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# Perception and Challenges of Using Artificial Intelligence (AI) in Post Graduate Medical Education in Dar Es Salaam, Tanzania

**Nahida Walli**

Nahida.walli@aku.edu

Aga Khan University

**Elisamia Ngowi**

Aga Khan University

**Daudi Gidion**

Aga Khan University

**Hajaj Salum**

Aga Khan University

**Hanifa Mbithe**

Aga Khan University

**Aliakbar Zehri**

Mukhtar A Sheikh Hospital

**Mariam Noorani**

Aga Khan University

**Research Article**

**Keywords:** Artificial intelligence, postgraduate medical education, medical residents, faculty perceptions, qualitative research, Tanzania

**Posted Date:** October 30th, 2026

**DOI:** https://doi.org/10.21203/rs.3.rs-11007797/v1

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**Additional Declarations:** No competing interests reported.

## Abstract

# Background

Artificial intelligence (AI) is increasingly being integrated into healthcare and medical education, offering opportunities to enhance learning, teaching, and clinical decision-making. While AI has demonstrated considerable potential in medical training, evidence regarding its use in postgraduate medical education in low- and middle-income countries remains limited. This study explored the perceptions and challenges associated with AI use among postgraduate medical residents and faculty members in Tanzania and identified educational needs for its effective integration into training programs.

# Methods

A descriptive qualitative study was conducted among postgraduate medical residents and faculty members from three universities offering postgraduate medical education in Dar es Salaam, Tanzania. Participants were purposively selected to ensure representation across specialties and levels of training. Data were collected through four focus group discussions with residents and thirteen key informant interviews with faculty members. Audio-recorded interviews were transcribed verbatim and analysed using conventional content analysis with the aid of MAXQDA version 24. The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines.

# Results

A total of 40 participants (27 residents and 13 faculty members) were included. Five major themes emerged from the analysis: (1) AI as a supportive learning tool that enhances understanding and educational efficiency; (2) concerns that excessive reliance on AI may undermine clinical reasoning and academic integrity; (3) limitations in the accuracy, reliability, and contextual relevance of AI-generated information; (4) barriers to effective AI use within the local context; and (5) the need for structured institutional support to guide safe and effective AI use. Participants reported that AI improved learning efficiency, facilitated access to information, simplified complex concepts, and enhanced teaching productivity. However, concerns were raised regarding overdependence on AI, reduced critical thinking, fabricated references, inconsistent outputs, and limited applicability of AI-generated recommendations to the Tanzanian healthcare context. Financial constraints, limited local data, and lack of formal AI training were identified as important barriers to effective AI utilization.

# Conclusions

AI is perceived as a valuable adjunct to postgraduate medical education in Tanzania, with the potential to enhance learning and teaching practices. However, concerns regarding overreliance, information

reliability, contextual applicability, and inadequate institutional guidance remain significant barriers to its effective use. Structured training, institutional policies, and equitable access to reliable AI platforms are essential to support the responsible integration of AI into postgraduate medical education.

# INTRODUCTION

Artificial intelligence (AI) refers to computer systems capable of performing tasks that typically require human intelligence, including learning, reasoning, problem-solving, and decision-making (1). In recent years, AI technologies have become increasingly integrated into healthcare, transforming areas such as disease diagnosis, medical imaging, clinical decision support, treatment planning, and health research (2–4). Advances in machine learning and deep learning have particularly enhanced the ability of AI systems to process large volumes of data and identify complex patterns that support clinical practice (4). As AI continues to reshape healthcare delivery, its influence has extended beyond clinical care into medical education.

Medical education is continuously evolving to meet the changing demands of healthcare systems and advances in medical knowledge. The rapid expansion of biomedical information, increasing complexity of patient care, and growing use of digital technologies have created a need for innovative educational approaches that enhance learning efficiency and prepare future healthcare professionals for technology-enabled practice (5, 6). Within this context, AI has emerged as a potentially valuable tool for medical education, offering opportunities to support personalized learning, facilitate access to information, generate educational content, and enhance assessment and feedback processes.

