

Cadaveric Dissection Model Usage in Teaching Anatomy among Clinical Medicine Students at Kenya Medical Training College

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ABSTRACT

Background: Cadaveric dissection remains central to anatomy education, offering tactile and spatial understanding that builds student confidence. While widely used globally, access to cadavers varies by resources and culture. In Africa, support for cadaveric dissection is strong despite the constraints. Emerging tools like VR and 3D models increasingly complement dissection, creating a balanced, hybrid approach to effective training.

Methods: A mixed-methods cross-sectional study was conducted among 260 students and 13 lecturers across multiple campuses. Quantitative data were collected using a structured questionnaire and analysed using SPSS version 30 for descriptive statistics and regression analysis. Qualitative data were obtained through key informant interviews and were analysed thematically.

Results: Most students (51.2%) reported participating in cadaveric dissection once per semester, although overall use was perceived as infrequent (78.1%). The majority (83.1%) considered cadaveric dissection very important for learning anatomy, citing benefits such as hands-on understanding, improved critical thinking, and enhanced knowledge retention. While awareness of alternative teaching methods was moderate, 53.8% of respondents preferred cadaveric dissection over these methods. Lecturers similarly reported limited but essential use of cadaveric dissection. Regression analysis showed a weak and non-significant relationship between study variables and participation in dissection ($R^2=0.048$, $p=0.084$).

Conclusions: Cadaveric dissection is underutilised but remains a critical and preferred method for teaching anatomy. Expanding its use, improving infrastructure, and integrating complementary teaching methods may enhance the quality and effectiveness of anatomy education.

Keywords: cadaveric dissection; anatomy education; teaching methods; blended learning; alternative anatomy teaching methods;

INTRODUCTION

Cadaveric dissection has long been regarded as the cornerstone of anatomy education, maintaining its position as a foundational teaching method for over four centuries. Despite the emergence of digital and simulation-based approaches, it continues to be widely utilized across medical schools globally due to its unique capacity to provide tactile experience, spatial understanding, and professional orientation. Evidence indicates that students exposed to hands-on cadaveric training demonstrate significantly higher confidence levels compared to those relying solely on virtual anatomy platforms, underscoring the enduring pedagogical value of dissection-based learning (Mahboobeh et al., 2021). Globally, the level of cadaveric dissection model usage varies considerably, reflecting differences in institutional resources, cultural perspectives, and curriculum design. High adoption rates are reported in North America and parts of Europe, where well-established body donation programs support

sustained implementation (Ajemba, Iroanya and Ironegbu, 2024). Similarly, Asian institutions such as those in Singapore and Hong Kong maintain near-universal utilization, although student exposure varies due to differences in participation structures (Koh et al., 2023).

Studies across Africa reveal strong student support for cadaveric dissection, with high percentages affirming its importance in deepening anatomical understanding and rejecting its removal from training programs (Asante et al., 2021). However, utilization levels vary across countries due to disparities in cadaver availability, preservation facilities, and cultural acceptance. For instance, while countries such as Ghana, Kenya, and Uganda report relatively high adoption rates, others face limitations linked to resource constraints and procurement challenges (Takoutsing et al., 2023; Nnaka et al., 2024). Within Kenya, cadaveric dissection remains the predominant teaching model, although differences exist between urban and rural institutions in terms of access and intensity of use (Theroux et al., 2022). Recent trends indicate a gradual integration of alternative teaching methods, including virtual reality (VR), augmented reality (AR), and 3D modeling, which are increasingly used to complement rather than replace traditional dissection. While these technologies have demonstrated potential in enhancing visualization and student engagement, their adoption remains uneven, particularly in resource-limited settings where infrastructure and funding pose significant barriers (Ali, Nurein and MY Elmadhoun, 2025). Consequently, the current landscape of anatomy education reflects a hybrid approach in which cadaveric dissection continues to serve as the gold standard, supported by emerging digital tools that aim to enrich the learning experience (Usman et al., 2024). Understanding the level of cadaveric dissection model usage is therefore essential for evaluating the effectiveness and sustainability of anatomy education practices. Such insight provides a basis for balancing traditional and innovative approaches, ensuring that medical training remains both contextually relevant and pedagogically effective.

METHODS

Ethics statement

This study was approved by the AMREF-Ethics and Scientific Review Committee (ESRC P1996/2025).

