks, all of which impede large-scale implementation [5]. The knowledge-attitude-practice (KAP) model proposes that behavior change develops through three linked stages: acquiring knowledge, forming attitudes, and adopting practice. The framework treats knowledge as the foundation, attitudes as the mediating factor, and lasting behavior change as the final goal [6].

Globally, AI is becoming an increasingly useful tool for diagnosis and healthcare management in the medical field. Evidence from different settings shows that attitudes toward AI are generally positive, whereas knowledge and practical application remain limited. In Kerbala, Iraq, 58.9% of participants had poor knowledge of AI, yet 59.2% supported its integration into healthcare and 84% wanted to begin using AI tools. Similarly, in China, only 30.4% had good knowledge of AI, but 90.9% held positive attitudes toward it, and just 28.8% reported good clinical implementation. Together, these findings highlight the need for structured AI training for healthcare professionals[7,8].

Nonetheless, there are regional variations in the adoption of AI into healthcare systems. In Africa, a similar gap between attitudes and practice has been observed. In Tanzania, 70% of participants had moderate knowledge and 66.9% had a favorable attitude, but only 40.9% had used AI tools in practice. In Somalia, 67.6% had good knowledge and 80.5% had positive attitudes, yet 79.1% reported poor AI-related practices, which reflects a consistent gap between knowledge and practice[9,10].

In Sudan, interest in the potential medical uses of AI is increasing. A recent study found that 80.7% of participants had knowledge of AI and 81.8% considered it highly important. However, only 14.9% had received any AI education in medical school, which reveals a gap between knowledge and formal education despite the positive attitudes[11].

1.2.Problem statement:

AI is increasingly becoming an important tool in healthcare, particularly in clinical diagnosis and decision-making. However, studies conducted among physicians in different settings have demonstrated considerable variation in knowledge, attitudes, and practices regarding AI. In Sudan, although 80.7% of physicians reported previous knowledge of AI and 81.8% considered AI important in medicine, only 14.9% had received AI education during medical school and 14.5% had received AI-related training. These findings indicate a gap between physicians' interest in AI and their formal education and training [11].

Similar findings have been reported in other settings. In Somalia, 67.6% of healthcare professionals demonstrated good AI knowledge and 80.5% had positive attitudes, while 79.1% reported poor practical use of AI. In China, although 90.9% of physicians had positive attitudes toward AI, only 30.4% demonstrated good knowledge and 28.8% reported good AI practices. These findings indicate that positive attitudes and awareness may not necessarily translate into adequate practical application of AI in healthcare [7,9].

To the best of our knowledge, no previous study has assessed the knowledge, attitudes, and

practices regarding the use of AI among physicians in Dongola.

1.3.Justification:

The increasing use of AI in healthcare and the reported gaps between physicians' knowledge, attitudes, and practices highlight the need to understand their engagement with AI. Previous studies in Sudan, Somalia, and China have shown variations in these three domains, supporting the use of a KAP approach to provide a comprehensive assessment of physicians' understanding, perceptions, and actual use of AI[7,9,11]. Assessing physicians in Dongola is important because the local context may differ from findings reported in other settings, while no previous study, to the best of our knowledge, has specifically assessed AI-related KAP among physicians in Dongola.

1.3.Objectives:

General objective:

To assess knowledge, Atitudes, and Practices regarding the use of AI in diagnosis and management among Healthcare Professionals in Dongola.

Specific objectives:

1-To assess the level of knowledge regarding AI among healthcare professionals in Dongola.

2-To assess healthcare professionals' attitudes toward the use of AI in diagnosis and patient management.

3-To determine the practices of healthcare professionals regarding the use of AI in diagnosis and patient management.

4- To identify the main sources of information about AI among healthcare professionals

5-To assess the associations among physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence tools, and between these KAP domains and selected sociodemographic and professional characteristics.

6-To identify the barriers hindering the use of AI.

1.4.Research Hypotheses:

Null hypothesis (H_0):

There are no significant associations among physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence tools, and between these KAP domains and selected

sociodemographic and professional characteristics.

Alternative hypothesis (H_1):

There are significant associations among physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence tools, and between these KAP domains and selected sociodemographic and professional characteristics.

1.5.Research question:

What are the knowledge, attitudes, and practices regarding the use of AI in diagnosis and patient management among physicians in Dongola?

