ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF EMERGENCY MEDICINE

Exploring the perspective of emergency and critical care medicine residents regarding the utilization of Artificial Intelligence for clinical practice: A Multicenter Qualitative study from teaching hospitals in Addis Ababa, Ethiopia.

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LISTS OF ABBREVIATIONS /ACRONYMS

ECCM: Emergency and Critical Care Medicine

ER: Emergency Room

ED: Emergency Department

FMOH: Federal Ministry of Health

FGD-Focus group discussion

HCW: Healthcare workers

ICU; intensive care unit

LMICs: Low- and middle-income countries

PI- principal investigator

SPHMMC: St. Paul's Hospital Millennium Medical College

SSA: Sub-Saharan Africa

TASH: Tikur Anbessa Specialized hospital

WHO: World Health Organization

YAHMC: Yekatit 12 Hospital Medical College

TABLE OF CONTENTS

List of Table

LIST OF FIGURES

ABSTRACT

Background: The rapid global advancement of Artificial Intelligence (AI) presents a transformative potential for healthcare The integration of Artificial Intelligence (AI) , particularly in high burden, time-sensitive disciplines such as Emergency and Critical Care Medicine (ECCM) holds significant potential to enhance diagnostics, decision-making and minimize workload burden However, its adoption in low-resource settings remain uncertain, with limited understanding of the perspectives and readiness of frontline practitioners. This study explores the perspective of ECCM residents in Addis Ababa, Ethiopia regarding AI's integration in clinical practice.
Objective: The objective of this study is to explore the perspectives of Emergency and Critical Care Medicine (ECCM) residents regarding the integration of Artificial Intelligence (AI) in their clinical practice at three major teaching hospitals in Addis Ababa, Ethiopia.

Methodology: A qualitative, phenomenological, multi-center study was conducted from June 1 to October 30, 2025, at three major teaching hospitals in Addis Ababa. Using purposive sampling, sixteen ECCM residents participated. One focus group discussion with eight members and eight in-depth interviews were conducted. Data were collected from ECCM residents through audio recordings in the Amharic language, then transcribed and translated by the principal investigator. After familiarization with the data, initial open coding was generated, followed by axial coding. Five themes with three subthemes for each theme were developed, each theme and subtheme were defined and supported by verbatim quotes. thematic analysis was conducted manually.

Results: Five major themes emerged (1) a foundational Knowledge gap alongside conceptual understanding of AI (2) strong belief in AI's potential clinical Benefits for decision support, diagnostic accuracy, and burnout mitigation (3) profound systemic Barriers including financial constraints, lack of formal training, infrastructure limitations and lack of data governance (4) Attitudes of cautious optimism coupled with ethical concerns about accountability and skill erosion and (5) clear prerequisites of AI Implementation requiring AI literacy training, national policy, and infrastructure investment.
Conclusion and Recommendations: ECCM residents' positive attitude towards AI as a supportive tool rather than a replacement for clinical judgment and its perceived utility in mitigating burnout whereas key barriers include a lack of formal training and practical AI exposure, inadequate digital infrastructure, absence of regulatory frameworks, and fears regarding clinical autonomy and liability. We recommend formal AI training for the health professionals and conducting further research on perceptions of stakeholder at medical curricula to develop national AI integration policies.

Keywords: Artificial Intelligence, Emergency Medicine, Critical Care, Clinical Practice, Qualitative Research, perspective of residents**,** Implementation Barriers, Healthcare Technology,
Ethiopia

1. INTRODUCTION

1.1 Background

Artificial intelligence (AI) is increasingly being utilized to augment the practice of emergency medicine due to rapid technological advances and breakthroughs. AI applications have been used to enhance triage systems, predict disease-specific risk, estimate staffing needs, forecast patient decompensation, and interpret imaging findings in the emergency department setting AI's potential to revolutionize health care(1). Emergency medicine is a critical component of health care systems worldwide(2). In Addis Ababa, hospitals such as Tikur Anbesa Specialized Hospital (TASH), St. Paul's Millennium Medical College (SPMMC) and Yekatit-12 Hospital Medical College (Y12HMC) play pivotal roles in providing emergency and critical care medicine training. However, Emergency physicians are faced in a high stream of complex, lifesaving decisions in hectic and dynamic environment. The concept of decision fatigue a phenomenon characterized by a decline in the quality of decision-making after a long sequence of choices, has leads to increasing attention within healthcare (3) so integration with AI may minimize this problem and has the potential to enhance the capabilities of these residents by providing real-time data analysis(4) predictive analytic and decision support systems(5,6)

1.2. STATEMENT OF THE PROBLEM

The rapid development of AI technologies has opened up opportunities in many fields, including emergency and critical care medicine (4). Even though the potential of AI could be beneficial in the optimization of patient care, another Artificial intelligence has been able to revolutionize the healthcare sector of Medicine by providing innovative solutions (5).