Study design

This study employed a descriptive cross-sectional study with a mixed-methods approach employed to provide both measurable outcomes and in-depth contextual insights into the use of cadaveric dissection. Quantitative and qualitative data were collected concurrently for a period of 3 weeks in March 2025, with quantitative data enabling the estimation of population parameters and assessment of associations, while qualitative data offered a deeper understanding of students' experiences and perceptions.

Setting

The study was conducted at purposively selected Kenya Medical Training College (KMTC) campuses among 265 second-year clinical medicine students who had been enrolled in the anatomy course, 13 lecturers and 6 anatomy specialists as key informants. The institution serves as an ideal study setting due to its established clinical medicine programs with anatomy teaching components, diverse geographical distribution of campuses, varying resource allocation and infrastructure across different locations, and a representative sample of medical education in Kenya's public training institutions. Further, the study area encompasses urban, peri-urban, and rural medical training institutions across Kenya's eight former provinces, ensuring geographical representation and capturing variations in resource availability, cultural contexts, and educational infrastructure.

Research instruments

The study used a dual-method approach, combining closed-ended questionnaires and key informant interviews to assess the level of cadaveric dissection model usage in teaching anatomy among clinical medicine students. The instruments were pretested and validated through expert review and pre-testing. Reliability was confirmed using the half-split method and Cronbach's Alpha coefficients, all above 0.77. Data collection followed ethical guidelines, including informed consent. Although limited by the cross-sectional design, the use of multiple tools ensured accurate data to assess the level of cadaveric dissection model.

Data analysis

Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 30.0. Descriptive data were presented using frequencies, percentages, means and standard deviation. Qualitative data generated from KII in the form of notes (responses) from the participants were cleaned and coded manually based on themes developed from responses (thematic analysis) in accordance with the research objectives and reported in narrative form, and additionally used to reinforce quantitative data.

RESULTS

Participants

A total of 265 structured questionnaires for students were administered in tandem with the calculated sample size, of which 260 questionnaires were completely filled; therefore, the response rate was 98.1% of the required sample size and 13 questionnaires for lecturers were completely filled, which was deemed satisfactory for the purpose of obtaining dependable and adequate data.

Socio-Demographic Characteristics of Students

The respondents' ages ranged from 18 years to 33 years, the mode was 20 years, the median 21.0 years and the mean age was 21.15 ± 2.25 . The findings showed that 117 (45.0%) were between 18-20 years, 113 (43.5%) were between 21-23 years, and 30 (11.5%) were 24 years and above. Additionally, more than half 155 (59.6%) were males students (Table 1).

Table 1: Socio-Demographic Characteristics of the Students

Characteristics		Frequency	Percent
Age group	18-20 years	117	45.0%
	21-23 years	113	43.5%
	≥ 24 years	30	11.5%
Gender	Male	155	59.6%
	Female	105	40.4%

Socio-Demographic Characteristics of Lecturers

Approximately 38.5% of the lecturers were aged between 30-39 years, with most 4 (30.8%) being between 50-59 years, the mode was 44 years, the median was 44.0 years, and the mean age was 43.62 ± 8.32 . Further, 9 (69.2%) were males, 9(69.2%) had a bachelor's degree, and 12 (92.3%) were married (Table 2).

Table 2: Socio-Demographic Characteristics of Lecturers

Characteristics		Frequency	Percent
Age	30-39 years	5	38.5%
	40-49 years	4	30.8%
	50-59 years	4	30.8%
Gender	Male	9	69.2%
	Female	4	30.8%
Level of education	Degree	9	69.2%
	Masters	4	30.8%
Marital status	Single	1	7.7%
	Married	12	92.3%

Cadaveric dissection model usage in teaching anatomy

More than half of the students (51.2%) reported participating in cadaveric dissection once per semester, while 47.7% reported rare participation. Cadaveric dissection was most commonly used in teaching the musculoskeletal system (94.5%), followed by the circulatory system (60.4%), respiratory system (57.7%), and nervous system (57.7%). Further, 78.1% reported that cadaveric dissection is used less frequently at KMTC, while 17.3% indicated frequent use. Regarding adequacy of cadaveric dissection use for learning, 45.0% rated it very adequate, 40.0% somewhat adequate, and 5.0% adequate (Table 3).

