

Perceptions of First-Year MBBS Students on Anatomy Teaching and Assessment under Competency-Based Medical Education: A Cross-Sectional Study

Simrah Qadri¹, Ghulam M. Bhat², Nazish Nazir³

^{1,3}Resident, Postgraduate Department of Anatomy, Government Medical College Srinagar, Jammu and Kashmir, India

²Professor, Postgraduate Department of Anatomy, Government Medical College Srinagar, Jammu and Kashmir, India

Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026

Corresponding author: Dr. Simrah Qadri

Conflict of interest: Nil

Abstract

Background: The subject of anatomy is a cornerstone of medical education. As the competency-based medical education (CBME) model is rolled out in India, a change in the way in which medical students learn has occurred. However, concerns regarding the effectiveness of the current methods of teaching and assessment in medical schools have emerged.

Objectives: The goals of this study were to evaluate the perceptions of teaching and assessment in the department of anatomy of first-year MBBS students, and to determine their level of preparedness in clinical and research settings according to the CBME framework.

Methods: A cross-sectional questionnaire-based study was conducted among 182 first-year MBBS students attending Government Medical College, Srinagar. A prevalidated questionnaire (Cronbach's alpha = 0.82) was used to assess the student perceptions regarding anatomy department teaching methods, assessment methods, theory-practice balance, and preparedness for clinical settings. Data were analyzed using descriptive and inferential statistics, as well as thematic analysis of open-ended questions.

Results: Out of the different teaching methods, cadaveric dissection was the most preferred method (55%). However, in the category of assessment methods, the preferred method was practical examinations (55%). Other methods such as case-based learning were used by 25% of the students while only 5% of students indicated a preference for lectures or written examinations. A majority of students (62%) felt that the current assessment methods were adequate; however, some students noted that there was a focus on minutiae in many of these assessments. Furthermore, 50% of the students indicated that the focus of assessments was weighted towards theoretical knowledge, rather than the knowledge of how to apply that knowledge to patient care. Finally, only 25% of the students indicated that they feel prepared to apply their knowledge to clinical settings, and the remainder of the students expressed a feeling of partial preparedness.

Conclusion: Overall, students indicate a preference for methods that focus upon the application of knowledge to clinical settings. Therefore, these findings suggest the need for reforms to the current curriculum regarding the use of integrated teaching methods, the use of assessment methods like OSPE, and the use of digital tools to enhance the clinical preparedness of medical students.

Keywords: Anatomy education, competency-based medical education, dissection, assessment methods, integrated teaching, medical students.

DOI: 10.25258/ijcpr.18.8.135

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Anatomy is the foundation of medical education as it provides knowledge of the structural make-up of the human body and its relationship to physiological and pathological functions.

A good understanding of human anatomy is essential for the practice of medicine in any medical specialty. Deficiencies in anatomical

knowledge within doctors have been shown to adversely impact their clinical confidence, diagnostic and procedural skills, particularly within junior doctors [1-4]. The teaching of anatomy to medical students has undergone considerable change over the past two decades.

In the past, the approach to medical education was teacher-centred; however, a shift towards learner-centred strategies has been made possible to enable students to participate in the learning process. Instructional strategies such as the use of cadavers, case studies, problem-based learning, small groups of learners, simulations, three-dimensional digital models of the human body, radiological anatomy, and virtual learning have been incorporated into medical education as a means of improving the learning of medical students [5-8]. Furthermore, the National Medical Commission (NMC) of India has introduced the Competency-Based Medical Education (CBME) curriculum for all medical colleges in the country. The aim of the CBME curriculum is to shift the teaching of medical knowledge from a knowledge-based approach to a competency-based approach to medical education that focuses on the learner, clinical skills, and the development of well-rounded graduates who are competent in all aspects of medicine and delivery of healthcare services to patients [9-11].

