Level of awareness of simulation-based training among clinical medicine lecturers at Kenya Medical Training College

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ABSTRACT

Simulation-based training (SBT) has emerged as a growing field in our awareness of an effective pedagogical means to improve clinical competence, patient safety, and experiential learning in medical education. Kenya Medical Training College (KMTC) has invested in simulation facilities in order to support competency-based training, but the use of SBT by clinical medicine lecturers is inconsistent across campuses. There is limited empirical evidence on the factors affecting the adoption and application of SBT among lecturers in mid-level medical training institutions. This study sought to assess the level of awareness of SBT among clinical medicine lecturers at KMTC. The study was guided by the theory of innovation diffusion. The research design used was analytical and cross-sectional. The sampling techniques used were cluster and simple random. The target population included 250 lecturers of clinical medicine in 45 KMTC campuses in Kenya. A sample size was determined using Taro Yamane's formula, which generated 153 lecturers. Data collection was conducted using a structured online questionnaire through Google Forms. Data analysis was performed with the Statistical Package for the Social Sciences (SPSS) version 27.0 by means of descriptive statistics, such as frequencies, percentages, means, and standard deviations, and inferential statistics, including regression analysis. The findings revealed that most respondents agreed SBT provides safe development of clinical skills, as students can make errors without harm to patients, with 24.2% indicating agreement and 66.0% strong agreement. Knowledge of KMTC or national policies/guidelines promoting simulation in medical education was more variable (agree, 29.4%; strongly agree, 22.2%). There was high conceptual awareness about the patient safety advantage, with 90.2% of lecturers agreeing that SBT allows risk-free practice of clinical skills. Regression analysis revealed that the level of awareness of SBT among clinical medicine lecturers predicted 9.3% of the utilisation of SBT (β=.305, R^2=.093, p<.001). The study concludes that KMTC clinical medicine lecturers' awareness of simulation-based training is pedagogically informed but operationally limited. Despite lecturers acknowledging the advantages of SBT as a method of patient safety and procedural competence, knowledge of particular modalities and individual exposure is low, which leads to a hesitant and rare use. The study recommends that KMTC need to shift the indicative awareness-building on theoretical advocacy into practical pedagogy by instituting mandatory, cadre-specific faculty development programmes. They should focus on practical training on scenario design, facilitation, and structured debriefing and mentoring by the early adopters. A combination of awareness measures and utilisation results from institutional monitoring will make it possible to provide targeted assistance.

Keywords: Awareness of Simulation-Based Training, Clinical Medicine Lecturers, Kenya Medical Training College, Simulation-Based Training

I. INTRODUCTION

Globally, simulation-based training is well established in the medical and health professions education, particularly in high-income countries. Many medical schools in North America, Europe, and parts of Asia have included simulation-based training in their curriculum. They are backed by dedicated simulation centres, trained faculty, and technologies such as high-fidelity simulators and virtual reality platforms (Gaba, 2004; Motola *et al*., 2013). In these settings, simulation is often utilised for teaching and learning as well as assessment, interprofessional education, and ongoing professional development. Awareness of simulation-based training (SBT) by medical educators is a critical determinant of the adoption and utilisation of this training modality in health professions education. Awareness includes the knowledge of simulation pedagogy among educators, familiarity with various modalities of simulation, and awareness of the process of incorporating simulation in teaching and assessment. Studies carried out in high-income countries have shown consistently high levels of awareness of simulation-based education by medical educators, which

may be attributed to a long history of integration of simulation in curricula, very well-established faculty development programmes, and widespread access to advanced simulation technologies (Abahuje *et al*., 2025). In these contexts, simulation has often been considered a principle instructional strategy, rather than an innovation that is optional.

Adoption of simulation-based training in low- and middle-income countries, which include Sub-Saharan Africa, has been slower and more uneven. Although there is an increasing appreciation of the value of SBT as a way to improve healthcare training, implementation of SBT in many African medical schools is limited by a lack of financial resources, poor infrastructure, a shortage of trained simulation faculty, and competing institutional priorities (Pather *et al*., 2020). Evidence from countries such as South Africa and Nigeria suggests growing usage of simulation in selected institutions, especially in Surgical, emergency, and Nursing education. However, in many other Sub-Saharan African settings, simulation-based training is in its early stages of integration and is often confined to low-fidelity or skills-based approaches of simulation (Ismail *et al*., 2024). In low and middle-income countries, especially in Sub-Saharan Africa, there is much variation in awareness of the simulation-based training among medical educators, between institutions, and countries. There is evidence that in the places where simulation has been consciously implemented as part of curricula, such as certain institutions in South Africa and Nigeria, educators have a moderate to high level of awareness and familiarity with simulation methodologies (Pather *et al*., 2020). However, due to limited exposure to simulation pedagogy, inadequate opportunities for faculty training, and a lack of institutional emphasis on the use of simulations, lower levels of awareness among educators is contributing to the under-utilisation of simulation in many other African contexts (Ismail *et al*., 2024).