Evidence from how the residents of Ethiopian Emergency and Critical Care Medicine view of integration of AI into their clinical practices remains scant. Lack of such insight gives cause for concern about the preparedness of future health professionals to take up AI tools. So, this study aims to explore the perspectives of emergency and critical care medicine residents on the role of integrating AI in their clinical practices in Addis Ababa teaching hospitals, understanding basic knowledge and attitude also identifying main barriers, benefits, and prerequisites that may influence engagement with AI technologies.

1.3. RATIONALE OF THE STUDY

This qualitative multicenter study holds significant implications for the fields of emergency and critical care medicine clinical practice and healthcare technology integration. On the contrary, few studies have been conducted explicitly on the use of AI in emergency medicine education for residents within low-resource settings such as Ethiopia. Such a mismatch further highlights the need for targeted research that investigates the perspectives of emergency residents on AI integration.

Additional insights gained from this research will be additional input in the area of AI integration in clinical decision making among specialty program trainees. Furthermore, it could act as a foundation for other future research on the application and impact of AI on clinical outcomes and healthcare delivery in crowded environments.

2. LITERATURE REVIEW

2.1. Introduction

Literature on AI in healthcare underline how revolutionary it could be for operational efficiency, treatment planning, and diagnosis. AI reportedly can enhance patient care techniques, optimize resource allocation, and reduce diagnostic errors (7).

Artificial Intelligence is a constantly developing area of computer science that focuses on developing machines that are capable of accomplishing tasks requiring human intelligence. It encompasses a range of techniques like machine learning, deep learning predictive analytics, and natural language processing. Large Language Models are a type of AI algorithms that utilize deep learning approaches with enormous data volumes to comprehend, evaluate, generate, or predict new text-based information (6,8). A new revolutionizing area that is quickly developing by incorporating Artificial Intelligence in the medical area, especially for improving clinical decision-making processes and patient care (9). In the area of emergency medicine, where prompt and precise decisions are of utmost importance, Artificial Intelligence can significantly contribute to the development of emergency medicine residents.

AI technology have found applications ranging from efficiency to the diagnosis of patients in the healthcare industry (12). According to, AI is more effective than human specialists with regard to the analysis of vast quantities of information, thereby increasing the accuracy of a diagnosis or treatment plan (13).

2.2. AI in Emergency Medicine

The integration of Artificial Intelligence into healthcare could be opened to bring a paradigm shift in clinical practice especially in emergency and critical care medicine with the increasing complexity of patient care (5).

AI has emerged as a transformative force in clinical medicine, changing the diagnosis, treatment, and management of patients. Tools have been derived for working with ML, DL, and NLP algorithms to analyze large complex medical datasets with unprecedented accuracy and speed, thereby improving diagnostic precision, treatment personalization, and patient care outcomes(10)

Emergency medicine requires rapid assessment and management of patients. Some of the promising AI applications are in triage, diagnostic support and treatment planning (14). succeeded in differentiating skin cancer from images using AI algorithms, thus proving that there might be some use in diagnostic support in emergency situations. Conventional neural networks have dramatically improved the accuracy of medical imaging diagnoses, and NLP algorithms have greatly helped extract insights from unstructured data(10)

Emergency medicine physicians often practice in high-stress environments where they are expected to make rapid decisions based on very limited information. This pressure can lead to cognitive overload and increased risk of errors (15,17). Emergency personnel often experience difficulties in making cognitive challenges with complex cases needing a rapid synthesis of information, and they sometimes require decision support tools during time-critical and life-threatening illnesses (18).

AI can also support clinical decision-making by providing predictive insights and real-time data analysis.AI systems can analyze patient data to predict outcomes and recommend actions this support can lead to better patient outcomes as residents are helped to make better decisions (20).

Machine Learning can lighten the cognitive load on residents in emergency medicine by automating routine tasks and offering decision support. This reduction enables residents to allocate more time to complex aspects of patient care, resulting in better overall performance and increased confidence.

This would mean that integration of AI tools has over time been associated with improved patient outcomes in various studies. a predictive analytics could enhance the early identification of deteriorating patients, leading to timely interventions and reduced mortality (21).

2.3. Implementation of AI in Emergency Medicine

2.3.1. Educational Interventions

Educational efforts need to be made in order to effectively integrate AI into residency training in emergency medicine. The importance of using AI-centered training curricula that teach residents about using AI insights and translating them into clinical practice (22).

2.3.2. Simulation-Based Learning

Simulation-based learning is a very effective way for the residents of emergency medicine to learn about the applications of AI (22). Residents can get hands-on

experience in AI tools and develop their confidence in using them by modeling real-life scenarios where these tools will be used.

2.3.3. Interdisciplinary Collaboration

Collaboration between professionals in the field of emergency medicine and AI experts is important in the development of custom AI solutions to cater to the particular needs of residents (21). Such collaborations could aid in the development of user-friendly applications that could be immediately used in emergency settings.

