OPEN ACCESS   **Original Article**

Perceptions of Medical Students Toward Cadaver Dissection in the Anatomy Course at Two African Universities

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ABSTRACT

Background: Cadaver dissection remains a cornerstone of medical education, offering unparalleled hands-on experience in anatomical learning. Despite ongoing debates about its emotional impact and relevance in the age of advanced virtual technologies, dissection continues to play a vital role in enhancing anatomical comprehension.

Objective: This study aimed to explore medical students' perceptions of cadaver dissection.

Methods: A cross-sectional study was conducted at the University of Medical Sciences and Technology (UMST) in Sudan and the University of Rwanda (UR). A standardized, self-administered questionnaire was used to collect data from medical and dental students enrolled in gross anatomy courses, including voluntary participants.

Results: A total of 314 students participated, comprising 169 females (53.8%) and 145 males (46.2%), with ages ranging from 16 to 26 years. Over half of the participants (51.9%) were from UMST. The majority (82.8%) were medical students, while 17.2% were dental students. Most students (86.6%) described their first dissection experience as exciting. Additionally, 77.1% reported that dissection enhanced their understanding of anatomy, and 70.5% stated it improved their ability to recall anatomical structures compared to other learning methods. Furthermore, 55.4% preferred dissection over alternative methods, and 82% considered it essential to their medical education. However, challenges were noted: 47.1% had difficulty identifying structures, 74.2% were disturbed by the smell of formalin, and 29.9% experienced anxiety during dissection sessions.

Conclusion: The majority of students valued cadaver dissection as an effective and irreplaceable component of learning anatomy. Despite emotional and sensory challenges such as formalin odor, structural complexity, and anxiety, students demonstrated a strong preference for dissection and expressed respect for the cadaver as a vital educational resource.

Keywords: Cadaver dissection, UMST, UR, medical students, anatomy, Sudan, Rwanda.

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INTRODUCTION

Cadaver dissection has been a fundamental element of medical education for centuries, offering students a direct, hands-on approach to studying human anatomy (1,2,3). This method enables learners to observe the complex, three-dimensional relationships of anatomical structures in ways that textbooks and models cannot replicate (4). Despite its historical importance and unparalleled educational value, the practice of cadaver dissection has come under scrutiny in recent years. Concerns have been raised regarding its emotional impact on students, as well as debates about its effectiveness compared to modern alternatives. Nonetheless, its role in providing foundational knowledge in anatomy remains indispensable for medical students (5).

Anatomy forms the cornerstone of medical education, serving as a critical prerequisite for advanced medical sciences and clinical courses. A thorough understanding of anatomy underpins essential medical competencies, including patient history-taking, physical examinations, clinical reasoning, and accurate diagnosis and management (6). As a traditional and effective method of teaching gross anatomy, cadaver dissection provides unique experiential learning that significantly enhances students' grasp of anatomical relationships. Although technology-driven innovations in medical education have transformed teaching strategies, the enduring value of cadaveric dissection for safe and competent medical practice is widely recognized by educators and students alike (7). The evolving landscape of anatomical education presents a challenge in balancing classical dissection with modern, technology-based methods (8). Contemporary curricula emphasize student-centered, integrated, and clinically oriented teaching models, leading to reduced time for cadaveric dissection. While many students report feelings of excitement and distinctiveness during dissection, others cite adverse physical reactions (e.g., nausea and irritation) and psychological effects (e.g., stress and emotional trauma) (9). Despite these mixed perceptions, educators increasingly incorporate complementary methods such as interactive lectures, medical imaging technologies (USG, MRI, and CT), and virtual simulations. However, these approaches pose challenges related to cost and technical expertise, especially in resource-limited settings. Consequently, cadaver dissection remains a core, irreplaceable method in anatomy education, blending tradition with innovation to support comprehensive medical training (10,11,12). This study is designed to investigate the perception and attitude of medical students toward cadaveric dissection at two African universities.

METHODS

Study Design

This study employed a cross-sectional survey design.

