By The Name Of Allah

University of Dongola

Faculty of Medicine and Health Sciences

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RESEARCH PROPOSAL

Knowledge, Attitudes, and Practices Regarding the Use of Artificial Intelligence for Clinical Diagnosis Among Physicians at Dongola Specialized Hospital, Northern State, Sudan, 2026.

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Study Site:	Dongola Specialized Hospital, Northern State, Sudan

Dongola, Northern State, Sudan

2026

1. INTRODUCTION

1.1 Background

Artificial intelligence (AI) is a rapidly developing technology that can perform tasks involving learning, pattern recognition, prediction, language processing, and decision support. In healthcare, AI is increasingly used or investigated for diagnosis, clinical decision-making, and other healthcare tasks, while WHO emphasizes human oversight, safety, transparency, accountability, and protection of patients' rights. (1,2)

Knowledge, attitudes, and practices (KAP) describe three complementary dimensions of physicians' engagement with AI: knowledge reflects understanding of AI concepts, applications, benefits, and limitations; attitude reflects perceptions, trust, acceptance, concerns, and views about AI in clinical care; and practice reflects actual use of AI tools in clinical work. International evidence shows that these dimensions may differ substantially, so assessing them separately can identify gaps that may not be apparent from awareness or attitude alone. (3–5,9)

At the international level, a nationwide cross-sectional study among 1,137 practicing physicians in China found that 30.4% had good AI knowledge, 90.9% had positive attitudes, and 28.8% had good AI practices; 51.2% agreed that medical AI was safe. The study also found significant positive correlations between knowledge, attitude, and practice, while practical use remained much lower than positive attitudes. (5)

In Nigeria, a cross-sectional study among medical doctors at a state university teaching hospital in Enugu State reported that 68.8% had good AI knowledge, 54.4% had positive attitudes, and 46.8% had good AI utilization. High implementation cost and insufficient training were reported as important barriers. (4)

In Sudan, a national cross-sectional survey of 825 physicians found that 80.7% had previous knowledge of AI, but only 14.9% had been taught about AI in medical school and 14.5% had received AI-related lessons during professional training. Regarding attitudes, 81.8% considered AI very important in medicine and 82.6% supported teaching AI in medical schools; 64.8% believed physicians needed specialAI training and 78.9% were interested in working with AI in the future. (3)

1.2 Problem Statement

Artificial intelligence is increasingly relevant to clinical diagnosis and decision-making, but its safe and appropriate use requires physicians to understand its capabilities and limitations, maintain appropriate trust and critical judgment, and use AI under suitable human oversight. Evidence from healthcare professionals shows concerns about understanding AI outputs, confidence in accuracy, trust, governance, and implementation, indicating that knowledge and attitude alone may not translate into appropriate practice. (1,5,9)

The available physician evidence demonstrates important gaps and variation in KAP. Internationally, the Chinese study reported good AI knowledge in 30.4% of physicians, positive attitudes in 90.9%, and good AI practices in 28.8%; only 51.2% agreed that medical AI was safe. In Nigeria, 68.8% had good knowledge, 54.4% had positive attitudes, and 46.8% had good utilization. In Sudan, 80.7% reported previous AI knowledge, but only 14.9% had received AI teaching in medical school and 14.5% had received AI-related lessons during professional training; 81.8% considered AI very important and 64.8% believed physicians needed special AI training. (3–5)

These findings show that awareness and positive attitudes may coexist with limited formal training and lower practical use. However, the available Sudanese national evidence provides an overall picture across different physician ranks and specialties and does not provide hospital-specific evidence for Dongola Specialized Hospital. A search conducted by the researchers did not identify a published study specifically assessing physicians' KAP regarding the use of AI for clinical diagnosis at Dongola Specialized Hospital. Without local evidence, the extent of knowledge and training gaps, sources of AI information, current clinical use, and perceived barriers at the hospital cannot be clearly described. This study will therefore assess these areas among physicians at Dongola Specialized Hospital in 2026.

1.3 Justification

This study is justified by the need to assess physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence for clinical diagnosis. A KAP approach will help identify gaps in knowledge, attitudes, training, and actual use of AI among physicians.

The study will be conducted in Dongola because, to the best of the researchers' knowledge, no previous published study has specifically assessed physicians' KAP regarding the use of AI for clinical diagnosis in Dongola. Therefore, local evidence is lacking, and this study will provide baseline data that may help identify training needs and support appropriate and responsible use of AI in clinical practice.