Despite these curricular reforms, there are a few challenges in anatomy education. The traditional method of lecturers teaching anatomy to students has always been challenged by the need for students to be actively involved in the learning process, as opposed to passively receiving knowledge from lecturers [12-14]. Current studies from Indian medical colleges show a shift towards active learning in the anatomy classroom. Muraleedharan A, et al. discovered that all students accepted the vertical integration of anatomy education within their curriculum. Furthermore, Bharti A, et al. discovered that 64% of student's preferred cadaveric dissection to lectures, which represent 6% of students who preferred traditional lectures. Skaria S, et al. also found that students accepted cadaveric dissection (90.2%), using multimedia resources to teach anatomy (91.7%), and problem-based learning in their anatomy education (76.7%), indicating a shift towards preferred anatomy education methods that integrate the clinical aspects of anatomy and technology to teach the subject matter [15-18].

Assessment strategies play a pivotal role in shaping students learning behaviour and competency development. While examinations of recall of information are common in medical education, competency-based strategies encourage the use of assessments based upon the performance of

students in practical examinations, Objective Structured Practical Examinations (OSPEs), case-based assessments, and formative assessments of student competency [11-13]. Previous studies indicate that students have a preference for these types of assessments, as they believe they reveal more about their knowledge and competency in the subject areas [15-18]. Furthermore, a recent systematic review of medical students from different institutions indicated that, despite improvements in competency development and perceptions of clinical relevancy to education after the implementation of CBME strategies, challenges to the implementation of these strategies into medical education still exist [19].

Despite the increasing number of research studies demonstrating students' preference for active learning and teaching integrated with clinical cases, there is still a gap between the knowledge of anatomy and its clinical application. Most of the published research studies focused on evaluating the individual components of anatomy education, while few have attempted to comprehensively evaluate both the teaching and assessment components of anatomy education [15-19]. Understanding students' perceptions of anatomy education is essential to understanding the success of implementing the competency-based medical education (CBME) curriculum.

Therefore, a study was undertaken among first-year MBBS students studying at Government Medical College, Srinagar to investigate the perceptions of anatomy education within the CBME curriculum

Materials and Methods

Study Design and Setting: A cross-sectional study using questionnaires was undertaken in the Department of Anatomy at Government Medical College, Srinagar over a period of three months.

The study targeted first-year MBBS students receiving training under the CBME curriculum and aimed to evaluate the perceptions of its anatomy education.

Study Population: The study consisted of the population of first-year MBBS students who were enrolled during the academic session. Out of 200 students who were approached for the study, 182 students gave their consent to participate in the study, giving a response rate of 91%. All the students who were present and willing to participate in the study were included in the study.

Students who refused to participate or did not complete the questionnaire were excluded from the study.

Study Tool and Development of Questionnaire:

A questionnaire was used to collect the data for the study. The questionnaire was developed based on the existing literature in the field regarding anatomy education. The questionnaire consisted of three domains: teaching, assessment, and perceptions regarding anatomy education. The questions in the questionnaire were of the multiple choice type with a specific set of options for the students to answer the questions.

Validity and Reliability of the Questionnaire:

The content validity of the questionnaire was ensured through the reviews of experts in the field. Three senior anatomists, one radiologist, and one medical education specialist reviewed the items in the questionnaire and made suggestions for modification. The questionnaire was also administered to 20 second-year MBBS students to assess the feasibility of the questionnaire, clarity of the questions, and the time required to complete the questionnaire. These students were not part of the study. The reliability of the questionnaire was measured using Cronbach's alpha. The value obtained for the questionnaire was 0.82 indicating that the questionnaire was reliable.

Data Collection Procedure: The questionnaire was administered in the classroom after obtaining consent from the students. Each student was informed of the objectives of the study and the voluntary nature of their participation in the study. The identities of the students were not recorded in the administration of the questionnaire. On average, it took the students 10-15 minutes to complete the questionnaire. In addition to the close-ended questions, an open-ended question was included in the questionnaire that asked the student for comments and suggestions regarding the study. These comments and suggestions were used to obtain additional insights regarding the objectives of the study.

Outcome Measures: The following outcome measures that will be used in the study include questions that assess students' preferred teaching and assessment modalities, the perceived adequacy of the current practical examinations, their perception of the balance of theoretical and practical assessments, and their preparedness for clinical and research applications. Additionally,

qualitative perceptions of the anatomy course will be captured from the open-ended questions and analyzed for any themes regarding the anatomy course.