In Kenya, simulation-based training has received more attention in recent years as part of wider efforts to achieve improvements in the quality of health professions education and the degree of alignment of training to competency-based curricula. To supplement clinical training, several universities and medical training institutions have introduced simulation laboratories and skills centres. Nonetheless, the application of simulation in different institutions continues to vary with many programs employing mostly simple simulation equipment and minimal structured integration into curricula (Nyamu *et al*., 2018). Awareness of simulation-based training among medical educators is slowly growing but varies from one institution and program to another. Recent studies have suggested that although some educators have a good knowledge of the principles and benefits of simulation-based education, others have limited exposure to such education, especially in institutions where simulation facilities are newly established or underutilised (Nyamu *et al*., 2018). Several campuses have developed skills laboratories and procured some of the basic simulation equipment to support clinical training. However, comprehensive simulation facilities with high-fidelity equipment are still limited, and there are disparities in different campuses (Nyamu *et al*., 2018).

At Kenya Medical Training College, clinical medicine lecturers are central in the preparation of the clinical officers of the future for safe and competent clinical practice. Despite the availability of simulation facilities in campuses, there is insufficient documentation indicating the level of use of simulation-based learning by these lecturers, as well as the factors that influence the use of simulation-based learning. This study therefore aims to investigate utilisation of simulation-based training among clinical medicine lecturers at KMTC with a special focus on lecturers' awareness of simulation-based training. By finding this predictor, the study will produce evidence that can be used to guide specific interventions to improve the integration and effectiveness of simulation-based training in KMTC.

1.1 Statement of the Problem

Kenya Medical Training College (KMTC) has invested in the simulation facilities and skills laboratories to support clinical training and address some of the challenges; for example, overcrowding of placement sites and increasing student enrolment. However, it is a question how far these investments have led to a consistent utilisation of simulation by lecturers. The level to which clinical medicine lecturers at KMTC are using simulation-based training is not known or seems to differ from campus to campus. Study carried out in KMTC and similar training institutions in Kenya suggests inequalities in the availability, quality, and functionality of simulation and skills laboratory equipment (Kavinya *et al*., 2023). More, these studies opined that while some campuses have modern simulation tools, others have outdated or low-fidelity equipment, which may affect the scope and frequency of simulation-based activities. The use of simulation-based training is affected by the level of awareness. Studies in health professions education show that lecturers who are knowledgeable about simulation pedagogy are more likely to use it in their instructional practise (Kavinya *et al*., 2023). On the other hand, lack of awareness has been identified as barriers to effective utilisation of simulation-based training.

Despite the growing focus in Kenya on simulation-based education, there is minimal empirical evidence of the role of lecturers' awareness in actual utilisation of SBT at KMTC. This gap was important since lecturers are key players in preparing competent clinical officers; however, their role in simulation adoption has been underexplored. Most existing studies have been carried out regarding student results or regarding other health disciplines, leaving a gap in terms of understanding the effects of awareness, perceptions, and availability of simulation resources among lecturers as an influencing factor in the use of SBT in clinical medicine training at KMTC. Therefore, this study aimed to assess

the level of awareness of simulation-based training among clinical medicine lecturers at Kenya Medical Training College.

1.2 Research Objective

To assess the level of awareness of simulation-based training among clinical medicine lecturers at Kenya Medical Training College.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Diffusion of Innovation

The Diffusion of Innovations Theory was proposed by Everett M. Rogers in 2003. Diffusion of Innovations Theory offers a useful, empirical framework that is enduring and applicable for analysing the spread of new ideas, practices, and technologies in and between social systems (Rogers, 2003). Diffusion occurs in five stages at the individual level: knowledge, persuasion, decision, implementation, and confirmation. Adoption is influenced by characteristics of the innovation (relative advantage, compatibility, complexity, trialability, observability), the characteristics of adopters, communication channels, time, and the social system.

This framework has direct application to the present study on awareness. This is the knowledge stage. Lecturers need to be aware of the existence of simulation-based training (SBT), its modalities, and its pedagogical principles, in the first place. Awareness is therefore the point of entry in diffusion. Without knowledge, there can be no adoption. Applied to KMTC, this framework describes why awareness is important predictors of utilisation. Awareness initiates diffusion. The outcome of these processes is utilisation that, in turn, becomes fed back into institutional norms and policy.