1.4 Research Question

What is the level of knowledge, attitudes, and practices regarding the use of artificial intelligence for clinical diagnosis among physicians at Dongola Specialized Hospital, Northern State, Sudan, in 2026?

1.5 Hypothesis

Null Hypothesis (H_0):

There is no statistically significant association between physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence for clinical diagnosis and selected socio-demographic, professional, AI-exposure, training, digital-resource, and institutional factors.

Alternative Hypothesis (H_1):

There is a statistically significant association between physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence for clinical diagnosis and selected socio-demographic, professional, AI-exposure, training, digital-resource, and institutional factors.

2. RESEARCH OBJECTIVES

2.1 General Objective

To assess the knowledge, attitudes, and practices regarding the use of artificial intelligence for clinical diagnosis among physicians working at Dongola Specialized Hospital, Northern State, Sudan, in 2026.

2.2 Specific Objectives

- To assess the knowledge of physicians regarding the use of artificial intelligence for clinical diagnosis at Dongola Specialized Hospital.
- To assess the attitudes of physicians toward the use of artificial intelligence for clinical diagnosis at Dongola Specialized Hospital.
- To assess the practices of physicians regarding the use of artificial intelligence for clinical diagnosis at Dongola Specialized Hospital.
- To identify the main sources of information through which physicians obtain knowledge about artificial intelligence and its clinical applications.
- To determine the factors influencing physicians' knowledge, attitudes, and practices regarding the use of artificial intelligence for clinical diagnosis at Dongola Specialized Hospital.

3. LITERATURE REVIEW

3.1 International Evidence – China

Chen et al. (2026) conducted a nationwide cross-sectional study among 1,137 practicing Chinese physicians using a validated questionnaire. Good AI knowledge was found in 30.4% of participants, while 90.9% demonstrated positive attitudes and 28.8% reported good AI practices. In addition, 51.2% agreed that medical AI was safe. The study also reported significant positive correlations between knowledge, attitudes, and practices, indicating that physicians with greater knowledge tended to have more favorable attitudes and greater practical use. The findings also showed that positive attitudes were considerably more common than good practical use, suggesting a gap between acceptance of AI and its actual application in clinical work. (5)

3.2 Regional Evidence – Nigeria

Mgbachi et al. (2025) conducted a cross-sectional study to assess the knowledge, attitudes, and utilization of artificial intelligence in healthcare among medical doctors at a state university teaching hospital in Enugu State, Nigeria. The study found that 68.8% of participants had good knowledge of AI in healthcare, 54.4% demonstrated positive attitudes toward AI, and 46.8% reported good utilization of AI. High implementation costs and insufficient training were identified as important barriers to AI utilization. The authors emphasized the need for structured AI education, improved infrastructure, clear policies, and integration of AI-based clinical decision-support systems into healthcare practice. (4)

3.3 National (Sudanese) Evidence

Amin et al. (2024) conducted a national cross-sectional survey among 825 physicians in Sudan to assess knowledge, attitudes, and practices regarding AI applications in medicine. Previous AI knowledge was reported by 80.7% of participants; however, only 14.9% had been taught about AI during medical school and 14.5% had received AI-related lessons during professional training. Regarding attitudes, 81.8% considered AI very important in medicine and 82.6% supported teaching AI in medical schools. For future practice, 64.8% believed that physicians needed special AI training and 78.9% were interested in working with AI in the future. These findings indicate relatively high awareness and positive attitudes, but limited formal AI education and training among physicians in Sudan. (3)

3.4 Research Gap

- **Population gap:** The Sudanese national study included physicians from different ranks and specialties, but no published study identified by the researchers has specifically assessed physicians at Dongola Specialized Hospital. (3)
- **Geographical/institutional gap:** Existing Sudanese evidence is national and does not provide a hospital-specific KAP profile for physicians working at Dongola Specialized Hospital, Northern State. (3)
- **Practice gap:** Evidence from Nigeria and China demonstrates variation in AI knowledge, attitudes, trust, safety perceptions, and clinical use, but comparable hospital-specific evidence from Dongola is lacking. (4,5)
- **Training gap:** Sudanese and international evidence indicates gaps in formal AI education, technical knowledge, confidence, and practical preparedness, supporting assessment of local training needs. (3,5,6,9)

This study will address these gaps by assessing knowledge, attitudes, and practices regarding AI for clinical diagnosis among physicians working at Dongola Specialized Hospital in 2026.