2.3.4 **Challenges of AI implementation**

There are still numerous challenges that face AI integration into clinical workflows, including data privacy, algorithmic bias, ethical dilemmas, and problems with the interpretability of deep learning process. These barriers have thus far prevented the widespread application of AI in health care, and its possible trends, obstacles, and future implications are necessary to be systematically explored(10)

3. CONCEPTUAL FRAMEWORK

The conceptual framework for this study is based on the integration of AI technologies into emergency medicine clinical practice. It showing dimensions that shape residents' perspective of AI integration in clinical practice.

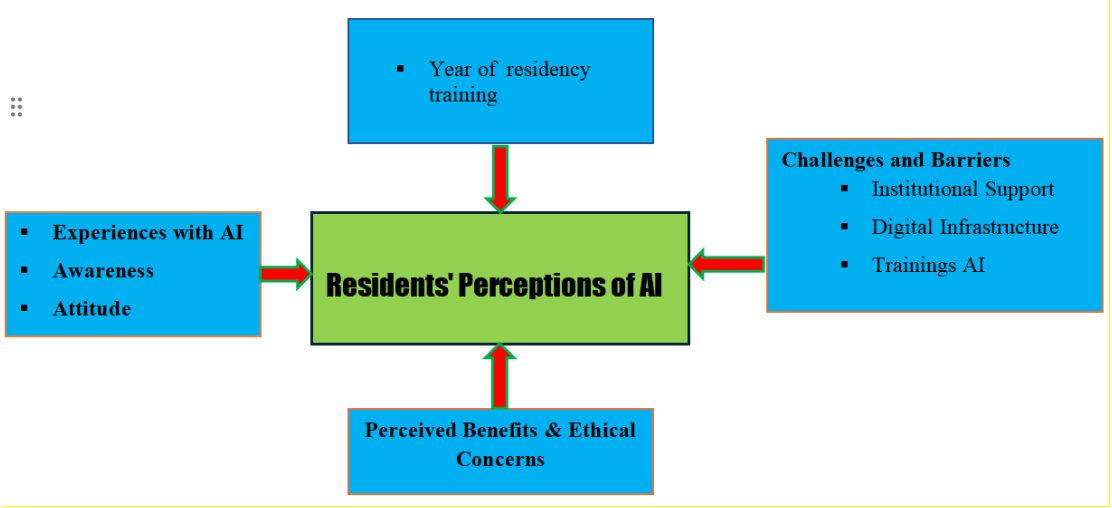

Figure 1; conceptual frame work, adapted from different litterateurs

(4,6,7,10)

4. OBJECTIVES

4.1 General Objective

To explore the perspective of AI integration in clinical practice Among Emergency and Critical Care Medicine residents at the three major teaching hospitals in Addis Ababa, Ethiopia.

4.2 Specific Objectives

- To examine the attitude of ECCM residents towards AI integration in clinical practices
- To investigate perceived benefits and challenges associated with integration of AI in clinical practice
- To discover the lived experiences of ECCM residents about integration of AI tools in clinical practice

5. METHODOLOGY

5.1 Study Setting and Period

The study was conducted at TASH, SPMMC and Yekatit-12 HMC in Addis Ababa, Ethiopia, focusing on three medical teaching institutions that provide training in emergency medicine and critical care specialty. The study was conducted from June 1 to October 30,2025

5.2. Study Design

A phenomenological qualitative study design was employed to explore the perspective of AI integration in clinical practice Among Emergency and Critical Care Medicine residents at three major teaching hospitals in Addis Ababa, Ethiopia.

5.3 Population

5.3.1 Target Population

All Emergency medicine residents across Ethiopia

5.3.2 Source Population

All Emergency medicine residents in TASH, SPHMMC and Y-12HMC during the study period.

5.3.3 Study population and sampling procedure

A total of sixteen ECCM residents were purposively sampled from TASH, SPHMMC, and Y-12HMC, though this can prove to be a powerful research technique in ensuring a research has access to the most valuable sources of information and are encouraged to gain a qualitative understanding of something through research insights and analysis, this technique can prove to have some limitations in regard to representativeness. To make research credible and minimize sampling biases in this regard, maximum variation sampling is being used based on their year of residence, direct involvement in AI and trainee center.

5.4. Data collection methods and procedures

Data were collected from ECCM residents through audio record in Amharic language using One Focus-group and eight in-depth interviews by the principal researcher. Data saturation occurred after completing the 8th in-depth interview. The recorded interview was transcribed and translated then coded by principal investigator, themes were developed, described and finally theme analysis conducted manually.

5.5 Data quality assurance

To significantly enhance the study's credibility, members of emergency and critical care medicine of the TASH, SPHMMC and Y12HMC residents who have direct involvement in the implementation of AI in Emergency and Critical Care Medicine were recruited since their active participation in the research and sharing of their perspective, experiences and future in AI integration paramount. Appropriate locations were selected by the data collectors to conduct the interviews, where participants would feel comfortable to respond openly. Additionally, efforts were made to explain the purpose of the study in order to maintain the participants' trust in its importance, thus ensuring that they could provide open, thorough, and honest responses.