Several potential applications of AI in medical education have been described. AI-powered tools can assist learners by simplifying complex concepts, summarizing large volumes of information, providing adaptive learning experiences, and supporting clinical reasoning through interactive learning platforms (6–8). AI can also assist educators in developing teaching materials, generating clinical scenarios, creating assessments, and providing timely feedback to learners. These capabilities have generated considerable interest among educators and institutions seeking to improve learning outcomes and educational efficiency (8–10). Some experts have suggested that AI technologies will become an integral component of future healthcare training and practice, requiring healthcare professionals to develop competencies related to the appropriate use and evaluation of AI tools (10).

Despite these potential benefits, the integration of AI into medical education raises important concerns. Ethical issues related to data privacy, transparency, bias, accountability, and academic integrity have been widely discussed (11). There is also growing concern that excessive reliance on AI-generated information may reduce independent learning, critical thinking, and clinical reasoning skills among trainees (14). Furthermore, AI systems may generate inaccurate or misleading information, including fabricated references and recommendations that require careful verification before use in educational or clinical settings (14). These concerns highlight the need for healthcare professionals to develop the

skills necessary to critically appraise AI-generated outputs and apply them appropriately within clinical and educational environments.

Recognizing the increasing importance of AI in healthcare, several professional organizations have advocated for the incorporation of AI-related competencies into medical education curricula. The World Medical Association has emphasized the need for physicians, medical students, and healthcare professionals to develop an understanding of both the opportunities and limitations of AI technologies (11). Similarly, the Standing Committee of European Doctors has recommended the integration of AI into undergraduate, postgraduate, and continuing medical education to ensure that future healthcare professionals are adequately prepared for AI-enabled healthcare systems (12). Effective implementation of these recommendations requires an understanding of learners' and educators' experiences, perceptions, and educational needs regarding AI.

A key step in curriculum development is the assessment of learners' needs and identification of gaps between existing and desired competencies (13). Understanding how postgraduate medical trainees and faculty perceive AI, how they currently use it, and the challenges they encounter is therefore essential for informing educational strategies and institutional policies. Although studies from high-income countries have explored attitudes toward AI among medical students and healthcare professionals, evidence from low- and middle-income countries remains limited.

In Tanzania and many other sub-Saharan African countries, there is limited evidence regarding the use of AI in postgraduate medical education. As AI technologies become increasingly accessible and integrated into educational and clinical practice, understanding local perceptions and challenges is essential to ensure their responsible and effective implementation. Such evidence can inform curriculum development, faculty training initiatives, institutional policies, and future investments in educational technologies. Therefore, this study explored the perceptions and challenges associated with the use of artificial intelligence among postgraduate medical residents and faculty members in Dar es Salaam, Tanzania.

# METHODS

## Study design and setting

We conducted a descriptive qualitative study using conventional content analysis to explore perceptions and challenges associated with the use of AI in postgraduate medical education. The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines.

The study was conducted in Dar es Salaam, Tanzania, and included the three universities offering postgraduate medical education programmes in the city: Aga Khan University (AKU), Muhimbili University of Health and Allied Sciences (MUHAS), and Hubert Kairuki Memorial University (HKMU).

AKU is a private university offering five postgraduate medical programmes, with approximately 38 residents and 40 faculty members. MUHAS is the largest medical training institution in Tanzania, offering sixteen postgraduate medical programmes with approximately 300 residents and 160 faculty members. HKMU is a private university offering four postgraduate medical programmes, with approximately 84 residents and 34 faculty members.

## Participants and sampling

The study population comprised of postgraduate medical residents and faculty members involved in postgraduate medical training at the three participating universities. Residents were eligible if they were currently enrolled in a postgraduate medical training programme, while faculty members were eligible if they were full-time academic staff involved in postgraduate teaching and supervision. Individuals who declined to provide informed consent were excluded.