Qualitative (Thematic) Analysis: The qualitative data from the open-ended questions will be analyzed using an inductive thematic analysis approach (Braun and Clarke). All responses will be read to become familiar with the content of the responses. During the initial coding of the content, two investigators will independently code meaningful statements from the responses into initial codes. Codes that contain similar meanings will be grouped into categories. These categories will be further grouped into themes. Any discrepancies between the two investigators will be discussed and resolved by all investigators conducting the analysis. Finally, the themes will be reviewed against the responses to ensure that they accurately represent the perceptions of the students regarding the anatomy course.

Statistical Analysis: All data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA). All categorical variables were summarized in tables as frequencies and percentages. The Chi-square (χ^2) test was used to assess any differences between variables and within variables. Results were considered to be statistically significant if < 0.05 in significance (with values of < 0.001 representing highly significant results). Subgroup analyses were performed to determine if there were any differences within the individuals according to their gender or educational background; no statistically significant differences were found ($p > 0.05$). Finally, the qualitative data were analyzed through thematic content analysis methods. The responses to the open-ended questions were coded and grouped into themes for presentation and discussion. These qualitative results are discussed alongside the quantitative results of the study.

Results

A total of 182 first-year MBBS students participated in the survey, and the response rate was 91%. The responses to the survey questions provided statistically significant responses regarding the teaching and assessment modalities preferred by the students. Among the teaching modalities, cadaveric dissection was the most preferred by 55% of the students, followed by case-

based learning (25%), group discussions (15%), and conventional lectures, which were least preferred by only 5% of the students (Table 1). The difference in preference for the different teaching modalities was statistically significant ($\chi^2 = 112.4$, $p < 0.001$).

Similarly, among the assessment modalities, the majority of the students (55%) preferred practical examinations to other forms of assessment. The percentage of students who preferred case-based assessments was the next highest at 25%, followed by oral examinations (15%) and written tests, which were preferred by only 5% of the students (Table 2). The difference in preference for the assessment modalities was also statistically significant ($\chi^2 = 96.7$, $p < 0.001$).

Regarding the adequacy of practical examinations to assess anatomical knowledge, it was found that 62% of the students felt that the examinations adequately assessed their anatomical knowledge, 21% felt that they were only somewhat adequate, and the remaining 17% felt that the examinations were inadequate (Table 3).

The distribution of responses to this question was statistically significant ($\chi^2 = 54.2$, $p < 0.001$). The majority of students felt generally positively about the practical examinations. However, some of the reasons for which students felt that the examinations were only somewhat adequate related to the amount of focus that was placed upon the identification of minute anatomical structures within the examinations.

Regarding the students' preparedness for the clinical and research applications of their anatomical knowledge, it was found that 25% of students felt that they were prepared, 60% of students felt that they were only partially prepared, and the remaining 15% of students felt that they were not prepared (Table 4). Such an answer distribution was statistically significant ($\chi^2 = 68.9$, $p < 0.001$).

Regarding the balance between theoretical and practical assessments, 50% of the students indicated that the current balance of theoretical and practical assessments in the medical school curriculum was imbalanced in favor of theoretical assessments. Furthermore, 30% of the students indicated that they believed that the current balance between theoretical and practical assessments was

appropriate (Table 5). These differences were statistically significant ($\chi^2 = 41.6$, $p < 0.001$).

There were no statistically significant differences in the teaching and learning methods preferred by male versus female students within the study ($*p > 0.05$). Female students had higher preferences for learning methods that included group discussions, while male students showed higher preferences for learning methods that included the dissection of human bodies. Additionally, students from rural educational backgrounds had higher preferences for learning methods that were based upon collaboration among students, while students from urban backgrounds had higher preferences for case-based learning methods; however, these differences were not statistically significant ($*p > 0.05$). Figure 1

Qualitative Analysis: The qualitative analysis of the open-ended questions revealed four main themes (see Table 6). The most common theme among the students was the need for more clinical content to be integrated into the anatomy course. Students suggested the integration of content related to radiological imaging, clinical cases, and surgical procedures into the anatomy course as a means of enhancing their understanding of the three-dimensional anatomy of the body and applying that knowledge to clinical practice.