2.2 Empirical Review

Faculty awareness of simulation-based training (SBT) is defined as the knowledge and understanding of simulation by lecturers as a pedagogy, including familiarity with the modalities of simulation, the principles of education that underpin the use of SBT, the facilitation and debriefing process, and its role in competency-based medical education. Awareness is regarded as a basic prerequisite for adoption and use of SBT as it influences lecturers' attitudes, confidence, and willingness to incorporate simulation into teaching practice (Elendu *et al.*, 2024; Barlow *et al*., 2024). In the absence of sufficient awareness, even the best resourced simulation programs may be underused. Contemporary literature makes the awareness of faculty as the antecedent variable that affects the following perceptions, behavioural intentions, and actual utilization of educational innovations (Robinson *et al*., 2024).

Studies throughout the world have found moderate to high levels of awareness of SBT among health professions educators, especially among those institutions where simulation has been introduced through workshops or faculty development activities. Elendu *et al.* (2024), in a cross-sectional survey of 210 medical trainees that used chi-square tests and logistic regression analysis, concluded that the detection of simulation pedagogy was found to be significantly linked to the willingness to use SBT. Sung *et al.,* (2024) in a systematic review, exploring 18 studies (sample sizes ranging from 40 to 250 people, mixed RCTs and surveys, and meta-analysis and thematic synthesis was applied) found that most educators were aware of the educational benefits of SBT, including enhanced competence and patient safety. Faculty development workshops have also been shown to be effective for improving awareness: Aftab *et al*., (2024) in a quasi-experimental study of 96 nursing faculty's which was analysed with paired t-tests showed significant improvements in self-reported awareness following structured training. Karimijavan *et al*. (2026), in surveying 132 faculty members and using descriptive statistics to analyse the responses, confirmed similar improvements.

Despite this, there are a number of studies that warn that high awareness does not necessarily translate to implementation readiness. Seethamraju *et al*. (2022) examined educators' understanding of simulation in a qualitative study that involved 28 faculty and thematic coding and reported that while many faculty members recognised the theoretical value of simulation, many did not have operational knowledge of scenario design and debriefing. This difference between conceptual awareness and functional awareness is important in determining faculty preparedness for the use of SBT.

In Sub-Saharan Africa (SSA), the awareness of SBT is increasing due to competency-based education reforms and international partnerships. In a scoping review of 12 studies (sample sizes 50-200, mixed surveys and pre/post designs, analysed descriptively), Alayande *et al*. (2023) found positive awareness of the role of SBT for high-risk, low frequency, e.g., obstetric emergencies. A synthesis of 14 LMIC studies (sample sizes 40-250, mostly cross-sectional surveys with regression analysis) by Robinson *et al*. shows varied levels of awareness between institutions. Najjuma *et al*. (2020), in a survey of 85 faculty using the chi-square tests, did point out that awareness represented a basic familiarity with equipment, and there was inadequate understanding of pedagogy and assessment strategies.

In Kenya, there is some evidence for generally favourable awareness of SBT among health professions educators. Shikuku *et al*. (2022), in a survey of 102 nursing lecturers using descriptive statistics and regression, found simulation recognition of improvement of competence. Fant *et al.* (2022), in a mixed-method study of 76 faculty, including both survey and thematic analyses, found that faculty development efforts led to a better understanding of facilitation and debriefing. In a descriptive cross-sectional survey conducted by Kavinya *et al.* (2023) on 120 lecturers, using Chi-square tests, found that previous exposure to simulation training was significantly related to an increased level of awareness. However, a number of studies have reported that awareness was not consistent across institutions and that lecturers lacked adequate knowledge of how to operationalize simulation within assessment-driven curriculum (Shikuku *et al*., 2022).

Within Kenya Medical Training College (KMTC), there is available evidence that indicates a positive but variable level of awareness. Nyamu *et al.* (2018), in a survey of 64 faculties using descriptive statistics, reported positive attitudes towards simulation-based teaching. Kavinya *et al.* (2023) found variability between departments and campuses, with the consensus that although lecturers had some awareness of the use of simulation, many were not fully knowledgeable of pedagogy, structured debriefing, and integration of assessment. As a result, use of simulation was still inconsistent, with some campuses using available facilities less than they should. Importantly, there is little empirical evidence investigating awareness in clinical medicine lecturers in KMTC, given that most of the studies are from the fields of nursing, midwifery, and sciences in the laboratory.

Despite relevant points can be found in the existing literature that indicate faculty awareness to be a key determinant of SBT utilisation, there are several gaps that are relevant to the present study. First, there are few studies that considered the awareness among clinical medicine lecturers in middle-level institutions such as KMTC. Second, standardized tools for the measurement of awareness are not commonly used, limiting the ability of multiple studies to be compared. Third, most studies in Kenya are based on perceptions and attitudes rather than directly linking awareness level and utilisation outcomes. Finally, the academic literature does not break down awareness by department or cadre, but such distinctions may be important in multi-campus institutions such as KMTC. Given the existence of these gaps, measuring awareness among clinical medicine lecturers at KMTC is a necessary first step in understanding the predictors of utilisation. Establishing baseline awareness will provide empirical evidence for targeted faculty development and institutional planning, in addition to the literature at large about the adoption of simulations in resource-constrained training environments.