Study Setting

The study was conducted at two institutions: the University of Medical Sciences and Technology (UMST), Sudan, and the University of Rwanda (UR).

Study Population

The target population included all medical and dental students who had completed or were currently enrolled in the anatomy course. Specifically, the participants were second- and third-year students.

Inclusion Criteria

Currently enrolled medical or dental students at UMST or UR.

Exclusion Criteria

Students who were absent during data collection or who declined to participate.

Sampling Technique

A simple random sampling method was applied. The sample size was first determined based on the total number of students in the relevant faculties. Subsequently, the number of participants required from each academic year (batch) was calculated proportionally using the formula:

Batch-specific sample size = (Number of students in the batch ÷ Total number of students) × Total sample size

A complete list of students was obtained from both universities administrations, and each student was assigned a number. A random number generator was then used to select participants from each batch.

Sample Size

The sample size was calculated using the formula for a known population:

$$n = N / (1 + N * e^2)$$

Where:

- n = required sample size
- N = total population size
- e = margin of error

A total of 319 students were targeted based on this calculation.

Data Collection Tool

Data were collected through a standardized, self-administered questionnaire (see Annexes). The questionnaire was distributed electronically using a Google Form.

Data Management

The Google Form link was shared with batch coordinators at UMST and UR via WhatsApp. Coordinators then forwarded the link to their respective batch groups. In each batch, a volunteer student was assigned to ensure compliance with completing the questionnaire.

All data were stored securely using password protection and regularly backed up to prevent data loss. Access was restricted to authorized personnel only. Data were saved electronically to facilitate analysis and will be archived on a secure institutional server after the completion of the project.

Statistical Analysis

Responses from the questionnaires were compiled into Microsoft Excel, where initial data cleaning was performed by removing incomplete entries. The cleaned data were then imported into SPSS version 29.0 for analysis. Descriptive statistics, including means, standard deviations, and frequency distributions, were calculated.

Ethical Considerations

Ethical approval was obtained from both (the University of Medical Sciences and Technology and the University of Rwanda). Prior to participation, students were presented with an informed consent form embedded within the Google Form. The form clearly explained the study's purpose, procedures, and the voluntary nature of participation.

RESULTS
Demographic Data

A total of 314 students participated in the study, with 51.9% from the University of Medical Sciences and Technology (UMST) and 48.1% from the University of Rwanda (UR). Female students slightly outnumbered males, comprising 169 (53.8%) of the sample. The most common age group was 21–24 years, representing 208 students (66.3%). The majority were medical students (82.8%), while the remaining 17.2% were dental students. Detailed demographic characteristics are presented in Table 1.

Perceptions of Cadaveric Dissection

The majority of students (86.6%) reported that their first dissection session was an exciting experience. Furthermore, 77.1% believed that dissection enhanced their understanding of human anatomy. A notable proportion (70.5%) felt they remembered anatomical structures better through dissection compared to theoretical sessions or video-based learning. Similarly, 70.1% agreed that dissection offers long-lasting knowledge, and 77.1% stated that it deepened their respect for the human body (Table 2 and Figure 1).

However, 47.1% of students reported difficulties in identifying anatomical structures during dissection. A large majority (74.2%) expressed discomfort with the smell of formalin. In contrast, only 23.3% raised concerns regarding religious or cultural conflicts associated with human dissection (Table 3 and Figure 2).

Acceptability and Attitude toward Cadaveric Dissection

A relative majority (55.4%) of students preferred cadaveric dissection over alternative learning methods. Additionally, 82% believed that the absence of dissection sessions would negatively impact their anatomical education. Most significantly, 94.1% of participants expressed respect and empathy toward the cadaver, reflecting a mature and compassionate

attitude toward donated bodies (Table 4 and Figure 3).

Emotional Impact of Cadaveric Dissection

A considerable proportion of students (56.1%) reported experiencing anxiety during dissection sessions. Despite this, 73.9% stated that they were mentally prepared for their first dissection. Notably, only 27.7% of the participants had prior exposure to a deceased body before attending the session.