The second most common theme related to assessment. Students suggested the implementation of quizzes, formative assessments of their performance in the course, and the provision of feedback after performing these assessments as means of improving their knowledge of the anatomy course content.

The third dominant theme that emerged from the focus groups was one of the concerns regarding the oral examinations (viva voce) that were to be undertaken by the graduating students. The students stated, for the most part, that they found the oral examinations to be stressful and subjective. Their suggestion was that the implementation of some form of a structured viva examination would help to ensure fairness and confidence in the oral examinations of the practical components of the program.

The fourth theme to emerge from the focus groups was the students' demands regarding the incorporation of technology into the anatomy program. The students expressed interest in the use

of three dimensional models of the body, virtual reality and augmented reality applications, and other technology related to the study of anatomy.

especially in relation to the use of cadavers in the anatomy department.

The students felt that these technologies would be of particular value in the understanding of anatomy,

Table 1: Preference for Teaching Modalities (n = 182)

Teaching Modality	Students (n)	Percentage (%)	χ^2 Value	p-value
Dissection	100	55%		
Case-based learning	45	25%		
Group discussion	27	15%		
Lectures	10	5%	112.4	<0.001*

Table 2: Preferred Assessment Formats (n = 182)

Assessment Method	Students (n)	Percentage (%)	Rank	χ^2 Value	p-value
Practical exams	100	55%	1		
Case-based assessment	45	25%	2		
Oral exams	27	15%	3		
Written tests	10	5%	4	96.7	<0.001*

Table 3: Adequacy of Practical Examinations (n = 182)

Response	Students (n)	Percentage (%)	χ^2 Value	p-value
Yes	113	62%		
Somewhat	38	21%		
No	31	17%	54.2	<0.001*

Table 4: Preparedness for Clinical and Research Application (n = 182)

Preparedness Level	Students (n)	Percentage (%)	χ^2 Value	p-value
Fully prepared	46	25%		
Partially	109	60%		
Not prepared	27	15%	68.9	<0.001*

Table 5: Perception of Balance between Theory and Practical Assessments (n = 182)

Response	Students (n)	Percentage (%)	χ^2 Value	p-value
Balanced	55	30%		
Imbalanced	91	50%		
Not sure	36	20%	41.6	<0.001*