III. METHODOLOGY

This study utilised an analytical cross-sectional approach with a predictive model aspect. While cross-sectional designs are mostly descriptive, predictive elements were included via multivariate regression to examine the significance of awareness, perceptions, and resources as predictors of utilisation of simulation-based training. The study area was based on all Kenya Medical Training College (KMTC) campuses offering the Diploma in Clinical Medicine and Surgery, which currently number 45 campuses distributed throughout Kenya. These campuses were in diverse geographical, administrative, and socio-economic contexts, including urban, peri-urban, and rural settings. Such variation was important given that the availability of simulation facilities, staffing levels, and institutional support for simulation-based training (SBT) may differ substantially across campuses.

The target population for this study was all the full-time and part-time lecturers who teach Diploma in Clinical Medicine and Surgery programmes in the 45 KMTC campuses. According to institutional records (unpublished KMTC records), the combined number of lecturers employed by Clinical Medicine departments was estimated at 250. The study utilised a two - stage simple random sampling technique to ensure that lecturers from all the Kenya Medical Training College (KMTC) campuses offering the Diploma in Clinical Medicine and Surgery were represented. Simple random sampling was carried out within each cluster to select each lecturer.

The study population comprised approximately 250 clinical medicine lecturers distributed across 45 Kenya Medical Training College (KMTC) campuses offering the Diploma in Clinical Medicine and Surgery. The required sample size was determined using a standard formula for estimating proportions in a finite population, assuming a 95% confidence level and a margin of error of 5%. In the absence of prior institutional data on the prevalence of simulation-based training (SBT) utilization, a conservative proportion estimate of p = 0.5 was used to maximise the sample size and ensure adequate statistical precision. The sample size was calculated using Taro Yamane's (1967) formula for finite populations.

$$n = \frac{N}{k+N(e)^2}$$

Where:

n is desired sample size (for finite population), N is the target population of Clinical Medicine Lecturer, k is constant (1), e is the desired level of precision (the margin of error), set at = 0.05. After computation, the sample size was n=153.

Data collection used self-administered structured questionnaires, which were given to the lecturers physically or electronically (where possible) during the department meetings or working time. The structured questionnaire obtained quantitative data pertinent to predictors for simulation-based training (SBT) utilisation. The awareness used a five-point Likert scale that ranges from "Strongly Disagree" to "Strongly Agree." These items assess the lecturer's understanding of the principles, modalities, and policies of the SBT. The Likert scale format provides quantifiable scores which could be statistically analysed to elicit the extent of awareness and the relation between this and the utilisation.

The study was ethically approved by the KCA University Research Ethics Committee, Nation Commission of Science, Technology and Innovation (NACOSTI) research permit, and the KMTC headquarters/campus administrations. Access was made through an introductory letter by the KCA University. Questionnaires were included with the consent forms that informed about voluntary participation and withdrawal, anonymity, confidentiality, and the use of data in the research. There were no incentives provided, risks would be very low (time spent). Information was kept in secure places, encrypted password devices, and identifiers were eliminated. The results will be shared with KMTC to be used to improve the institution.

Validity was achieved via expert review (three medical education specialists and two KMTC lecturers) was used to ensure content validity by matching the items with the objectives. Reliability test was done by via the test of internal consistency using Cronbach's alpha at 0.70 or above. Data Analysis of the quantitative data was done with the help of the Statistical Package for Social Sciences (SPSS) version 27. Awareness and utilisation were summarised with the help of descriptive statistics (frequencies, percentages, means and standard deviation). Linear regression was used to explore whether awareness has a significant role in explaining variance in utilisation scores. In this regard, regression was not used to predict causally but to find the relative contribution of each independent variable to the dependent variable (utilisation of SBT).

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Sociodemographic Characteristics and Levels of Awareness of Simulation-Based Training among Clinical Medicine Lecturers at Kenya Medical Training College

The study computed association between sociodemographic characteristics and level of awareness of SBT. Table 1 presents the findings.