Table 1: Frequency distribution of demographic and academic characteristics of students at UMST and UR assessed for their perception of cadaveric anatomy dissection in 2024 (n=314)

Characteristic	Variable	n (%)
University	UMST*	163 (51.9)
	UR*	151 (48.1)
Faculty	Medicine	260(82.8)
	Dentistry	54(17.2)
Gender	Male	145 (46.2)
	Female	169 (53.8)
Age group	16-18	14 (4.5)
	19-20	67 (21.3)
	21-22	124 (39.5)
	23-24	84(26.8)
	25-26	25(8.0)
Year of study	1st	33 (10.5)
	2nd	64(20.4)
	3rd	65 (20.7)
	4th	43 (13.7)
	5th	109 (34.7)

*UMST= University of Medical Science and Technology. UR= University of Rwanda

Table 2: Frequency distribution of the perception and experiences of students at UMST and UR about positive thinking for dissection 2024 (n=314)

| Domain	Disagree/Strongly Disagree n(%)	Neutral n(%)	Agree/Strongly Agree n(%)
Enjoyed dissection sessions	45 (14.3)	37(11.8)	232(73.9)
Better anatomy understanding through dissection	22 (7.0)	41 (13.1)	251(79.9)
Prefer theory over practical dissection	118(37.6)	113 (36)	83(26.4)
Dissection increased respect for the human body	25 (8.0)	50 (15.9)	242 (77.1)
Dissection gave lasting knowledge of body structures	32(10.2)	62 (19.7)	220(71.1)
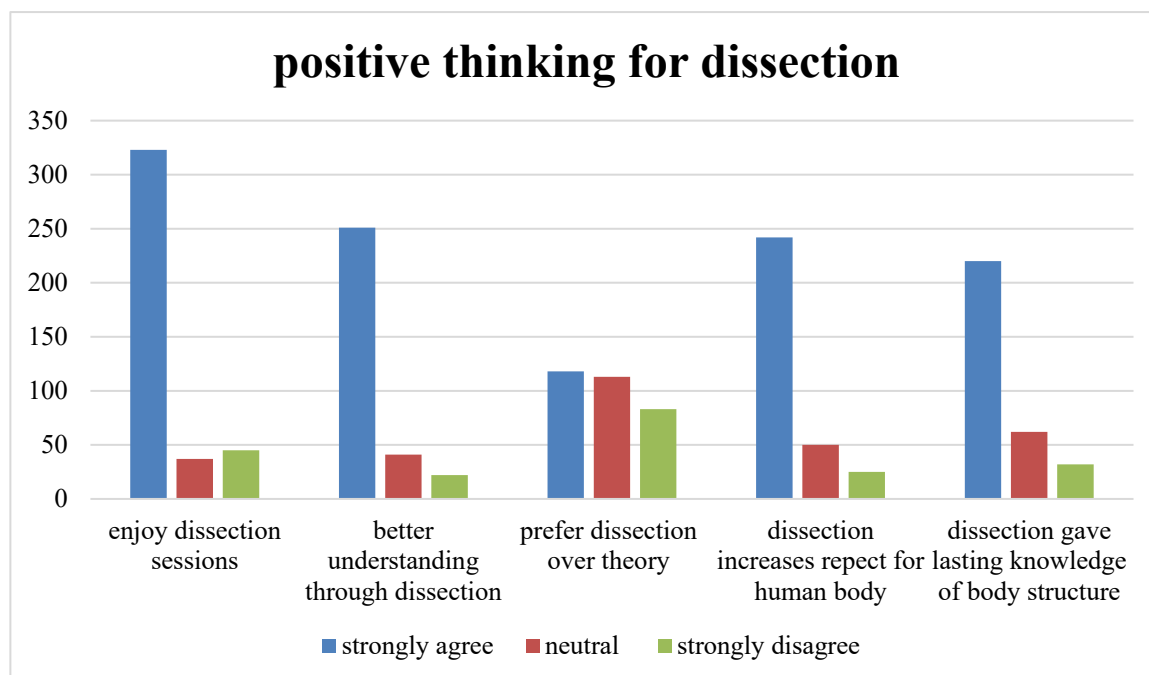
Figure 1: Frequency distribution of the perception and experiences of students at UMST and UR about positive thinking for dissection 2024 (n=314)