Participants were recruited using purposive sampling to ensure representation across institutions, specialties, and levels of training. Recruitment continued until data saturation was achieved, defined as the point at which two consecutive interviews or focus group discussions (FGD) that generated no new codes or concepts relevant to the study objectives.

## Data collection

Data were collected between April and August 2025.

A total of thirteen key informant interviews were conducted with faculty members, while four focus group discussions involving twenty-seven postgraduate medical residents were conducted. Separate semi-structured interview and focus group discussion (FGD) guides were developed specifically for this study to explore faculty members' and residents' perceptions, experiences, perceived benefits, challenges, and educational needs related to the use of AI in postgraduate medical education. The guides were developed by the research team based on the study objectives and relevant literature and were not adopted or adapted from previously published data collection instruments. The interview and FGD guides are provided as supplementary material (Supplementary File 1).

Topics explored included the use of AI in lesson planning, teaching and learning activities, clinical teaching, assessment and examination preparation, feedback provision, research activities, and clinical decision-making.

The interviews and focus group discussions were conducted by research assistants and were audio-recorded with participants' permission. Field notes and reflective memos were documented during and after data collection to capture contextual information and emerging insights.

# Data analysis

Audio recordings were transcribed verbatim and analysed using conventional content analysis. Data analysis was conducted concurrently with data collection to facilitate identification of emerging concepts and assessment of data saturation.

The transcripts were read repeatedly to achieve familiarity with the data. Meaning units relevant to the study objectives were identified and assigned initial codes. Similar codes were grouped into categories, which were subsequently refined into broader themes representing participants' perceptions and experiences regarding AI use in postgraduate medical education.

Data management and coding were performed using MAXQDA version 24 (VERBI Software, Berlin, Germany). Coding was undertaken by DG and reviewed by EN. Discrepancies were discussed and resolved through consensus.

To enhance trustworthiness, participants were purposively selected from multiple institutions, specialties, and levels of training. Reflective memos were maintained throughout the study, and coding decisions and emerging themes were discussed among members of the research team to enhance credibility and confirmability.

## Ethical considerations

### Ethical approval

was obtained from the Aga Khan University Ethics Review Committee (Reference Number: AKU/2024/27/fb/012/150). Permissions were also sought from MUHAS (Ref No. CA.301/374/01/) and HKMU (Ref No. KU/ARG/14.2.19/139) for data collection. Written informed consent was obtained from all participants prior to enrolment. Participation was voluntary, and participants were informed of their right to withdraw from the study at any time without consequences. All data were anonymised before analysis, and confidentiality was maintained throughout the study.

# RESULTS

Four focus group discussions involving twenty-seven postgraduate medical residents and thirteen key informant interviews with faculty members were conducted across three universities providing postgraduate medical education in Dar es Salaam, Tanzania. Resident participants represented multiple specialties and levels of training, while faculty participants were drawn from diverse clinical disciplines, including Internal Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology, Family Medicine, Neurology, Ophthalmology, Oncology, and Accident and Emergency. Participant characteristics are summarized in Tables 1a and 1b.

**Table 1a: Characteristics of Focus Group Discussion Participants (Residents)**

| FGD | Number of Participants | Gender (M/F) | Year of Training | Specialties Represented |
|---|---|---|---|---|
| FGD 1 | 8 | 5M / 3F | Year 1-3 | Internal Medicine, Surgery, Paediatrics |
| FGD 2 | 7 | 4M / 3F | Year 1-3 | Obstetrics & Gynaecology, Family Medicine |
| FGD 3 | 6 | 3M / 3F | Year 2-4 | Surgery, Orthopaedics, Anaesthesia |
| FGD 4 | 6 | 2M / 4F | Year 1-4 | Internal Medicine, Paediatrics, Emergency Medicine |
| Total | 27 | 14M / 13F | | |