Table 1

Sociodemographic Characteristics and Level of Awareness of Simulation-Based Training among Clinical Medicine Lecturers at Kenya Medical Training College

		Level of awareness of simulation-based training				
		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Sex	Male	7	3	9	39	32
	Female	5	1	4	32	21
Age group	25 - 34	1	1	1	7	13
	35 - 44	7	1	9	38	24
	45 - 54	1	0	2	18	10
	55+	3	2	1	8	6
Years of teaching experience in clinical medicine	1 - 3 Years	3	1	2	4	16
	4 - 6 Years	4	0	3	10	10
	7 - 9 Years	1	0	2	19	10
	10+ Years	4	3	6	38	17
Highest academic qualification	Higher Diploma	4	1	3	4	12
	Bachelor's	4	3	4	44	32
	Master's	4	0	6	22	9
	PhD/Doctorate	0	0	0	1	0
Have you received any formal training in Simulation-Based Training Methodology?	Yes	3	0	1	7	16
	No	9	4	12	64	37

Table 1 shows that the awareness of KMTC clinical medicine lecturers with regards to simulation-based training (SBT) was consistently high across all the demographic subgroups, but there were some variations that should be interpreted with caution. Interestingly, females (84.1% agreeing/strongly agreeing) were slightly more aware than males

(78.9%), and the 45-54 age group and the 7-9 years teaching experience group were the most aware (90.3% and 90.6%, respectively). The distribution indicated that mid-career professionals – those with enough clinical credibility to be interested in pedagogical innovation and who are active in such innovation – are the most receptive to SBT concepts. This was consistent with Rogers' (2003) finding that "early adopters" often fall into this niche. The somewhat lower awareness score of the oldest age group (55+, 70.0%) and Higher Diploma participants (66.7%) indicated a possible generational and academic exposure gap. This shows structural and differential access to faculty development opportunities, which KMTC must find a way of tackling through targeted and tiered training interventions.

The most striking finding is that the awareness scores for lecturers who received formal SBT training (85.2%) were higher than those for lecturers who did not receive formal training (80.2%), but the difference was small, indicating an important point: awareness alone is not enough to be ready for use. This confirms the findings of Seethamraju *et al.*, (2022), which identified conceptual awareness and functional implementation capacity in resource-limited areas. This data shows there is a 'knowing-doing gap': lecturers can agree on the importance of SBT without having the methodological skills to implement it. Additionally, there is a strong indication that investing in faculty development at bachelor's level would have disproportionate returns as the largest group of faculty members are at this level (87.4% of all faculty members have bachelor's degrees). For KMTC, this means that the awareness creation campaigns should be complemented by pedagogical knowledge to classroom practice, in the form of experiential, cascade-mentorship models (Fant *et al.*, 2022). Finally, Table 2 validates that awareness trajectories are influenced by demographic factors while structured faculty development is the key to changing awareness to sustained utilization within KMTC's multi-campus environment.

Table 2

Level of Awareness of Simulation-Based Training among Clinical Medicine Lecturers at Kenya Medical Training College

Level of awareness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
I am aware that SBT helps students develop clinical skills safely by allowing errors without patient harm.	8.5%	0.7%	0.7%	24.2%	66.0%	4.39	1.148
I am aware of evidence showing that SBT improves student situational awareness and procedural competence compared to traditional lectures.	9.2%	1.3%	2.6%	37.3%	49.7%	4.17	1.174
I am aware of research indicating that SBT improves student satisfaction and knowledge retention.	8.5%	3.3%	14.4%	35.9%	37.9%	3.92	1.192
I am familiar with various SBT modalities (e.g., high-fidelity mannequins, virtual reality, standardized patients).	8.5%	17.0%	17.6%	37.3%	19.6%	3.42	1.223
I have personally used or observed SBT methods (e.g., task trainers, virtual scenarios) in teaching.	13.7%	17.6%	19.0%	34.0%	15.7%	3.20	1.289
I am aware of common barriers to SBT implementation in Kenya (e.g., limited funding, equipment shortages).	9.2%	7.8%	10.5%	34.0%	38.6%	3.85	1.271
I am aware of the need for faculty training to effectively implement SBT at KMTC.	7.2%	3.3%	3.9%	26.1%	59.5%	4.27	1.160
I am aware of KMTC or national policies/guidelines supporting the use of simulation in health training.	9.2%	16.3%	22.9%	29.4%	22.2%	3.39	1.253
I am aware that simulation-based training can be used for both formative and summative assessment.	8.5%	3.3%	11.8%	35.3%	41.2%	3.97	1.197
I am aware of ways simulation can be integrated into health training curricula across different levels of training.	11.1%	7.2%	15.7%	38.6%	27.5%	3.64	1.265

There was a range of awareness of patient safety and policy support for simulation-based training (SBT). Most respondents agreed that SBT provides safe development of clinical skills as students can make errors without harm to patients with 24.2% indicating agreement and 66.0% strong agreement. It was revealed that 8.5% strongly disagree, 0.7% disagree and 0.7% unsure. The mean score was 4.39 (*SD* = 1.15) with a strong level of agreement. Knowledge of KMTC or national policies/guidelines promoting simulation in medical education was more variable. Agreement was indicated by 29.4%, strong agreement by 22.2% and 22.9% were undecided. This is compared to 16.3% disagreeing and 9.2% strongly disagreeing. The average was 3.39 (*SD* = 1.25), indicating moderate awareness.