Table 3: Frequency distribution of the perception and experiences of students at UMST and UR about challenges facing dissection 2024 (n=314)

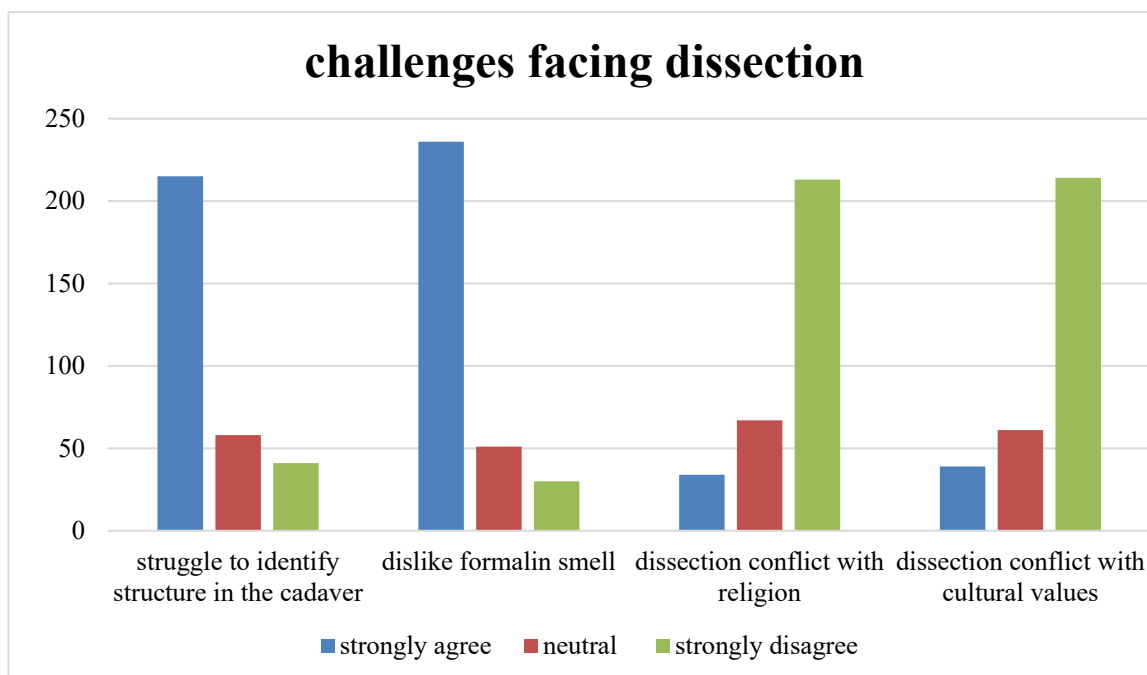| Domain	Disagree/Strongly Disagree n(%)	Neutral n(%)	Agree/Strongly Agree n(%)
Struggled to identify cadaver structures	41 (13.1)	58 (18.5)	215 (68.4)
Disliked the smell of formalin	30 (9.6)	51 (16.2)	236 (75.2)
Dissection conflicted with religious beliefs	213 (67.8)	67 (21.3)	34 (10.8)
Dissection conflicted with cultural values	214 (68.2)	61 (19.4)	39 (12.4)

Figure 2: Frequency distribution of the perception and experiences of students at UMST and UR about challenges facing dissection 2024 (n=314)