*FGD = Focus Group Discussion; M = Male; F = Female.*

**Table 1b: Characteristics of Key Informant Interview Participants (Faculty)**

| Participant ID | Institution | Department | Gender | Years of Teaching Experience |
|---|---|---|---|---|
| G-01 | MUHAS | General Faculty | M | 12 |
| A&E-01 | | Accident & Emergency | M | 8 |
| IM-01 | | Internal Medicine | F | 10 |
| Neuro-01 | | Neurology | M | 15 |
| Paed-01 | | Paediatrics | F | 9 |
| Surgery-01 | | Surgery | M | 14 |
| Oncology-01 | | Oncology | F | 7 |
| Optha-01 | | Ophthalmology | M | 11 |
| A&E-01 | AKU | Accident & Emergency | M | 6 |
| Paed-01 | | Paediatrics | F | 8 |
| OB-01 | | Obstetrics & Gynaecology | F | 10 |
| FM-01 | | Family Medicine | M | 12 |
| PH-01 | HKMU | Public Health | M | 20 |
| Total | 3 | 11 | 13 (8M / 5F) | Range: 6-20 years |

***M = Male; F = Female; MUHAS = Muhimbili University of Health and Allied Sciences; AKU = Aga Khan University; HKMU = Hubert Kairuki Memorial University; IM = Internal Medicine, Neuro = Neurology, Paed = Paediatrics, OB = Obstetrics and Gynaecology, A&E = Accidents and Emergency, FM = Family Medicine, PH = Public Health, Ophtha = Ophthalmology; G = General Faculty***

Five major themes emerged from the analysis: (1) AI as a supportive learning tool that enhances understanding without replacing foundational learning; (2) concerns that unregulated AI use may undermine clinical decision-making and academic integrity; (3) limitations in the accuracy, reliability, and contextual relevance of AI-generated information; (4) perceived barriers to accessing and effectively using AI within the local context; and (5) the need for structured institutional support to guide safe and effective AI use. A summary of the themes and representative quotations is presented in Table 2.

**Table 2: Summary of the key themes derived from the qualitative analysis, with illustrative quotes**

| Theme | Description | Illustrative Quote |
|---|---|---|
| **AI as a support tool that enhances understanding without replacing foundational learning** | **AI was perceived as a supplementary tool that improves learning efficiency, simplifies complex content, supports personalized learning, and enhances faculty productivity without substituting core educational practices.** | ***AI is going to develop us, is going to benefit us more than developed countries. I think we need AI more than developed countries (KII, HK-PH-01, Faculty)*** |
| **Concerns that unregulated AI use may undermine clinical decision-making and academic integrity** | **Participants expressed concerns that excessive or unregulated AI use could reduce learning effort, weaken critical thinking, erode confidence in independent reasoning, and compromise the development of clinical competence.** | ***"It reaches a point that you cannot trust your own reasoning or your own memory. You just have to go and question AI." (FGD 4 participant P)*** |
| **Limitations in the Accuracy, Reliability, and Contextual Relevance of AI-Generated Information** | **AI-generated outputs were perceived as sometimes inaccurate, inconsistent across platforms, and insufficiently tailored to the local clinical context, limiting trust in AI as a reliable source of information.** | ***"You search the same thing from one AI, you get this answer, then from another AI you get a different answer." (FGD 4, Participant S)*** |
| **Perceived barriers to accessing and effectively using AI within the local context** | **Financial constraints, limited local and African-specific data, infrastructure challenges, and gaps in AI-related skills were identified as key barriers to effective AI use.** | ***"One of the restrictions I have faced is to get local data. Especially if you're looking for Tanzanian guidelines, it might give you false information." (FGD 4, participant V)*** |
| **Need for structured institutional support to guide safe and effective AI use** | **Participants emphasized the need for institutional training, access to validated AI tools, clear policies, and monitoring systems to ensure ethical and effective integration of AI into education.** | ***"If we could have an institutional subscription to an AI platform whereby both faculty and students access AI and get training on how to use it." (FGD 2, participant G)*** |

### Theme 1: AI as a Support Tool That Enhances Understanding Without Replacing Foundational Learning

Both residents and faculty described AI as a supportive learning tool that enhances efficiency, simplifies complex medical content, and supports personalized learning without replacing foundational knowledge. AI was primarily used to break down complex topics, provide rapid overviews of large volumes of information, and support learning in time-constrained clinical environments.