The results demonstrated high conceptual awareness about the patient safety advantage, with 90.2% of lecturers agreeing that SBT allows risk-free practice of clinical skills. This strong endorsement resonated with Elendu *et al.*

(2024), who reported that health educators in resource-poor settings were aware of the pedagogic benefits of simulation in competency development. The finding aligned with Rogers' (2003) knowledge stage as awareness of relative advantage leads to diffusion. But awareness of the concept did not necessarily translate into readiness to implement, as familiarity with operation was low.

Policy awareness had moderate support, with 51.6% agreeing that institutional and national policies encouraged SBT use. This was consistent with Nyamu *et al*. (2018) who reported a disconnect between policy and practice in health education reforms in Kenya. The large neutral and disagreeing proportions likely implied that KMTC campuses were not well-informed about institutional priorities for simulation. Robinson *et al*. (2024) also noted that poor policy frameworks in LMICs positioned innovation uptake by lecturers.

The gap in the knowledge of safety and policy had implementation implications. Seethamraju *et al*. (2022) described distinction between knowledge and implementation, suggesting lecturers needed clear policy directives to support their pedagogical knowledge to practice. The results implied that KMTC needed to improve policy awareness and curriculum mapping to better connect policy awareness to practice. As per Rogers' (2003) compatibility attribute, institutional directives would make simulation-based training less complex and foster its long-term diffusion across multiple campuses.

Knowledge of faculty training and skill level for simulation-based training (SBT) was high. On evidence that SBT enhances student situational awareness and procedural skills over lectures, 37.3% agreed and 49.7% strongly agreed. A total of 2.6% were neutral, 1.3% disagreed and 9.2% strongly disagreed. The average score was 4.17 (*SD* = 1.17), indicating wholehearted agreement. The understanding of the importance of faculty training for successful implementation of SBT at KMTC was much higher, with 26.1% agreeing and 59.5% strongly agreeing. A total of 3.9% were undecided, 3.3% disagreed and 7.2% strongly disagreed. The average response was 4.27 (*SD* = 1.16), suggesting strong agreement that faculty need to be trained.

The study showed high conceptual awareness that simulation-based training improved student knowledge and procedure compared to lectures, with 87.0% of lecturers endorsing this. This level of endorsement supported Elendu *et al*. (2024) who reported health educators in resource poor settings easily identified the relative advantage of simulation for competency development. The finding confirmed Rogers' (2003) knowledge phase, with relative advantage awareness as the catalyst for diffusion. But awareness of the concept did not necessarily translate into readiness to implement, as familiarity with operation was low.

The highest rated variable was awareness of the need for faculty training, with 85.6% agreeing that training was crucial for successful SBT implementation. This echoed Fant *et al*. (2022), who found that structured faculty training led to better confidence and continued simulation implementation among Kenyan lecturers. The high agreement highlighted that lecturers identified training as a vital facilitator, in line with Seethamraju *et al*. (2022), who identified the difference between awareness and implementation in low-resource settings.

The overlap of high awareness of both pedagogical value and training needs had implications for implementation. Robinson *et al*. (2024) noted that in LMICs, awareness needed to be translated to operationalisation through experiential learning to be adopted. The findings recommended KMTC should focus on specific methodology training and mentorship to translate this awareness. In line with Rogers' (2003) compatibility attribute, clear faculty development would minimise complexity and enable effective diffusion of simulation-based training across multi-campuses.

Knowledge of barriers and modalities in simulation-based training (SBT) varied. Awareness of a range of SBT modalities (such as high-fidelity mannequins, virtual reality, standardized patients) was average. Strong agreement was indicated by 37.3%, 19.6% agreed, 17.6% were neutral. Strong disagreement was reported by 8.5%, and disagreement by 17.0%. The average score was 3.42 (*SD* = 1.22) suggesting moderate awareness. Knowledge of barriers to the provision of SBT in Kenya (e.g., lack of funding, lack of equipment) was greater. A total of 34.0% agreed and 38.6% strongly agreed. The response of 10.5% was neutral, 7.8% disagreed and 9.2% strongly disagreed. The average score was 3.85 (*SD* = 1.27), indicating fairly high levels of awareness on barriers.

The results indicated a moderate level of awareness on specific SBT modalities with 56.9% of lecturers agreeing or strongly agreeing that they were familiar with simulation approaches such as high-fidelity mannequins, virtual reality or standardised patients. This operational awareness was consistent with Nyamu *et al*. (2018), who revealed similar disconnects between theoretical and operational awareness among Kenyan health lecturers. The high neutrals and disagrees indicated that while many lecturers were theoretically aware of simulation, they may not be practically familiar with the many forms of simulation, a finding supported by Ismail *et al*. (2024) in resource-limited Sub-Saharan regions.