5.6. Data processing and analysis

The qualitative data analysis began concurrently with the data collection process, with additional probing questions being asked based on the participants' responses. Verbatim transcription and translation to English were done by principal investigator himself. Translation was done after verbatim transcription. Coding and emerging theme organization were performed using the components of the framework. Afterwards, thematic analysis was performed manually. This qualitative data analysis in a systematic, five-phase process based on thematic analysis. First, verbatim transcripts in Amharic were created from audio recordings, and then open coding was done through line-by-line analysis of each of the one FGD and eight IDI transcripts to generate initial, descriptive codes directly reflecting participants' words. These numerous codes were then organized during axial coding into broader conceptual categories by identifying relationships and patterns. Then refining these categories into preliminary themes for each data source, then conducting a cross comparative

analysis across all transcripts to merge and synthesize them into a final, coherent thematic framework. This framework consisted of five major themes

Theme 1: Knowledge gap with sub-themes including Variable Baseline Knowledge, Ad-hoc Use of AI Tools and Need for AI Literacy ,Theme 2: Perceived Clinical Value & Benefits including Augmenting Rapid Decision-Making, Enhancing Diagnostic Imaging Accuracy and Mitigating Burnout, Theme 3: Barriers to Implementation including poor Infrastructure , absence of Data Governance/Protocols, and Workflow Mismatches; Theme 4: Attitudes and Ethical Concerns, including Cautious Acceptance, Fear of Skill Erosion and Accountability Dilemmas; and Theme 5: Readiness & Implementation Requirements, include sub-themes of Foundational Training, Systemic Policy Integration, and Infrastructure Investment. Finally, in the interpretation phase, each theme and sub-theme was clearly defined and supported with direct, verbatim quotations from the participants in order to AI ground the findings in their authentic perspectives, yielding a rich, structured understanding of residents' views on AI integration into clinical practice.