Residents emphasized AI's role in simplifying difficult concepts and facilitating quick revision.

***"It helps me break down very complex concepts into chunks that I can actually digest… and it also saves time."*** **(FGD 1, Participant V)**

Participants also highlighted AI's ability to adapt explanations to individual learning needs, which was perceived as an improvement over traditional uniform teaching approaches.

***"AI is most personalised and that will help every learner adapt quickly compared to having one learning method for everyone."*** **(FGD 4, Participant W)**

Faculty members similarly reported that AI enhanced productivity in teaching and assessment preparation, enabling more efficient development of educational materials.

***"AI particularly for teaching has done many things for me in terms of enhancing my productivity. I'm able to now generate better case scenarios for my teaching purposes. In the past, I have to go through PubMed and so many articles, and it takes me ages "(KII, MUHAS-01, Faculty)***

Overall, participants viewed AI as an inevitable component of modern medical education, comparable to earlier transitions such as the adoption of internet-based learning resources.

**Theme 2: Concerns That Unregulated AI Use May Undermine Clinical Decision-Making and Academic Integrity**

Despite acknowledging the benefits of AI, both residents and faculty expressed concern that unregulated or excessive reliance on AI could negatively affect learning quality, critical thinking, and professional development. Participants described risks of intellectual dependency, reduced learning effort, and erosion of confidence in independent reasoning.

Residents noted that easy access to instant answers could discourage deeper engagement with learning materials.

***"To some extent, it also makes us lazy because you're getting everything at your button compared to before."*** **(FGD 2, Participant M)**

Faculty similarly observed a decline in self-directed learning habits among trainees, with increased reliance on AI-generated information rather than active searching and synthesis.

***"People no longer search, look, and read. They just pick AI… the habit of self-driven learning is now going out."*** **(KII, MUHAS-A&E-01, Faculty)**

Participants also expressed concern that frequent AI use could weaken critical thinking, creativity, and confidence in clinical judgment, with some residents reporting increased dependence on AI validation even for familiar topics.

***"It reaches a point that you cannot trust your own reasoning… you just have to go and question AI."* (FGD 4, Participant P)**

Faculty further cautioned that over-reliance on AI may compromise the development of clinical reasoning, hands-on skills, and human connection, which were viewed as essential components of medical training.

***"If the resident fits everything into a tool and the tool gives all the differentials, it will definitely affect cognitive and reasoning ability."* (KII, AKU-FM-01, Faculty)**

**Theme 3: Limitations in the Accuracy, Reliability, and Contextual Relevance of AI-Generated Information**

Both residents and faculty expressed concerns regarding the accuracy, reliability, and contextual relevance of AI-generated information. Participants described instances of fabricated or inaccurate references, inconsistent outputs across platforms, and limited applicability of AI responses to the local Tanzanian healthcare context, which collectively undermined trust in AI as a dependable source of information.

Residents frequently reported encountering non-existent or incorrect citations, necessitating additional verification and reducing confidence in AI outputs.

***"It tells you that this is found in this reference, but when you go to that reference it might not be there."* (FGD 2, Participant K)**

Participants also highlighted inconsistencies across AI platforms, noting that contradictory answers to the same query made it difficult to rely on AI-generated information without cross-checking.

***"You search the same thing from one AI, you get this answer, then from another AI you get a different answer."* (FGD 4, Participant S)**

Faculty members further emphasized concerns about contextual inappropriateness, explaining that AI tools are largely trained on Western datasets and may generate recommendations that are poorly suited to local clinical realities.