Recognition of barriers to implementation was the more highly rated indicator with 72.6% indicating constraints such as funding and equipment. This result corroborated Robinson *et al*.'s (2024) finding that lecturers in LMICs easily identified structural barriers despite limited operational knowledge. This finding corroborated Rogers' (2003) compatibility attribute, suggesting lecturers identified contextual incongruences between simulation needs and capacity.

Similarly, Seethamraju *et al*. (2022) characterised meta-awareness of barriers from functional implementation readiness, observing that diagnostic understanding did not necessarily translate to use.

The gap between familiarity and awareness of barriers had implications for implementation. Kavinya *et al*. (2023) showed that Kenyan lecturers who had experiential training expressed increased confidence and decreased complexity. This implied that KMTC should focus on experiential faculty training and mentoring to address this operational awareness gap. Consistent with Rogers' (2003) trialability principle, didactic instruction on low-fidelity, high-yield simulation exercises will minimise perceived complexity and facilitate ongoing diffusion of simulation-based training in multi-campus environments.

Students were aware that simulation-based training (SBT) enhances student satisfaction and retention. A total of 35.9% agreed and 37.9% strongly agreed. There was 14.4% neutral, 3.3% disagreed and 8.5% strongly disagreed. The average for this item was 3.92 (*SD* = 1.19), suggesting that lecturers had positive awareness of the benefits of SBT for satisfaction and knowledge retention.

The results showed moderate to high awareness that simulation-based training improved student satisfaction and retention of knowledge, with 73.8% of lecturers endorsing this. This endorsement echoed conclusions by Elendu *et al*. (2024), who reported health educators from resource-limited settings endorsed the relative advantage of simulation-based training for its engagement and competency building. This finding validated Rogers' (2003) knowledge stage, where perceptions of relative advantage triggered the process of diffusion. But the high percentage of the neutral response (14.4%) implied that implementation knowledge was lacking among some respondents, implying a disconnect between awareness and utilisation.

This finding supported Kavinya *et al*. (2023), who reported similar awareness-usage gaps among Kenyan health educators. The average score (3.92) reflected pedagogic appreciation qualified by contextual factors, corroborating Seethamraju *et al*. (2022), who noted a distinction between theory and practice in low-resource settings. Robinson *et al*. (2024) also noted that while educators were aware of the educational benefits of the approaches, this did not translate into regular practice unless faculty development and institutional support were established.

The results had significant implications for KMTC. In line with Rogers' (2003) compatibility attribute, curriculum mapping and protected teaching time would enhance compatibility and promote diffusion. The findings indicated that faculty training in scenario development and debriefing would address the awareness gap in use. As Fant *et al*. (2022) showed that hands-on training enhanced simulation confidence among Kenyan teachers, it supported that awareness of pedagogic use needed operationalization to support sustained utilisation across multiple campuses.

Use of assessment in simulation-based training (SBT) was varied. It was reported by 34.0% who agreed and 15.7% who strongly agreed that they had used or observed the use of SBT (simulation-based training) methods (e.g., task trainers, virtual scenarios). A total of 19.0% were neutral, 17.6% disagreed and 13.7% strongly disagreed. The mean awareness was 3.20 (*SD* = 1.29), suggesting moderate awareness. Most participants were aware that SBT can be used for both formative and summative assessment, with 35.3% agreeing and 41.2% strongly agreeing. Eleven-point eight percent of the sample were neutral, 3.3% disagreed and 8.5% strongly disagreed. The average score was 3.97 (*SD* = 1.20) and indicated high agreement. An understanding of the potential uses and benefits of simulation for health training across the curriculum was also evident. The response of agreement was 38.6%, and strong agreement was 27.5%. 15.7% were neutral, 7.2% disagreed and 11.1% strongly disagreed. The mean agreement score was 3.64 (*SD* = 1.27), which is moderate to high awareness.

The results showed moderate awareness of the personal experience of SBT methods with 49.7% of lecturers agreeing or strongly agreeing that they personally used or observed simulation teaching methods. This operational awareness mirrored Kavinya *et al*. (2023), who reported low operational awareness of SBT among Kenyan health educators. The high rates of neutral and disagreeing responses implied that while simulation knowledge was present, it was not complemented by operational experiences; a finding supported by Seethamraju *et al*. (2022) in resource-limited Sub-Saharan regions where faculty simulation experiences were not common.

Perception of SBT's use for formative and summative assessment was the highest rated indicator (76.5% endorsement). This result corroborated Elendu *et al*. (2024) who found that health educators in LMIC settings immediately recognised the comparative benefits of simulation for competency assessment. This finding supported Rogers' (2003) compatibility attribute, as lecturers deemed simulation compatible with assessment-based curricula. But Robinson *et al*. (2024) noted that while conceptual awareness was necessary, it did not automatically translate to readiness without instructor and institutional support to translate awareness into practice.