Table 4: Frequency distribution of the perception and experiences of students at UMST and UR comparing dissection versus other methods 2024 (n=314)

| Domain	Disagree/Strongly Disagree n(%)	Neutral n(%)	Agree/Strongly Agree n(%)
Prefer dissection over other teaching methods	65(20.7)	91(29.0)	158 (50.3)
Felt disadvantaged without dissection	21 (6.7)	64(20.3)	229(73.0)
Attended dissection sessions regularly	31(9.9)	50 (15.9)	233 (74.2)
Prefer tutorials/3D models over dissection	149 (47.4)	94(29.9)	71(22.7)
Have respect for the dead human body under dissection	17(5.4)	46 (14.6)	251 (80%)
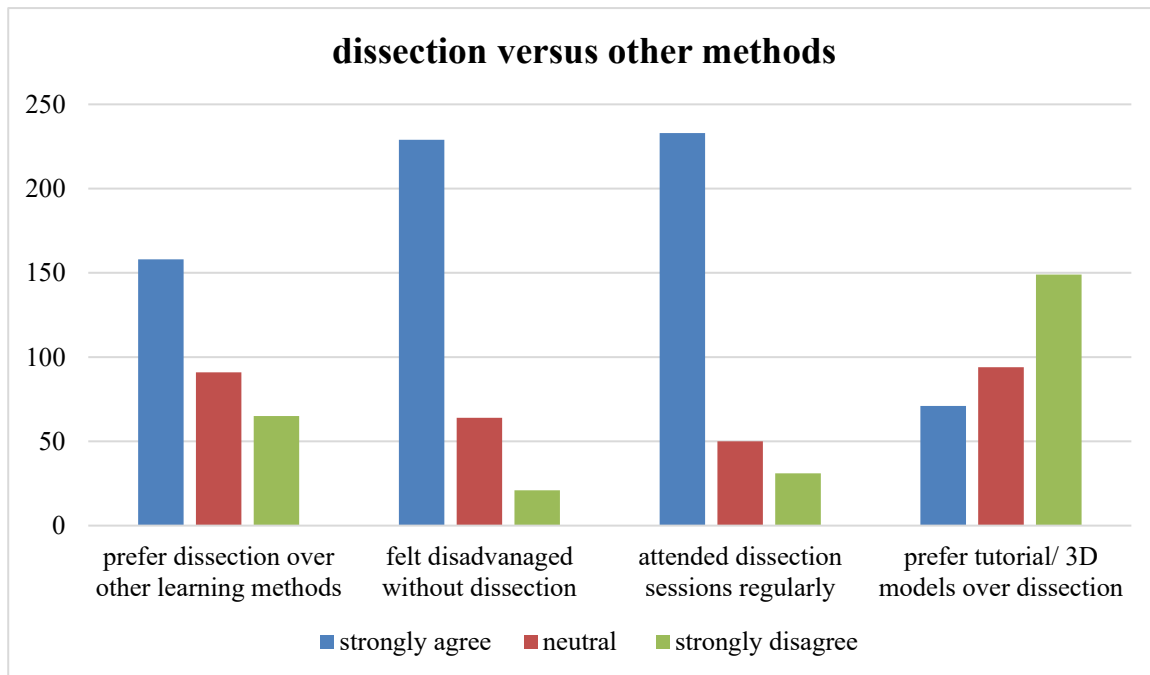
Figure 3: Frequency distribution of the perception and experiences of students at UMST and UR about comparing dissection versus other methods 2024 (n=314)