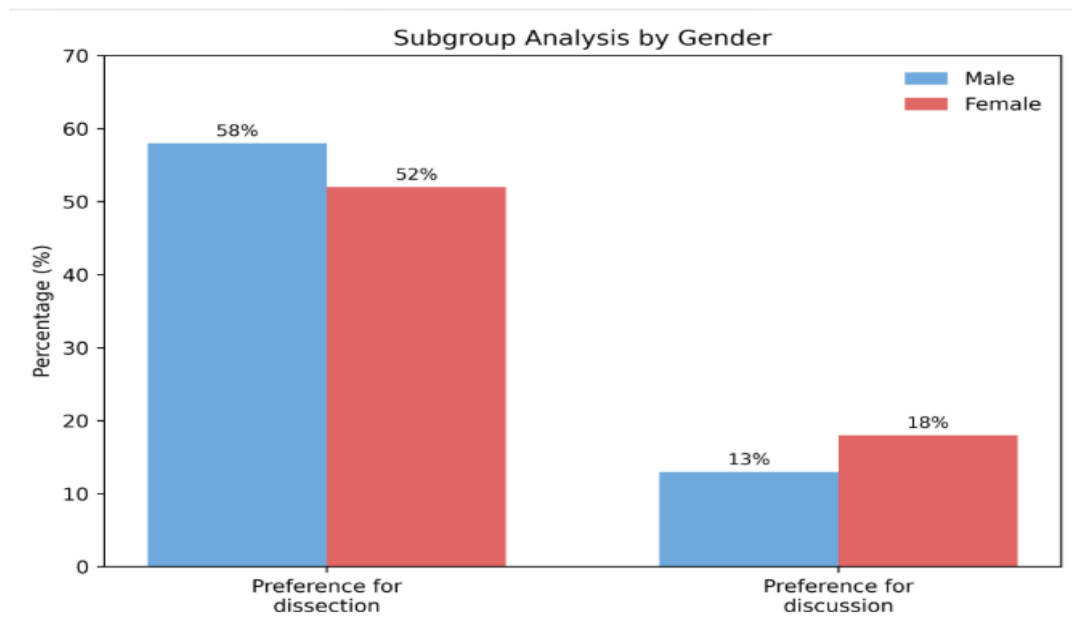


Figure 1: Comparison of teaching modality preferences between male and female first-year MBBS students

Table 6: Thematic Analysis of Qualitative Responses from First-Year MBBS Students

Theme	Representative Student Perceptions	Educational Implication
Clinical integration	It was stated that students would like to see more radiological images, clinical and surgical case studies included in the curriculum to aid in the understanding of anatomy and its application in clinical settings.	Supports vertical and horizontal integration within the CBME curriculum.
Formative assessment	Students indicated that they preferred low-stakes assessments to end-of-term examinations.	Promotes continuous learning and timely feedback.
Oral examination concerns	The majority of students noted that viva voce examinations were stressful and subjective.	Highlights the need for structured viva formats and standardized assessment criteria.
Technology-enhanced learning	Students were very interested in the use of three-dimensional anatomical models, virtual dissection software, digital atlases, and simulation software in the curriculum.	Supports blended learning and integration of educational technologies.

Discussion

Overall, the results of the study showed that first-year MBBS students have a preference for certain teaching and assessment methods in the CBME curriculum. Among the teaching methods, cadaveric dissection was the most preferred method (55%) followed by the preferred method of assessment which was practical examinations (55%). However, only 5% of the first-year MBBS students preferred these traditional teaching and assessment methods. This indicates that first-year MBBS students have a preference for learning methods that are more practical and related to the clinical aspects of medicine yet have a lack of preparedness in clinical settings. Only 25% of the students feel prepared for clinical rotations while 60% of the students feel that they are only partially prepared for clinical rotations. Thus, despite the introduction of CBME, there is still room for improvement in the clinical competence of first-year MBBS students.

The fact that cadaveric dissection is still preferred by medical students today only further highlights the value that this form of education continues to hold for medical education. Authors Bharti A, et al. reported that 64% of students feel that cadaveric dissection is the most effective method of learning in their first year of medical school. Authors Skaria S, et al. found that 90.2% of students prefer cadaveric dissection to other forms of anatomy education in their clinical settings [17,18]. Muraleedharan A, et al. discovered that 69% of students feel that self-dissection is an extremely useful component of their medical school education, as do 100% of those students who supported the integration of anatomy education with clinical disciplines [15]. These similar results

from different institutions across the country only further supports the argument that cadaveric dissection is an indispensable component of medical school education, despite the rapid development of technology in medicine and education. Furthermore, though there are benefits to the use of cadaveric dissections, the slightly lower percentage of individuals who preferred this modality in the present study suggests the growing acceptance of other forms of anatomy education, particularly those that incorporate the use of both clinical and digital educational resources.

One of the most notable findings of the present study was the higher percentage of students who preferred case-based learning as compared to Bharti A, et al.'s findings (25% vs. 12%) [17]. Muraleedharan A, et al. reported that 81% of students found clinically-integrated lectures to be highly useful during their medical education, while 100% of students indicated that vertical integration of clinical content into the curriculum was beneficial to their education [15]. Additionally, Konar S, et al. found that more than 85% of students believed that integrated learning of anatomy was beneficial to their understanding of the subject [16]. Furthermore, Skaria S, et al. reported that 90.2% of students preferred cadaveric dissection to learning anatomy through other means, 91.7% of students indicated a preference for multimedia learning resources over conventional methods of teaching anatomy, and 76.7% of students indicated a preference for problem-based learning and case discussions over traditional methods of teaching the subject [18]. These various findings all work together to suggest a shift in the way that anatomy is taught within medical schools toward a multimodal, clinically integrated, and technology-enhanced approach to education.