Study / setting	Population&sample	Knowledge	Attitude	Practice / use	Main implication
Sudan – National (Amin et al., 2024)	Physicians of different ranks/specialties; n=825	80.7% had previous AI knowledge	81.8% considered AI important; 82.6% supported AI teaching	64.8% believed physicians need special AI training; 78.9% interested in future AI work	Awareness and attitudes were positive, but formal education/training was limited. (3)
Nigeria – Regional (Mgbachi et al., 2025)	Medical doctors at a state university teaching hospital in Enugu State, Nigeria	68.8% had good knowledge of AI in healthcare	54.4% demonstrated positive attitudes toward AI	46.8% reported good utilization of AI	High implementation costs and insufficient training were identified as important barriers to AI utilization. (4)
China – International (Chen et al., 2026)	Practicing physicians nationwide; n=1,137	30.4% had good AI knowledge	90.9% had positive attitudes; 51.2% agreed medical AI is safe	28.8% had good AI practices	KAP domains were significantly correlated, while practical use remained lower than positive attitude. (5)

Table 1. Comparison of selected physician KAP studies on artificial intelligence.

4. MATERIALS AND METHODS

4.1 Study Design

A descriptive cross-sectional analytical study using a quantitative approach will be conducted to assess knowledge, attitudes, and practices regarding the use of AI for clinical diagnosis among physicians at Dongola Specialized Hospital. The design will

measure KAP at a defined point in time and examine associations between KAP outcomes and selected socio-demographic, professional, and AI-exposure characteristics.

4.2 Study Area

The study will be conducted at Dongola Specialized Hospital, Northern State, Sudan. Data collection will be conducted during 2026 following ethical and administrative approval from the University/Faculty and Dongola Specialized Hospital authorities.

4.3 Study Population

The study population will comprise qualified physicians working at Dongola Specialized Hospital during the study period. For this study, the term “physicians” includes specialists/consultants, residents/registrars or deputy specialists, general practitioners/medical officers, and internship doctors who are providing clinical services. Medical students who have not completed their medical degree will be excluded.

4.4 Inclusion Criteria

- Qualified physicians currently working at Dongola Specialized Hospital during the data-collection period.
- Physicians who have completed their medical degree and are currently providing clinical services, including specialists/consultants, residents/registrars (deputy specialists), general practitioners/medical officers, and internship doctors.
- Physicians who provide informed consent to participate.

4.5 Exclusion Criteria

- Physicians who are on prolonged leave or unavailable during the data-collection period.
- Medical students who have not completed their medical degree, and physicians who decline participation or withdraw consent.

4.6 Sample Size Determination

Because the total number of eligible physicians working at Dongola Specialized Hospital is not yet known at the proposal stage, the sample size will be calculated using Cochran’s formula for an unknown/large population: $n_0 = Z^2pq / d^2$. Using a 95% confidence level ($Z = 1.96$), expected proportion $p = 0.50$, $q = 0.50$, and margin of error $d = 0.05$: $n_0 = (1.96)^2 \times 0.50 \times 0.50 / (0.05)^2 = 384.16 \approx 384$ physicians. Allowing approximately 10% for non-response, the target sample will be approximately 427 physicians ($384/0.90 \approx 427$). (8)

4.7 Sampling Technique

A list of eligible physicians will be obtained from Dongola Specialized Hospital. Stratified random sampling will be used according to professional rank, with the required sample

allocated proportionally to the number of eligible physicians in each rank, and participants selected randomly from the hospital list.

4.8 Data Collection Tool

The data collection questionnaire will be adapted primarily from the pre-designed questionnaire used in the Sudanese national physician KAP study by Amin et al. (3), with wording and items modified to focus on AI use for clinical diagnosis in Dongola. Additional questions will be added where necessary to cover professional characteristics, current clinical AI use, common diagnostic applications, barriers, and training needs, informed by the regional, international, and clinical-implementation evidence. (3–7,9)

Section A: Socio-demographic and professional characteristics: age, sex, professional rank, specialty, years of clinical experience, clinical department/unit, previous exposure to AI, access to digital resources, and previous AI training. (3)

Section B: Knowledge of AI: basic concepts of AI, types/applications of AI in healthcare, clinical applications, potential benefits, limitations, inaccurate or biased outputs, understanding of AI-generated outputs, and the need for human verification. (3,5,6,9)

Section C: Attitudes: perceived usefulness and importance of AI, trust, confidence, perceived safety and risks, willingness to use AI, views on AI-assisted diagnosis, responsibility for clinical decisions, and perceived need for formal AI training and institutional guidelines. (3–7,9)

Section D: Practices: previous and current AI use, frequency of use, AI tools used, clinical/diagnostic applications, verification of AI-generated information, and reported barriers to AI use. (3–7,9)

4.9 Data Management and Analysis

Completed questionnaires will be checked for completeness and consistency. Data will be entered into a password-protected database and analyzed using SPSS or Stata.