2.literature review:

Internationally:

1.A nationwide cross-sectional study was conducted in China to assess physicians' knowledge, attitudes, and practices (KAP) regarding AI and to identify factors influencing AI adoption. The study was conducted from January 15 to March 14, 2024, using a multistage sampling method to recruit practicing physicians from different regions of China. Data were collected through a validated, self-administered online questionnaire covering demographic characteristics and AI-related knowledge, attitudes, and practices. A total of 1,137 physicians participated in the study, of whom 346 (30.4%) demonstrated good knowledge of AI. Despite this relatively limited level of knowledge, 1,034 participants (90.9%) had positive attitudes toward AI; however, only 51.2% considered medical AI to be safe. Regarding practice, 328 physicians (28.8%) reported good implementation of AI in clinical practice. The study also found that Chinese physicians preferred the term "AI-assisted medicine" (75.1%), reflecting the perceived supportive role of AI in clinical practice. Multivariate analysis showed that male gender and age between 50 and 59 years were significantly associated with higher odds of good AI knowledge. Chief physicians demonstrated more positive attitudes toward AI compared with residents. Good AI practices were significantly associated with male gender, having a doctoral degree, and specialization in obstetrics and gynecology, internal medicine, or surgery compared with pediatrics. Significant positive correlations were also found between knowledge and attitude, knowledge and practice, and attitude and practice (all $p<0.001$). The study concluded that although Chinese physicians generally had positive attitudes toward AI, levels of knowledge and clinical implementation remained relatively limited. The findings emphasized differences in AI adoption according to demographic characteristics and medical specialties and highlighted the importance of targeted education and training to support the responsible integration of AI into clinical practice[7].

2.A cross-sectional study was conducted in Kerbala Governorate, Iraq, to assess physicians' knowledge, attitudes, and practices regarding AI and to explore factors associated with these domains. Data were collected using a structured questionnaire covering demographic characteristics, knowledge, attitudes, and practices related to AI. The questionnaire was distributed electronically through a web-based survey and in paper-based form to physicians working in hospitals and private clinics, with the data analyzed using the Statistical Package for the Social Sciences (SPSS). A total of 326 physicians participated in the study. The findings showed that 58.9% of participants had poor knowledge of AI, despite a relatively high level of familiarity with its general concepts and applications, including Generative Pre-trained Transformers (GPT) and electronic health record

analysis. In contrast, attitudes toward AI were generally positive, with 59.2% of physicians supporting its integration into the medical field. Regarding practice, only 31% reported that AI was currently being used in their institutions, whereas 84% expressed a desire to start using AI tools in their practice. Male physicians and those who owned personal computers demonstrated higher levels of knowledge and practical application, although the reported associations were not statistically significant ($p>0.05$). The study concluded that physicians in Kerbala had generally positive attitudes toward AI, but a gap existed between their knowledge and its practical application. Limited institutional education and training were identified as important barriers to the adoption and implementation of AI in healthcare[8].

Regionally:

3.A cross-sectional study was conducted in Somalia from January 1 to March 15, 2024, to assess the knowledge, attitudes, and practices (KAP) of healthcare professionals regarding AI and to explore their familiarity with AI technologies and applications in healthcare. The study included 441 healthcare professionals, and data were collected using an online questionnaire that assessed sociodemographic characteristics, knowledge of AI applications, attitudes toward AI capabilities, and practical experience with AI in healthcare. The findings showed that 67.6% of participants had good knowledge of AI, while 80.5% demonstrated positive attitudes toward its potential applications in healthcare. However, a considerable gap was observed between knowledge and practical application, as 79.1% of participants reported poor AI-related practices. Sociodemographic factors, including age, gender, and income level, were not significantly associated with knowledge or attitudes toward AI, although they influenced its practical use. Professionals working in fields such as midwifery and public health were more likely to use AI in their professional activities. Furthermore, knowledge and attitude scores were significant predictors of AI practice. The study concluded that although healthcare professionals in Somalia had relatively good knowledge and positive attitudes toward AI, significant challenges remained in translating this awareness into practical application. The findings highlighted the need for improved infrastructure, technical expertise, access to data, ethical guidelines, and appropriate regulations to facilitate the responsible and effective integration of AI into healthcare[9].

4.descriptive cross-sectional study conducted between September and December 2024 at Bugando Medical Centre in Tanzania assessed healthcare professionals' knowledge, attitudes, and practices regarding the use of AI in medical diagnosis and treatment planning. A total of 320 healthcare

professionals participated in the study. Most participants demonstrated moderate knowledge of AI (70%), while 66.9% agreed that AI integration is important in medical practice. However, only 40.9% had previously used AI tools in clinical practice. Education level, years of experience, and professional role were significantly associated with AI utilization ($p<0.05$). The study concluded that although healthcare professionals generally have positive attitudes toward AI, gaps remain in knowledge and practical application, emphasizing the need for structured training and policy support to facilitate AI adoption in healthcare[10].