The percentage of students that exhibit a preference for conventional lectures in the current study (5%) is similar to the 6% reported by Bharti A, et al. [17]. However, it is important to note that this percentage does not indicate a rejection of lecture classes altogether. Muraleedharan A, et al. determined that 81% of students had a positive perception of lectures that were integrated with clinical cases [15]. Additionally, while Skaria S, et al. found that 58.6% of students preferred lecture classes that utilized PowerPoint presentations, 41.3% of students still exhibited a preference for traditional lecture classes [18]. Thus, these results indicate that students prefer lectures that are interactive and utilize multimedia components to the traditional lectern-based lecture classes. Thus, the incorporation of clinically relevant case studies, radiological case studies, interactive presentation and lecture software, and the use of problem-solving activities have the potential to increase student engagement with the lecture material.

The assessment practices for competency-based education have a significant influence on students' learning behaviour. For this study, 55% of the students preferred practical examinations to written examinations, which is the same as the findings of Bharti A, et al. However, written examinations were of more interest to only 5% of the students in both studies [17]. Furthermore, 62% of the students in this study indicated that a practical examination was sufficient to assess their knowledge of anatomy. However, these students were of the opinion that there should be a reduction in the number of anatomy topics that were required to be identified during practical examinations within the given time frames.

Similar results were presented by Muraleedharan A, et al., where 87% of the students felt that the assessments used within the curriculum were of more interest to students if they related to the application of clinical medicine [15]. One of the largest reviews of competency-based assessment was conducted by Vaidya M, et al., where 76.2% of the students indicated an increase in the clinical relevance of their education after the implementation of competency-based assessment, as did 72.8% of the students in relation to their understanding of competency in medical education. Furthermore, 58.6% of the students felt that formative assessments allowed for the identification of learning gaps in their education,

while 64.4% of the students felt that receiving feedback on these assessments was crucial for the improvement of their learning outcomes [19]. However, within both of these studies, uncertainty regarding competency-based assessment was found to be one of the major challenges regarding the implementation of such an educational model. Implications from these studies indicate the need to incorporate assessments such as Objective Structured Practical Examinations (OSPEs), structured viva examinations, assessments based on radiological images, and case-based assessments to evaluate higher-order thinking skills rather than the recall of factual information alone.

One of the important observations from the present study was that 50% of the students thought that there was an imbalance in favour of theoretical assessments despite the efforts made to include more practical assessments. Similar findings were reported by Bharti A, Sarkar KN, Rohatgi R, et al. which showed that the imbalance in favour of theoretical assessments is a problem that extends beyond the institutions included in the current study [17]. The tendency of the instructors to focus on theoretical assessments instead of the practical application of knowledge may lead to students memorizing knowledge rather than understanding it. According to educational theory, the assessments used in an educational institution will influence the way in which the students learn; hence, the successful implementation of CBME will require the implementation of assessment strategies that evaluate the ability of students to apply and problem solve rather than simply remember the knowledge being taught. These findings were reported by Vaidya M, et al. who found that uncertainty regarding assessment, lack of implementation of assessments, lack of preparedness of the faculty to implement these assessments, and the need to document implementation of the assessments were all important barriers to the implementation of CBME in various institutions [19].* Perhaps the most clinically relevant finding of the present study was the discovery that only 25% of the students felt prepared for clinical rotations, even though they had positive opinions regarding the teaching of anatomy. This same finding was reported by Bharti A, et al. [17]. In contrast, Muraleedharan A, et al. discovered that nearly 100% of the students accepted the concept of vertical integration, though Konar S, et al. An investigation into the impact of