The level of awareness of curriculum integration strategies had implications for implementation. Barlow *et al*. (2024) found explicit mapping and dedicated time for simulation-based teaching significantly predicted long-term simulation use in multi-campus settings. The result implied that KMTC should focus on mentorship and scenario libraries to address this implementation awareness gap. In line with Rogers' (2003) trialability principle, controlled exposure to low-fidelity, high-yield simulation-based training exercises linked to module outcomes would limit

cognitive complexity and support diffusion of simulation-based training aligned with assessment and linked to the curriculum across KMTC's decentralised training environment.

4.1.2 Association Between Level of Awareness of Simulation-Based Training and Utilisation of Simulation-Based Training

The regression analysis examined the predictive relationship between the level of awareness of Simulation-Based Training and its utilisation. The model produced a correlation coefficient of $R = 0.305$, indicating a modest positive relationship. The coefficient of determination ($R^2 = 0.093$) revealed that awareness accounted for 9.3% of the variance in utilisation, with an adjusted $R^2 = .087$. The model was statistically significant, $F(1,151) = 15.47, p < 0.001$, suggesting that the level of awareness of Simulation-Based Training was a significant predictor of its utilisation.

Table 3

Regression Model Summary for Level of Awareness of Simulation-Based Training and Utilisation of Simulation-Based Training

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.305[a]	0.093	0.087	0.984	0.093	15.471	1	151	0.000

a. Predictors: (Constant), Level of awareness of simulation-based training

The regression analysis assessed the predictive influence of the level of awareness of Simulation-Based Training on its utilisation. The model summary (Table 3) indicated a modest positive relationship, $R = .305$, with awareness explaining 9.3% of the variance in utilisation ($R^2 = .093$; adjusted $R^2 = .087$). The model was statistically significant, $F(1,151) = 15.47, p < .001$, suggesting that awareness significantly predicted utilisation. The regression coefficients (Table 4) further confirmed this relationship. The unstandardized coefficient for awareness was $B = .281$(SE = .071), with a standardized coefficient of $\beta = .305$. The corresponding t-value was 3.93, which was statistically significant ($p < .001$). The constant term was also significant, $B = 1.963$(SE = .295), $t = 6.66, p < .001$. These findings indicate that higher levels of awareness were associated with increased utilisation of Simulation-Based Training, with awareness emerging as a significant predictor in the model.

Table 4

Regression Coefficients for Level of Awareness of Simulation-Based Training and Utilisation of Simulation-Based Training

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.963	.295		6.663	.000
	Level of awareness of simulation-based training	.281	.071	.305	3.933	.000

a. Dependent Variable: Utilisation of Simulation-Based Training

The regression analysis confirmed that knowledge of simulation-based training significantly predicted simulation-based training utilisation among clinical medicine lecturers (β = 0.305, p < 0.001) with 9.3% variance accounted for. This weak but significant association confirmed Rogers' (2003) knowledge stage, in which awareness of the concept was a prerequisite for adoption. This finding was consistent with Elendu *et al*. (2024) and Kavinya *et al*. (2023) who found that pedagogic awareness had a positive impact on the willingness to adopt simulation in Kenyan health training programs.

But the low explanatory power suggested that awareness was not enough to promote sustained adoption. This finding mirrored Seethamraju *et al*. (2022), who identified conceptual awareness and operational capacity in resource-limited environments. The finding indicated that although awareness triggered diffusion, operationalisation through faculty development was critical to translate pedagogic knowledge into practice in KMTC lecturers. Thus, the study suggested awareness-raising interventions needed to be complemented with other strategies to ensure uptake. In LMIC settings, Robinson *et al*. (2024) argued that awareness required additional support in the form of resources, institutional support and compatibility to initiate uptake. The study thus suggested that KMTC provide practical training in designing scenarios and debriefing with theoretical advocacy to leverage on awareness in its dispersed training system.

V. CONLUSION & RECOMMENDATIONS

5.1 Conclusion

The study concludes that the level of awareness of simulation-based training among KMTC clinical medicine lecturers is informed pedagogically and limited operationally. Despite lecturers acknowledging the advantages of SBT as a method of patient safety and procedural competence, knowledge of particular modalities and individual exposure is low, which leads to a hesitant and rare use. Regression analysis revealed awareness to be a small, yet significant, predictor of utilisation (β=0.305, p<0.001), which accounted for 9.3% of the variance. This implies that conceptual recognition starts with diffusion but needs functional translation using organized faculty development.

5.2 Recommendation

KMTC needs to shift the indicative awareness-building on theoretical advocacy into practical pedagogy by instituting mandatory, cadre-specific faculty development programmes. They should focus on practical training on scenario design, facilitation, and structured debriefing, and mentoring by the early adopters. A combination of awareness measures and utilisation results in institutional monitoring will make it possible to provide targeted assistance.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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