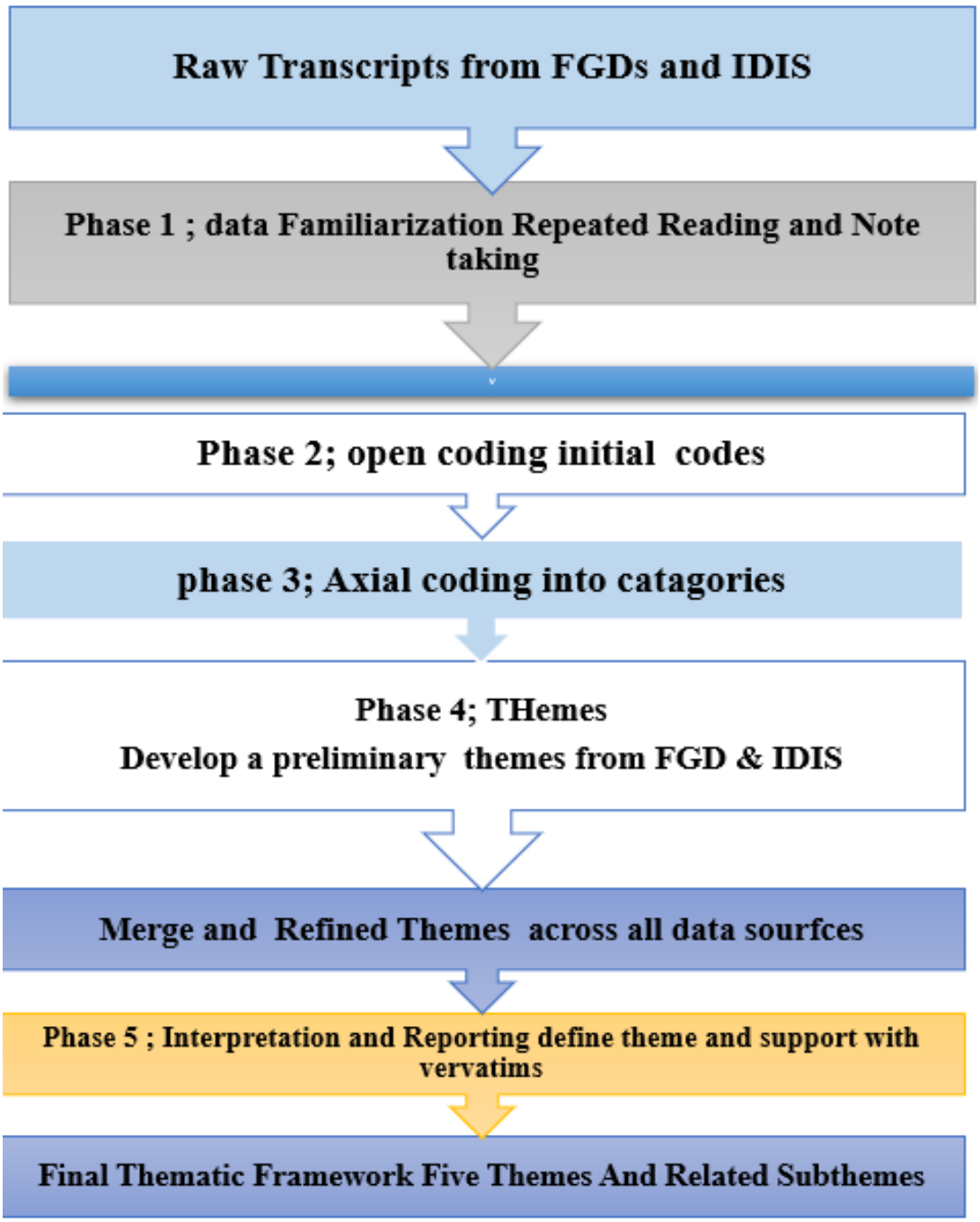

Figure 2 ; qualitative research Analysis Algorithms(Braun and Clarke)

5.7. Ethics approval and consent to participate

The study obtained an ethical clearance from Ethical Committee of the Department of Emergency Medicine and Critical Care, School of Medicine, Addis Ababa University (Ref. No/EM/SM/443/17).

6. RESULTS

Description of the study participants

In the study a total of one focused group discussion with a member of eight for one hour and three minutes and eight In-depth interviews were interviewed face to face which lasted from maximum 45 minutes and minimum of 30 minutes to explore perspectives of AI among emergency and critical care medicine residents.

Table 1 The participants work experience

Participant's description	**Response**	**Frequency**	**Percentage**
Sex	Male Female	13 3	81% 19%
Year of Residency	1st 2nd 3rd	3 4 9	19% 25% 56%
Training center	TASH SPHMMC Y12HMC	10 4 2	62% 25% 12.5%

A qualitative analysis of Focus Group Discussions (FGD) and In-Depth Interviews (IDI) with emergency and critical care medicine residents in Addis Ababa yielded five major themes and sixteen sub-themes, providing a holistic view of their perspectives on AI in clinical practice. The integrated findings are presented below.

THEME 1: Foundational Knowledge Gap

"This theme relates to residents' theoretical understanding of AI and their perceived level of preparedness towards using AI in a clinical setting. A basic conceptual understanding among both FGD and IDI participants of AI being a data-driven, support tool and AI's working being algorithm and data-driven, with usability depending on data input quality, However, this was uniformly coupled with self-acknowledged limited knowledge and an absolute lack of practical clinical exposure.

"Artificial intelligence to me is basically a computerized system that analyzes information and supports human activities. It works based on the data we feed into it and processes it faster than we can. I see it as a tool that tries to imitate human thinking to make decisions easier (code IDI-1).

"To me, AI is kind of a human-made intelligence which works in a manner very much like our human thought. AI substitutes our thinking functions in part and enables people to accomplish a task very quickly. In my belief, it saves time and energy because of this quickness and processing power (code IDI-8)."

This was also echoed by IDI participants, who described their awareness as "not enough to apply it safely" and highlighted the "very young" status of AI in Ethiopia, with no "real practical exposure or training for clinical use" (code IDI-7).

"But honestly, my own knowledge about AI is still very limited I mainly use AI as an academic supportive tool, I don't use it systematically for clinical decision-making (code FG4)."perceived a global divide, describing AI in Ethiopia as being at a "**neonatal age**" compared to the "skyrocketed" development abroad (code FG3)''

THEME 2: Perceived Potential Clinical Benefits

Participants from both groups held strong specific beliefs about the role of AI in enhancing emergency care, consistently framing it as an assistant to, not a replacement for, the clinician. The residents perceived AI as a strong ally to improve speed, accuracy, and efficiency regarding diagnostics, calculations, and information management while also acting as protection against human fatigue and error.

"Radiology reports sometimes take days, but AI can assist almost instantly. It helps us correlate imaging with clinical findings faster. This contributes to early decision-making and better patient flow (**code IDI-3**)." "AI supports scoring systems, comparing findings, predicting prognosis and augmenting rapid decision-making It

reduces the cognitive load by calculating things instantly. This helps us focus on important clinical decisions." mitigating burnout by reducing mental load (code IDI-2).

"AI can help in interpreting CT scans and MRIs almost like a radiologist. If AI supports this interpretation, patient care becomes quicker and more accurate: benefits like rapid decision support by diagnostic augmentation (code FG2)." It was also valued for its being an educational tool for machine learning and to recall forgotten management steps (code FG4).