Locally:

5. A cross-sectional analytical study was conducted in Sudan to assess physicians' knowledge, attitudes, and practices regarding the use of AI in medicine. The study used a web-based questionnaire distributed through email lists and social media platforms, and included 825 physicians from different professional ranks and medical specialties. The findings showed that 666 physicians (80.7%) had previous knowledge of AI. However, only 123 (14.9%) had received AI-related education during medical school, and 120 (14.5%) had received AI-related lessons as part of their professional training. Regarding attitudes, 675 physicians (81.8%) considered AI highly important in medicine, while 681 (82.6%) supported the inclusion of AI education in medical school curricula. In terms of practice, 535 physicians (64.8%) believed that specialized training in the use of AI tools in healthcare was necessary, and 651 (78.9%) expressed interest in working with AI in the future. Medical Officers demonstrated the highest proportions of knowledge (32.7%), favorable attitudes (31.6%), and AI-related practice (28.0%), followed by House Officers, although these differences were not statistically significant ($p>0.05$). The study concluded that although physicians in Sudan demonstrated generally positive attitudes and some level of AI-related practice, a considerable gap remained in their knowledge and formal education regarding AI. The findings highlighted the need for greater integration of AI education and structured training into medical education and professional development in Sudan[11].

3.Methodology:

3.1.Study design:

Descriptive analytical, cross sectional study.

3.2.Study area:

The study will be conducted in Dongola city, Dongola is the capital of Northern State in Sudan, on the banks of the Nile.[12].

3.3study setting

1.Dongola Specialized hospital
2.Military hospital
3. police hospital

3.4.Study population :

Physicians (Intern doctor,Medical Officer,Resident doctor,Deputy Specialist, Specialist, Consultant).

Inclusion criteria:

1.Medical doctors of any professional rank (e.g., internship doctors, medical officers, deputy specialists/residents, and specialists,cosultant).

2. Physicians working in selected healthcare facilities in Dongola, Northern State, during the study period.

3. Physicians who agree to participate in the study

Exclusion criteria:

1. Physicians who are on leave or absent during the period of data collection

2. Physicians are not currently engaged in clinical practice, such as those assigned exclusively to administrative or other non-clinical duties.
3. Physicians who submit questionnaires with substantial missing data that make the responses unsuitable for analysis.

35. Sampling:

The sample size (n) can be calculated using the formula for an unknown proportions[ ]:

$$n=Z^2\times p\times q\div e^2$$

n=Sample Size for an unknown population
Z= z score(1.96 for 95 % confidence)
P=Population proportion (0.5, assumed since the true proportion is unknown ,as this yields the maximum and most conservative sample size)
e= margin of error(0.05)
Substituting these values
q = 1-p

3.6.Sampling procedure:

Stratified random sampling techinque (A stratified random sampling technique will be used. The

eligible physicians will be divided into strata according to their professional level (internship doctors, medical officers, deputy specialists, and specialists). The required sample size will be proportionally allocated to each stratum according to the number of eligible physicians in each group. Physicians will then be selected randomly from each stratum using a simple random sampling technique).

3.7.Study Variables:

Dependent:

1.level of knowledge regarding Artificial Intelligence (AI)in diagnosis and patient management.

2.attitude toward the use of AI in diagnosis and patient management.

3.practice of using AI tools diagnosis and patient management.

Independent:

Socio-demographic Data:

1. Age.
2. Gender.
3. Profession rank
4. Year of professional experience
5. Personal computer use
6. Previous training or education related to Artificial Intelligence

3.8.Method of data collection:

The data was being collected using a self-administered Google form questionnaire.

3.9.Data Processing and analysis:

Data will be analyzed using Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics will be used to summarize the data. Categorical variables will be presented as frequencies and percentages, while continuous variables will be summarized using mean and standard deviation (SD) for normally distributed data, or median and interquartile range (IQR) for non-normally distributed data. The Chi-square test will be used to assess associations between categorical variables. A p-value < 0.05 will be considered statistically significant.

3.10. Ethical consideration:

The research will conduct after the ethical approval from the the state ministery of health and informed consent from the participants

4.Workplan:-

Activities	W1 20-26sep	W2 27Sep-03Oct	W3 04-10Oct	W4 11-17Oct	W5 18-24Oct	W6 25-31Oct	W7 01-07Nov	W8 08-14Nov	W9 15-21Nov	W10 22-28Nov	W11 29Nov-05Dec
Preparation\Submission of research proposal											
Presentation of research proposal											
Data collection											
Data analysis											
Writing results and discussion											
Writing the final report											

Budget :

No	Budget category	Totalcost(SDG)
1	Transportation	150,000
2	Printing questionnaires	100,000
3	Printing final report	100,000
4	Data Analysis	150,000
	Total	500,000SDG

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