Descriptive statistics will include frequencies and percentages for categorical variables, and means and standard deviations for continuous variables as appropriate.

The Chi-square test (χ^2) will be used to assess associations between categorical variables, including knowledge, attitude, and practice categories and selected socio-demographic, professional, AI-exposure, training, and institutional factors.

Where appropriate, Fisher's exact test will be used when the assumptions for the Chi-square test are not met.

The level of statistical significance will be set at $p<0.05$.

Results will be presented using tables, charts, and narrative summaries.

4.10 Ethical Considerations

- Ethical approval will be obtained from the relevant University/Faculty research ethics committee before data collection.
- Administrative permission will be obtained from Dongola Specialized Hospital and relevant health authorities.
- Electronic informed consent will be obtained from each participant after explanation of the study.
- Participation will be voluntary, with the right to refuse or withdraw without penalty.
- No patient-identifying information will be requested in the questionnaire. Participants will not be asked to enter patient names, medical record numbers, or confidential clinical data into the research tool.
- Participant confidentiality and anonymity will be maintained using codes rather than names, with secure storage and restricted access.
- The study will assess self-reported practices and will not encourage participants to use AI for patient care outside accepted clinical supervision or institutional policy.

4.11 study variables

1- Dependent variables

- Knowledge score regarding AI and its clinical applications.
- Attitude score toward the use of AI in clinical diagnosis.
- Practice score regarding the use of AI for clinical/diagnostic purposes.

2- Independent variables

- Age.
- Sex.
- Professional rank (specialist/consultant, resident/registrar/deputy specialist, general practitioner/medical officer, internship doctor).
- Specialty and clinical department.
- Years of clinical experience.
- Clinical department/unit.
- Previous exposure to AI.
- Previous formal AI training.
- Access to digital resources/internet.
- Frequency of exposure to AI-related information.

- Perceived barriers to AI use.
- Availability of institutional AI guidance or training.

5. WORK PLAN AND TIMELINE

No.	Activity	September 2026	October 2026	November 2026	December 2026	January 2027
1	Preparation of research proposal	✓				
2	Submission of research proposal	✓				
3	Presentation of research proposal	✓	✓			
4	Data collection		✓			
5	Data analysis		✓	✓		
6	Writing and discussion of the result			✓		
7	Writing the final report			✓	✓	
8	Electronic submission of research to the Department of Community Medicine				✓	
9	Research review				✓	
10	Research editing				✓	
11	Research discussion					✓

6. BUDGET OUTLINE

The following is an estimated budget in Sudanese pounds (SDG) and may be adjusted according to actual local prices and administrative requirements.

Item	Estimated quantity	Estimated unit cost (SDG)	Estimated total (SDG)
Printing/photocopying of questionnaires and consent forms	100 copies	500	50,000
Stationery (pens, folders, paper, clips)	1 lot	50,000	50,000
Transportation for data collection at Dongola Specialized Hospital	6 visits	40,000	240,000
Internet/mobile data for electronic coordination and data collection	1 package	100,000	100,000
Communication/telephone expenses	1 lot	50,000	50,000
Data entry and statistical analysis support	1 service	250,000	250,000
Administrative/printing of final report	1 lot	100,000	100,000
Contingency/miscellaneous expenses	1 lot	100,000	100,000
Estimated total			940,000 SDG

7. REFERENCES

(Vancouver style)

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8. ANNEXES

Four annexes will accompany this proposal:

- **Annex I:** Data Collection Questionnaire. The structured questionnaire adapted primarily from the Sudanese national physician KAP study by Amin et al., with modifications to assess physicians' use of artificial intelligence for clinical diagnosis at Dongola Specialized Hospital.
- **Annex II:** Participant Information Sheet and Informed Consent Form**.** The participant information sheet and informed consent form to be provided to eligible physicians before participation.
- **Annex III:** Ethical Approval Letter**.** To be attached after ethical approval is granted by the relevant University/Faculty research ethics committee, before data collection begins.
- **Annex IV:** Administrative Permission Letter. To be attached after administrative permission is obtained from Dongola Specialized Hospital and relevant health authorities before data collection begins.