THEME 3: Profound Barriers and Challenges to Implementation

This theme reflects an important level of system obstacles in order to incorporate AI in their work. A very detailed discussion turning up in both methods focused on overcoming barriers in order to incorporate AI with a focus on lack of basic knowledge, basic financial and infrastructure issues, lack of financial budget, lack of systems and policies for data governing.

"AI requires changed network systems, computers, and connectivity, our hospitals lack these infrastructures currently It takes a lot of money to establish data centers, this will become a major setback in adopting AI technology (code IDI-2)" The IDI added critical perspectives, pinpointing basic deficiencies in infrastructure and finance (absence of network systems, computers, and budget, (code IDI-3)

"The financial burden is a major barrier paid AI tools are more accurate, but here we rely on free versions with limited accuracy. Health systems need the most accurate results, but the cost is too high." Key barriers were financial constraints (reliance on inaccurate free versions, (code FG6), infrastructure limitations lack of data centers, (code FG1), data quality concerns risk of "disastrous consequences" from poor input, (code FG2), and workflow mismatches slow AI response vs emergency needs, (code FG3).

THEME 4: Attitudes and Ethical Concerns

ECCM residents view AI positively as a supportive tool with many benefits. Their stance, however, is one of cautious optimism; they see AI as a complement to, not a replacement for, clinical judgment. This is tempered by serious concerns about over-reliance and a lack of oversight.

ECCM residents' positive attitudes towards AI as a supportive tool with a lot of benefits cautious optimism rather than a replacement for clinical judgment alongside serious concerns about over-reliance and a lack of oversight

IDI participants similarly showed conditional acceptance, insisting AI must be an "adjuvant, not a replacement" (code IDI-4). They raised critical concerns about fear of skill erosion (code IDI-5, IDI-6) and ethical dilemmas and accountability gaps, questioning who is legally responsible for AI-driven errors (code IDI-4, IDI-5).

"I am open to using AI but only as an adjuvant, not a replacement. It must be used carefully because it is not fully responsible yet. Organizations must take accountability before we rely on it (code **IDI-4**)." "When AI lacks effective surveillance, it can be misleading and damaging to patients. AI must therefore be under proper control in order not to face ethics issues. Human accountability remains core in this case (code IDI-5)."

"AI can help both us and our patients by improving timely and appropriate management," but "AI has no institutional or national-level acceptance or regulation, if something goes wrong the responsibility falls on the physician. We need legislation to guide safe use (code FG2)."

They were pleased with a general positive orientation (code FG2, FG3) but showed cautious skepticism concerning observed inaccuracies (code FG2). Their emotional reactions were fear and humor concerning job.

THEME 5: Clear Implementation Readiness

This theme articulates the residents' definitive, practitioner-informed prescriptions for the requirements to successful AI integration, they also offered definitive recommendations for requirements to successful AI integration

The need for AI literacy and training was a dominant sub-theme (code FG2, FG4)."AI needs proper training. We must learn how to feed data correctly, how to interpret what AI gives us, and understand its limitations... Training is absolutely necessary **(**code FG2)."**,**"We rely on open data and we don't have dedicated data centers or integrated hospital systems. If AI were to be used clinically, it would face major gaps (code FG1)."

IDIs greatly expanded on this, specifying the need for foundational training and AI literacy programs (code IDI-8, IDI-4). They strongly advocated for systemic integration with national policy and institutional guidelines (code IDI-1, IDI-3) and concrete investment in enabling infrastructure (code IDI-5, IDI-7).

"There is a need for AI education/training," emerged strongly as a sub-theme (code FG2, FG4). "AI requires proper education/training. One must learn how to input data appropriately, how to analyze results returned by AI, and learn from their limitations. Education/training is a definite necessity," explained one focus group participant (code FG2). "We are using open data and do not have a centralized data system or a hospital's information system in place. Use of AI in a hospital setting would pose a challenge in this way," explained another focus group participant (code FG1).

7. DISCUSSION

This study provides a basic understanding of the perspectives of emergency and critical care medicine residents in Addis Ababa, Ethiopia, towards the integration of Artificial Intelligence (AI) in their clinical practice. The findings reveal a complex interplay of anticipation and apprehension, highlighting a significant gap between the theoretical potential of AI and the on-the-ground realities of a low-resource setting. The discussion that follows interprets these findings through the lens of the existing literature, demonstrating where the residents' experiences confirm, challenge, or add critical depth to the global conversation on AI in healthcare.

To make research credible and minimize sampling biases in this regard, maximum variation sampling is being used based on their year of residence, direct involvement in AI and trainee center.

Knowledge Gap

A major emerging area from both FGDs and IDI is the resident's variable level of existing knowledge and little practical experience with AI. While they were able to describe a good level of conceptual understanding of AI as "supportive" and "data-driven," (code IDI-3) they consistently admitted to being "very limited" in their knowledge and unable to apply it in a clinical setting. The residents' self-identified knowledge gap and their united call for structured training underscore the urgent need for educational interventions. aligns with the literature that defines AI as a set of techniques, including machine learning, aimed at performing tasks requiring human intelligence (21). Their demand for "proper training" on how to feed data and interpret outputs resonates with research (6), which emphasizes the necessity of implementing AI-focused curricula. This study's findings strongly suggest that without such foundational AI literacy, the potential benefits of AI cannot be realized, and the risks of misuse, as feared by the residents, will remain high.