***"You see a patient in a Tanzanian context, but the differential diagnosis it gives you might not be really appropriate in our context."* (KII, AKU-FM-01, Faculty)**

**Theme 4: Perceived Barriers to Accessing and Effectively Using AI Within the Local Context**

Participants described several context-specific barriers that limited effective use of AI in postgraduate medical education. These included the high cost of advanced AI tools, limited availability of locally relevant medical data, and gaps in user knowledge and skills. Free AI platforms were widely perceived as

inadequate for academic and clinical purposes, while paid versions were viewed as more reliable but financially inaccessible to many trainees.

***"If you want legit content which is up to date and true, you have to pay extra cost… it's a bit expensive." (FGD 3, Participant F)***

In addition, participants emphasized that AI-generated outputs often lacked local and African-specific context, reducing their applicability to Tanzanian clinical guidelines and practice.

**"If you're looking for Tanzanian guidelines, it might give you false information." (FGD 4, Participant V)**

Both residents and faculty also highlighted skills gaps in effective AI use, noting that most users relied on trial-and-error approaches rather than formal training, which affected the quality of AI outputs.

***"If you do not prompt the AI well, it won't be able to provide the information that you require." (KII, AKU-A&E-01, Faculty)***

**Theme 5: Need for Structured Institutional Support to Guide Safe and Effective AI Use**

Both residents and faculty emphasized the urgent need for structured institutional frameworks to support the responsible integration of AI into postgraduate medical education. Participants highlighted the importance of formal training, equitable access to quality AI tools, and clear institutional policies to guide ethical and effective AI use.

Participants consistently called for formal training programs for both residents and faculty, focusing on effective prompting, critical appraisal of AI-generated content, and appropriate integration of AI into learning and teaching activities.

***"We need training, maybe from experts, on how to approach asking questions in AI… sometimes a small change in phrasing gives a totally different result."* (FGD 2, Participant E)**

Faculty echoed the need for structured curriculum-based training that clearly outlines available AI tools and their appropriate use.

***"There has to be formal training both for faculty and residents in the curriculum on what tools are available and how you use them."* (KII, AKU-FM-01, Faculty)**

Participants also emphasized the need for institutional infrastructure and subscriptions to ensure equitable access to reliable AI platforms for all learners and educators.

***"If we could have an institutional subscription to an AI platform whereby both faculty and students access AI…"* (FGD 2, Participant G)**

In addition, both groups highlighted the importance of clear policies, assessment adaptations, and monitoring systems, including standard operating procedures, to regulate AI use and prevent misuse.

***"There needs to be a proper SOP on how to implement AI… certain policies that should guide how it should be used."*** **(KII, MUHAS-01, Faculty)**

Overall, participants viewed institutional support as essential for maximizing the benefits of AI while minimizing potential risks associated with its use in postgraduate medical education.

# DISCUSSION

Participants perceived AI as a valuable educational tool that enhances learning efficiency, facilitates access to information, and supports teaching activities. However, concerns regarding overreliance on AI, the accuracy and contextual relevance of AI-generated information, and barriers to effective implementation were also identified. To our knowledge, this is among the first qualitative studies exploring perceptions and challenges related to AI use in postgraduate medical education in Tanzania. These findings contribute to the growing body of literature examining the integration of AI into healthcare and medical education globally (2, 4, 12).

A key finding of this study was the widespread perception of AI as a supportive educational tool that enhances learning and teaching efficiency. Residents described using AI to simplify complex concepts, summarize large volumes of information, and facilitate rapid revision in time-constrained clinical environments. Faculty members similarly reported improved efficiency in preparing educational materials, developing teaching cases, and supporting assessment activities. These findings are consistent with previous studies demonstrating that AI technologies can improve access to medical knowledge and facilitate personalized learning experiences among healthcare trainees (15, 28). The ability of AI tools to tailor information to individual learning needs may be particularly valuable in postgraduate training, where learners often have diverse educational backgrounds, clinical experiences, and learning preferences.