Table 3: Cadaveric dissection model usage in teaching anatomy

Characteristics		Frequency	Percent
Frequency of participation in cadaveric dissection	Never	2	0.8%
	Rarely	124	47.7%
	Per semester	133	51.2%
	Per module	1	0.4%
Anatomy courses for cadaveric dissection	Musculoskeletal system	242	93.1%
	Nervous system	150	57.7%
	Circulatory system	157	60.4%
	Respiratory system	150	57.7%
	Digestive system	1	0.4%
	Reproductive system	1	0.4%
Frequency of use of cadaveric dissection at KMTC	Less frequently	203	78.1%
	Frequently	45	17.3%
	More frequently	12	4.6%
Adequacy of cadaveric dissection use for learning	Not adequate	26	10.0%
	Somewhat adequate	104	40.0%
	Adequate	13	5.0%
	Very adequate	117	45.0%

Key informants consistently reported that cadaveric dissection at KMTC is implemented in a structured but limited manner. Across all interviews, it was noted that students are exposed to cadaveric dissection once per academic year, for approximately 50 hours. While informants acknowledged the cadaveric dissection educational value, they agreed that the duration and frequency are insufficient compared to universities, which provide more frequent and sustained exposure. As the KII 1 narrated that

“Cadaveric dissection at KMTC is used minimally, confined to semester two for approximately 50 hours over one week. This limited exposure follows a full semester of theoretical instruction, indicating that practical anatomy training is brief and not continuously integrated throughout the academic year” (KII 1).

“Cadaveric dissection at KMTC is implemented per semester within the clinical medicine curriculum. Students in diploma and higher national diploma programs are exposed through structured anatomy modules combining systemic, regional, and applied clinical anatomy, indicating a curriculum-based but time-limited exposure rather than continuous engagement” (KII 3).

“Cadaveric dissection at KMTC is used once per academic year, specifically in Year 1 Semester 2. Students attend a one-week intensive program after completing theoretical anatomy. The exposure includes about 50 hours of practical learning, making it limited in duration but formally integrated into the curriculum” (KII 5)

Storage and Support in Conducting Cadaveric Dissection

Majority of lecturers 12 (92.3%) mentioned that the institutional doesn't have adequate infrastructure (e.g., dissection labs, equipment) to support the use of cadaveric dissection in teaching anatomy. Further, 7 (53.8%) mentioned they had significant issues related to the storage and preservation of cadavers with 4 (30.8%), and 7

(53.8%) had poor support for the logistical needs of conducting cadaveric dissection (e.g., space, safety equipment, storage (fridges, specimens, ventilation)).

Table 4: Storage and Support in Conducting Cadaveric Dissection

Characteristics		Frequency	Percent
Adequate infrastructure to support the use of cadaveric dissection	No, not adequate	12	92.3%
	Not sure	1	7.7%
Issues related to the storage and preservation of cadavers	Yes, significant issues	7	53.8%
	Yes, minor issues	2	15.4%
	No issues	4	30.8%
Support the logistical needs of conducting cadaveric dissection	Very well	1	7.7%
	Adequately	4	30.8%
	Poorly	7	53.8%
	Not sure	1	7.7%

“KMTC lacks sufficient in-house anatomy laboratories, leading to dependence on partner institutions for dissection sessions. While external labs are generally well-equipped, limited capacity and shared usage among multiple institutions create scheduling challenges and reduce flexibility in practical teaching arrangements” (KII 1).

“Key logistical challenges include insufficient cadavers, lack of dedicated KMTC anatomy labs, and dependence on partner universities. Time allocation is also limited to short, intensive sessions, making coverage of content rushed. Additionally, coordination of student groups and availability of trained anatomists affect the smooth implementation of dissection training” (KII 4).

Model Summary on Cadaveric Dissection Model Usage in Teaching Anatomy

The regression analysis demonstrated a weak relationship between predictors and cadaveric dissection usage ($R=0.219$, $R^2=0.048$, adjusted $R^2=0.022$), indicating limited explanatory power (Table 4).

Table 5: Model Summary on Cadaveric Dissection Model Usage in Teaching Anatomy

Model	R	Model Summary		Std. Error of the Estimate
		R Square	Adjusted R Square	
1	0.219 ^a	0.048	0.022	0.518

a. Predictors: (Constant), Cadaveric Dissection Model Usage in Teaching Anatomy

Analysis of Variance

The regression model was not statistically significant ($F=1.818$, $p=0.084$), suggesting that the included predictors did not significantly influence participation in cadaveric dissection (Table 5).