Perceived Potential Clinical Benefits

The residents demonstrated a deep understanding of the particular role of AI in given medical situations is presently at the peak of research in medical AI. Their

identification of rapid support in decision-making, support for automation of complicated calculations, and support in diagnostic assistance reflects a literature in support of AI in increasing the efficiency of operations, treatment strategy, and enhanced diagnostics (24). Their belief in AI assisting with "interpretation of CT scans and/or MRI" corresponds completely to studies (25) Secondly, a direct reflection of AI role in reducing cognitive load and counteracting burnout is a salutary observation. Their contention of AI being a complement in which they stated they were "exhausted during long hours of duty and working with AI can reduce cognitive load by calculating things instantly authenticates theoretical speculation(1) in which authors assumed AI alleviates situations of cognitive load in emergency medicine residents by providing them optimum support in automating routine tasks. AI relates to this major role in a setting in which increased cognitive load is a proven adversary in medicine, being a proven factor in increasing error in emergency medicine in stressful environments with immediate time pressures on critical thinking decisions (15).

Profound Barriers

Although the literature frequently speaks to "transformational potential" in AI, this study uncovers the profound, system-level barriers that dominate the perspective of clinicians in low-resource settings. The challenges of financial constraints, infrastructure limitations, and data quality concerns were not just ancillary issues but were presented as fundamental, insurmountable obstacles to adoption. The residents' reliance on "free versions with limited accuracy" (FG6) and their description of a lack of "data centers or integrated hospital systems" (FG1) starkly contrast with the high-resource environments in which many AI tools are developed. This finding critically aligns with and gives voice to literature noting that emergency residents in low-resource settings may lack access to advanced diagnostic tools and clinical guidelines (19).

The concern over data quality is especially astute. The fear that "poor or incomplete input leads to misleading AI outputs" (FG2) touches upon the central issue of algorithmic bias and the "garbage in, garbage out" paradigm, a well-known challenge in data science. The residents' pragmatic observation underscores that AI cannot be a

magic bullet; its performance is inextricably linked to the quality of the data ecosystem in which it is deployed.

Attitudes and Ethical Concerns

These cautious optimism and conditional acceptance on the part of residents mirror a mature and realistic stance expressed by residents in global studies of practitioner perceptions (7) Insisting that AI must be an "adjuvant, not a replacement" (IDI-4) reinforces human oversight. Skepticism, born from direct experience with inaccurate outputs from general AI tools, underlines the vital importance of clinical validation-the call for which is very pertinent in the literature.

The ethical issues they raised, especially those regarding accountability gaps and the fear of erosion of skills, are at the heart of the global bioethical debate on AI. The legal responsibility issue (10)."if something goes wrong the responsibility falls on the physician"(FG2) indicated a major regulatory gap. Again, the fear that over-reliance would lead them to "lose core diagnostic skills"(IDI-6) highlights that in situations where clinical good judgement is of prime importance, AI must be engineered to enhance not atrophy the basic medical competence.

Implementation Readiness

Perhaps the most valuable contribution of this study is the clear, practitioner-informed roadmap for implementation. The resident's recommendation in AI ethics learning, national policies, and investments in infrastructure, which very neatly maps into recommendations presented in literature.

Their demand for "curriculum-based training" (IDI-4) is greatly supported by research, which promotes educational programs focusing on effectively incorporating AI into emergency medicine education (26). Their proposal on how this can be achieved in simulation learning is an excellent idea, which is largely supported in literature for being an effective tool for residents to have hands-on learning experience with AI systems (22).

Moreover, their views on requiring national policies and guidelines prior to usage in a medical setting reflect an unstated need in research for some guidelines.

8. CONCLUSION

This study concludes that the emergency and critical care medicine residents in Addis Ababa are demonstrated a positive attitude towards AI integration in clinical practices recognize the significant potential of Artificial Intelligence to augment clinical decision-making, enhance diagnostic efficiency, and mitigate burnout. They exhibit a clear conceptual understanding of AI and express a stance of cautious optimism towards its integration.

In this context, the introduction of AI faces profound barriers that include nearly a complete lack of enabling digital infrastructure, substantial financial constraints, an absence of localized data systems and no formal staff training, for this reason, current readiness for the integration of AI in these clinical settings is low.

The perspectives of these frontline providers are invaluable in crafting a feasible, context-sensitive, and ethical implementation strategy for AI in the low-resource healthcare system.