The findings also support broader discussions regarding the role of AI in transforming medical education. Scholars have suggested that AI represents an important component of technology-enhanced learning systems that help learners navigate the rapidly expanding body of medical knowledge while supporting lifelong learning (14, 25). In this context, participants viewed AI primarily as an adjunct to traditional educational approaches rather than a replacement for foundational learning. This distinction is important, as postgraduate medical education relies heavily on the development of critical thinking, clinical reasoning, and experiential learning, all of which remain fundamental human processes.

Despite these perceived benefits, concerns regarding excessive reliance on AI emerged as a prominent theme among both residents and faculty members. Participants expressed concerns that the ease and speed with which AI generates responses may reduce motivation for deeper learning and encourage passive consumption of information. Faculty members were particularly concerned that overreliance on AI-generated explanations and differential diagnoses could undermine the development of independent clinical reasoning and decision-making skills. Similar concerns have been reported in previous studies examining AI integration in healthcare and medical education, where scholars have emphasized the

importance of balancing technological assistance with preservation of human expertise and critical thinking (24, 30).

These concerns are particularly relevant within postgraduate medical education, where trainees are expected to progressively develop autonomy in patient care and clinical decision-making. Excessive dependence on AI-generated outputs may inadvertently limit opportunities for reflective learning, problem-solving, and evidence synthesis. Consequently, educational institutions may need to emphasize responsible AI use and encourage learners to critically evaluate AI-generated information rather than accepting it uncritically.

Another important finding relates to concerns regarding the accuracy, reliability, and trustworthiness of AI-generated information. Participants reported encountering fabricated references, inconsistent outputs across different AI platforms, and information that required verification through conventional academic sources. These observations are consistent with documented limitations of generative AI systems, which may occasionally produce plausible but inaccurate information due to the probabilistic nature of large language models (31). While AI tools have demonstrated impressive performance in answering medical examination questions and generating educational content, inaccuracies remain a recognized limitation (23, 27).

The findings highlight the importance of developing AI literacy among both educators and trainees. AI literacy extends beyond technical competence and includes the ability to critically evaluate outputs, identify inaccuracies, assess sources of information, and recognize situations where AI-generated recommendations require verification. Strengthening these competencies may help mitigate potential risks associated with the use of generative AI technologies in educational and clinical settings.

Participants also emphasized concerns regarding the contextual relevance of AI-generated information within the Tanzanian healthcare environment. Many AI systems are predominantly trained using datasets derived from high-income countries and may therefore generate recommendations that do not fully reflect local disease patterns, healthcare infrastructure, resource availability, or clinical guidelines. As a result, AI-generated recommendations may have limited applicability within low- and middle-income country settings.

These findings align with previous research highlighting the need for greater representation of African populations and healthcare systems within AI development and validation processes (21, 29). Without the incorporation of locally relevant data, AI technologies risk perpetuating existing inequities in global health knowledge production and decision support systems. Efforts to strengthen local data ecosystems and encourage the development of context-specific AI tools may improve the relevance and utility of AI technologies in African healthcare and educational settings.

Structural barriers to AI utilization also emerged as important challenges. Participants identified financial constraints, limited access to premium AI platforms, and inadequate training as significant barriers to effective use. While free AI platforms were commonly used, they were often perceived as less

reliable and less capable than subscription-based alternatives. These findings reflect broader disparities in access to digital technologies between high-income and resource-constrained settings. Similar challenges have been reported in studies examining digital transformation and AI implementation in low- and middle-income countries (21, 26).

Addressing these barriers will require institutional investment in digital infrastructure, training opportunities, and equitable access to validated AI platforms. Such investments may help ensure that the benefits of AI are accessible to all learners and educators rather than being limited by financial or technological constraints.