DISCUSSION

Learning human anatomy through traditional human body dissection for medical students is facing a lot of challenges. Lack of cadavers as well as the impression that the advances in technology in education may substitute the human body increases the reluctancy in providing a human body for dissection purposes. Besides, legal and ethical issues have been an area for concern for some cultures. On the other hand, it is still believed that practicing real dissection on the human body adds great value in building confidence among the medical students. This study tried to investigate the perception of medical students about the time-honored practice of human body dissection for the purpose of learning. The population of the study was composed of students from two different African countries, i.e., Sudan (UMST, hosted in Rwanda since 2023) and the University of Rwanda (UR). The age range of the students falls between 16 and 26 years. In general, it was clearly evident that the majority of the students have a positive perception about dissecting the human body. This is manifested by their responses to the questionnaire that they enjoyed dissection, showed better understanding of gross anatomy when they performed dissection, preferred dissection to virtual sessions, and claimed that dissection increased their respect for the human body as well as that what they learned through dissection is long-lasting. These results are in agreement with other reports carried during the last few years such as the study conducted in Australia (13,14) which reported the majority of students (>75%) agreed with all the survey instrument items that reflected positive perceptions of cadaveric dissections, and the other and the other study by Dissabandara who found out that only (36%) of students in the Griffith University GEMP preferred theory sessions as a more effective learning tool for anatomy course. Furthermore, in a study conducted in Ghana, about 90% of the students recognized dissection as irreplaceable as far as the study of anatomy is concerned and the same findings were also reported in Ukwenya Victor study (15,16), this is in addition to the fact that the cadaver served as the first patient to the medical doctor under training making them familiarized with the dead body before their clinical years. With regard to cadaver respect and empathy A large majority (94.1%) of students expressed their feelings, demonstrating a thoughtful and considerate positive attitude towards the donated bodies. This result is also consistent with other studies (12,14,15) where the majority of the respondents were regular

attendants of dissection, had respect and empathy for the cadaver, and recognized the cadaver as once a human.

When considering the challenges that face dissection, it was expected that conflict with religion and cultural values would be the main obstacles based on the different cultural backgrounds of the study population. Interestingly, the majority of the students declared that there was neither religious nor cultural conflict against practicing dissection for the purpose of learning. Although the students reflected discomfort with the formalin smell and difficulty in identifying the structures in the cadavers. Studies of similar findings were reported by Edmund Atta Asante found that students in a study expressed major dissatisfaction with some aspects of dissections (18,19). In a similar study, a significant number of respondents also, related to items that reflected a negative perception of cadaveric dissection including "difficult to identify structures" (48.4%), and "do not like the smell of preservatives" (45.1%) (14).

When the students were asked to compare dissection and other learning methods in the sense of which is more beneficial, the great majority were biased towards dissection. This was evident in that considering dissection is their preferred method over learning through models. Moreover, they used to feel bad when they missed a dissection session, and also, they used to attend dissection activities regularly. The data suggests that cadaveric dissection can be a stressful experience for many medical students. A significant portion of students' experience anxiety at various stages of the process. While some students felt prepared, many others did not. Prior exposure to a dead body was not common, and its helpfulness varied among those who had it. These findings highlight the importance of providing support mechanisms for students undergoing cadaveric dissection to help them manage anxiety and emotional challenges.

Based on our findings, and given the significant emotional impact on students, institutions should prioritize awareness about the first exposure to cadavers before the encounter and have a general idea about the empathy, emotions, and support needed to start cadaver dissection in the anatomy course to mitigate anxiety and stress. Integrating dissection with complementary teaching methods such as models, specimens, and visual aids can significantly enrich the learning process. Additionally, allocating sufficient teaching assistance in the system to oppose the problems of difficulties identifying and locating structures because in most OSPE exams, which are a standard part of the Anatomy exam, students face the problem of identifying and locating structures when examiners ask for it. Furthermore, prioritizing the curricular time for dissection is crucial to ensure adequate anatomical exposure. Lastly, the study's findings highlight potential disparities between medical and dental students' experiences, suggesting the need for tailored dissection approaches. Further research is warranted to explore these differences and develop targeted interventions to maximize learning outcomes for both groups.

This study has many limitations. A recall bias may have affected the answers of senior students about their experience. In addition, the cultural and social variations between Sudanese and Rwandan students may have created some bias in the perception of their experiences.

CONCLUSION

Despite some minor negative aspects, cadaveric dissection is still preferred by medical and dental students in low-resource settings and is considered to have a high learning impact.

Conflict of Interest

The authors declare that there is no conflict of interest.

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