9. Limitation

The study's findings are some limitations on transferability, as the perspectives were gathered exclusively from residents at three teaching hospitals in Addis Ababa, which may not fully represent the views of clinicians in other Ethiopian regions or healthcare settings. To make research credible and minimize sampling biases in this regard, maximum variation sampling is being used based on their year of residence, direct involvement in AI and trainee center and the principal investigator deeply familiarized about the participants concept to reduce researcher bias, probing question was used to reduce recall bias.

10. RECOMMENDATIONS

The PI consider the following recommendations, to integrate AI in clinical practice needs formal AI literacy training, facilitate advanced digital health infrastructure, launching pilot programs through interdisciplinary collaboration, and conducting further research on localized AI solutions and stakeholder perceptions, Followed by developing national AI policies and regulatory frameworks to integrating AI literacy into medical curricula.

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Annex-1

Assurance of the principal investigator

I, the undersigned, agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide a timely progress report to my advisor and seek the necessary advice and approval from my primary advisors during the research. I will communicate timely to my advisors all stakeholders involved in the study, including any funding source for this research.

Name of the student: _____

Signature: _____

Date: _____

Approval of the primary Advisor Name of the primary advisor: _____

Signature: _____

Date: _____

Annex-2: **Information sheet and consent form**

Research Project: Exploring the perspective of emergency and critical care medicine residents regarding the utilization of Artificial Intelligence for clinical practice: A Multicenter Qualitative study from teaching hospitals in Addis Ababa, Ethiopia.

Name of Principal Investigator: Dr Tamrat Kifle

Introduction : This information sheet and consent form is prepared by the investigator whose aim is to Exploring the perspective of emergency and critical care medicine residents regarding the utilization of Artificial Intelligence for clinical practice: A Multicenter Qualitative study from teaching hospitals of Addis Ababa, Ethiopia. The investigator is an emergency medicine and critical care resident from Addis Ababa University.

Purpose: : Exploring the perspective of emergency and critical care medicine residents regarding the utilization of Artificial Intelligence for clinical practice in teaching hospitals in Addis Ababa, Ethiopia

Procedures: you are kindly invited to take part in our research because we believe you can provide the necessary information for the research. Participation in the study is voluntary. If you are willing to participate in our project, you need to understand and sign the consent form. Then, you will be asked to give your response by the data collectors. All the responses given by the participants and the results obtained will be kept anonymous and confidential. No one outside the research team will have access to your responses.

Risk and/or Discomfort: There is no risk that this research will pose to its participants. Benefits: This study will have paramount importance. It will generate a hypothesis for further research done in this area. Further, the result will be communicated to the respective stakeholders, including the Federal Ministry of Health, for reviewing its guideline per the physicians' perception.

Incentives: There is no incentive associated with the study

Confidentiality and Anonymity: The information we will collect from this research project will be confidential. Information about you that will be collected from the survey will be stored in a file, which will not have your name on it, and it will not be revealed to anyone except the principal investigator.

Right to Refuse or withdraw: you have the full right to refuse to participate in this research (you can choose not to respond to some or all of the questions). If you do not wish to participate, this will not affect you. You also have the full right to withdraw from this study without losing your rights as a site resident.

Persons to contact for further information: If you have any questions, you can contact the principal investigator at the following address:

Name: Dr.Tamrat kifle

Tel: +251936993500

Email: kifletamrat108@gmail.com

If you agree to participate in this study, I appreciate your truthfulness. And after having this consent form read to you, please put a sign below to show if you are willing to participate (No need to write your name). Are you willing to participate in this study? Yes [ ] No [ ]

Data Collection Questionnaire

Section 1: Demographic Information

1. Age:____

2. Gender: Male_____ Female_____

3. Year of residency- 1st year___, 2nd year_____3rd year____

4. Institution- TASH_____SPMMC____ Yekatit-12 HMC_____

Qualitative questions(1,4,6,7,10)

In-depth interview

1. How can you describe Artificial intelligence in your understanding?
2. In your opinion what benefits you expect in integration of AI with emergency medicine clinical practice
3. What barriers do you think prevent the use of AI tools emergency medicine clinical practice
4. How do you think is AI will impact the development of clinical skills (positive vs negative)?
5. Would you be open to use AI tools in your future practice? why?
6. From your perspective, what would be needed to effectively use AI in daily clinical practice?

Focus group discussion

1. What are your thoughts about Artificial intelligence?

2. what are your perspectives about the roles of AI in emergency and critical care medicine?
3. What do you feel about the current status of AI technology in clinical practice?
4. What do you think are the main barriers to adopt AI technology in emergency clinical practice and how can overcome the barriers**?**

Annex 4

Declaration

I, the undersigned, agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide a timely progress report to my advisor and seek the necessary advice and approval from my primary advisors during the research. I will communicate timely to my advisors all stakeholders involved in the study, including any funding source for this research.

Name of the student: _

Signature: ___

Date: _

Approval of the primary Advisor Name of the primary advisor:

_____

Signature: ___

Date: __