Finally, participants consistently emphasized the need for structured institutional frameworks to guide the responsible integration of AI into postgraduate medical education. Both faculty members and residents highlighted the importance of formal training programmes, institutional subscriptions to reliable AI tools, and clear policies governing AI use in educational and clinical activities. These findings are consistent with growing calls for the integration of AI literacy into medical curricula and continuing professional development programmes (22, 25).

Institutional guidance is particularly important given the rapidly evolving nature of AI technologies and the ethical considerations associated with their use. Clear policies can help define acceptable uses of AI, support academic integrity, and promote responsible use while minimizing risks related to misuse or overreliance. Collectively, the findings suggest that successful integration of AI into postgraduate medical education will require a balanced approach that embraces innovation while preserving the core competencies and professional values that underpin medical practice.

# Strengths and limitations

This study provides important insights into perceptions and challenges related to the use of artificial intelligence in postgraduate medical education from the perspectives of both residents and faculty members across multiple institutions in Dar es salaam, Tanzania. The inclusion of participants from different specialties, levels of training, and universities enabled exploration of a broad range of experiences and viewpoints.

However, several limitations should be considered. First, the study was conducted in three universities located within Dar es Salaam and may not fully reflect experiences in other postgraduate medical education settings within Tanzania or elsewhere. Second, as with all qualitative research, the findings are context-specific and are not intended to be statistically generalizable. Third, purposive sampling may have introduced selection bias, and participants may have provided socially desirable responses during interviews and discussions. Fourth, participants had varying levels of exposure to AI technologies, which may have influenced their perceptions and experiences. Finally, perceptions of AI are likely to evolve rapidly as AI technologies continue to advance, and therefore these findings reflect views at a specific point in time.

# Conclusions

Artificial intelligence is increasingly perceived as a valuable educational tool within postgraduate medical education in Tanzania. Residents and faculty members reported that AI enhances learning efficiency, facilitates access to information, and supports teaching and assessment activities. However, concerns regarding overreliance, potential impacts on critical thinking and clinical reasoning, inaccuracies in AI-generated information, and limited contextual relevance remain important challenges.

Financial constraints, limited access to reliable AI platforms, and inadequate formal training were identified as significant barriers to effective AI utilization. Participants emphasized the need for structured institutional support, including AI literacy training, equitable access to validated AI tools, and clear policies governing responsible AI use.

As AI technologies become increasingly integrated into healthcare and medical education, educational institutions should prioritize the development of frameworks that support the safe, ethical, and contextually appropriate use of AI. Such efforts may help maximize the educational benefits of AI while preserving the critical thinking, clinical reasoning, and professional judgment that remain fundamental to postgraduate medical training.

# Declarations

### Ethics approval and consent to participate

This study adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was received from all Universities with approval number AKU/2024/27/fb/012/150.

The Ethics Committee ensures the protection of participants' rights, safety, and welfare in accordance with established ethical guidelines and principles.

Written informed consent was obtained from all participants. Participants were also made aware that all the information obtained during and after the study was confidential.

### Consent to publish

Not Applicable

### Availability of data and materials

Available upon reasonable request to the corresponding author

### Competing interests

The authors declare no competing interests.

### Registration Details

This study is not a Clinical trial. Registration details are not applicable.

**Funding**

This research was funded by the Aga Khan University Scholarship of Teaching and Learning (SoTL) Grant 2024.

**Authors' contributions**

NW: Study conception, collection of data, Drafting and revision of manuscript

EN: Drafting manuscript, data collection and data analysis

DG: Drafting manuscript, data collection and data analysis

HB: Data collection and revision of the manuscript

AZ: Data collection and revision of the manuscript
HS: Data collection and revision of the manuscript

MN: Study conception, supervision of data collection and analysis, and revision of the manuscript and proofreading.

**Acknowledgements:**

The authors thank all postgraduate medical residents and faculty members at the Aga Khan University, Muhimbili University of Health and Allied Sciences, and Hubert Kairuki Memorial University who gave their time to participate in this study. We also acknowledge the programme directors at the three institutions for their facilitation.

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