Table 6: Analysis of Variance on Cadaveric Dissection Model Usage in Teaching Anatomy

Model	Sum of squares	df	Mean square	F	Sig.
Regression	3.412	7	0.487	1.818	0.084
Residual	67.553	252	0.268		
Total	70.965	259			

Key Informant Interview (KII) findings support the quantitative results, indicating that cadaveric dissection at KMTC is used less frequently. Most respondents noted limited scheduled access due to curriculum time constraints and high student numbers. However, they emphasized that when available, dissection is highly valuable for understanding anatomical structures. Some informants highlighted that, despite infrequent use, the

sessions are well organised and adequate for learning. Overall, KIIs confirm that cadaveric dissection is underutilised but still perceived as an effective learning tool, as indicated by KII (4).

“mmm....the use of cadaveric dissection is relatively low in frequency. It is mainly a short, scheduled program rather than continuous exposure. Most anatomy teaching relies on lectures and models, with cadaver sessions used as a supplementary practical component to reinforce theoretical knowledge during a single academic stage (KII 4).

“The level of cadaveric dissection usage is relatively low and concentrated in a single short training block. Students are not exposed continuously but only during a scheduled one-week session. Most anatomy teaching is theoretical, with cadaver use serving as a supplementary practical reinforcement rather than a continuous learning method” (KII 5).

“The cadaveric dissection model is implemented as an intensive short course of about one week per cohort. Students are introduced to anatomy through lectures and models before dissection. Compared to universities, the level of usage is lower, but it still provides essential hands-on exposure within constrained curricular time” (KII 6).

DISCUSSION

The findings indicate that cadaveric dissection is perceived as highly valuable for learning anatomy, particularly for enhancing hands-on understanding, critical thinking, and knowledge retention. However, its implementation remains limited in frequency and duration, with most students exposed only once per academic year through short, intensive sessions. Despite this limited exposure, both students and lecturers regarded cadaveric dissection as an essential component of anatomy education. Awareness of alternative teaching methods was moderate, although most respondents still preferred cadaveric dissection over these alternatives. The findings of this study are consistent with existing literature demonstrating the continued relevance of cadaveric dissection in medical education (Asad et al., 2023; Verma and Sharma, 2025). Previous studies have shown that cadaver-based learning enhances spatial understanding, clinical reasoning, and long-term retention of anatomical knowledge. At the same time, growing evidence supports the integration of alternative teaching methods, such as virtual dissection and 3D models, to supplement traditional approaches (Asad et al., 2023; Takoutsing et al., 2023). Similar to prior research, this study found that while these alternatives are useful, they are generally perceived as complementary rather than replacement tools. Additionally, the limited use of cadaveric dissection observed in this study reflects trends in resource-constrained settings, where factors such as infrastructure, cadaver availability, and regulatory requirements influence implementation (Ajemba, Iroanya and Ironegbu, 2024). This supports earlier findings that institutional and logistical challenges remain key barriers to the effective integration of cadaveric dissection in anatomy curricula.

CONCLUSION

Cadaveric dissection remains a highly valued and essential component of anatomy education at Kenya Medical Training College despite its limited frequency of use. Students and lecturers perceive it as critical for enhancing hands-on learning, spatial understanding, and knowledge retention. However, its implementation is constrained by logistical, infrastructural, and curricular limitations, resulting in short, intensive exposure rather than continuous engagement. Although alternative teaching methods such as 3D models and virtual reality simulations are recognized as useful, they are generally viewed as complementary rather than substitutes for cadaveric dissection. To improve anatomy education, there is a need to expand access to cadaveric dissection, strengthen institutional capacity, and integrate blended teaching approaches. A balanced strategy combining traditional dissection with innovative tools is likely to provide the most effective and sustainable model for anatomy instruction.

Author Contributions

Felistus Muinde: conceptualisation and design of the study, conducting the literature review, collecting and analysing data, interpreting the results, and writing the manuscript.

Ronald Obwoye: Review of the concept/study design, examination of data analysis and interpretation and writing of the manuscript.

Anastasiah Kimeu: Review of the concept and study design, examination of data analysis and interpretation and review of manuscript writing. Review of data analysis and interpretation, and manuscript writing.

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