CBME on medical students revealed that more than 85% of the students believed that the integration of anatomy within the medical school curriculum had helped to improve their understanding of clinical concepts [15,16]. Furthermore, another systematic review by Vaidya M, et al. reported that 76.2% of medical students felt that their understanding of the clinical relevance of the concepts that they were learning within their anatomy courses was improved following integration of CBME into their curriculum, 69.5% expressed increased motivation to learn those clinical concepts, and 67.1% expressed increased confidence in their ability to perform practical tasks within their medical and anatomy fields as a result of their exposure to CBME curricula [19]. These findings suggest that the integration of anatomy and radiology, anatomy and pathology, anatomy and surgery, and clinical exposure into the medical school curriculum is a more important variable to improving the clinical knowledge and preparedness of medical school students than increasing the amount of hours that they are to spend in their anatomy education.

Beyond these quantitative investigations into the impact of CBME on medical students, other studies have performed qualitative analyses of students' perceptions of CBME. These perceptions included opinions regarding the clinical integration of anatomy within the medical school curriculum, the preference of certain types of formative assessments of students' knowledge, concerns regarding the subjectivity of oral examination procedures performed by teachers, and the growing demands of medical students for the incorporation of technology-enhanced learning within their medical school curriculum. Each of these findings are echoed by recent research on medical school anatomy education. Muraleedharan A, et al., for instance, performed a study that found that 75.5% of medical students within their institution preferred to learn for themselves of concepts rather than learn within lecture-format classes, 77% preferred seminar and quiz-based courses, and 57% found their use of e-learning platforms beneficial to their education [15]. Furthermore, another study by Skaria S, et al. found that students within their institution were accepting of the use of multimedia education (91.7%), assessments other than examinations (93.2%), of cadaver dissection (90.2%), and problem-based learning (76.7%) but struggled with concepts in embryology (71.4%) and histology (52.6%) and expressed interest in

improvements to the visualization technology available for viewing anatomy in these courses [18]. Furthermore, another study by Konar S, et al. showed that while over 85% of the students indicated the value of the integrated teaching approach, approximately 66% of the faculty reported challenges with implementing such a program [16]. Similarly, Vaidya M, et al. discovered that the best learning strategies for anatomy and body systems included strategies like active learning, formative assessment, feedback, and self-directed learning were utilized in many competency-based programs yet discovered implementation challenges with aspects like workload, assessment, and faculty knowledge and preparation [19]. However, these studies indicate the challenges for implementing such a program and the need for accommodating factors like faculty development, institutional support, infrastructure, and feedback from students as part of implementing such a program.

Considering the results of this study and the current literature on the topic, it is evident that there is a need to continue to modernize anatomy education within the CBME framework. While cadaveric anatomy remains the cornerstone of anatomy education, various other methods of teaching anatomy can also be utilized to provide students with a more well-rounded understanding of the subject matter. For instance, Vaidya M, et al. recommended the implementation of various strategies for optimizing medical education within the undergraduate program, including the implementation of structured orientation to the CBME framework, competency mapping, formative assessments, feedback systems, faculty development, clinical skill sessions, and the reduction of documentation requirements for students within medical schools [19].

Each of these recommendations relate to the findings of this investigation, and each recommendation has the potential to lead to improvements in medical education within the Indian medical school graduate and to enable them to achieve their required competencies.

Limitations

Despite the strengths of the study, there are several limitations to consider. The study was limited in that it was performed at a single institution and used self-reported perceptions of the students to determine the impact of the program. Additionally,

the cross-sectional nature of the study limits its ability to discern if there are any changes in those perceptions over time. Future studies should employ these same methodologies on a multicentric scale, as well as incorporate assessments of the academic performance of those students and the implementation of different educational interventions to determine the long-term impact that such an anatomy course can have upon the students' education.

References

1. Azer SA, Eizenberg N. Do we need dissection in an integrated problem-based learning medical course? Perceptions of first- and second-year students. *Surg Radiol Anat.* 2007;29(2):173-180. doi:10.1007/s00276-007-0180-x.
2. Winkelmann A. Anatomical dissection as a teaching method in medical school: a review of the evidence. *Med Educ.* 2007;41(1):15-22. doi:10.1111/j.1365-2929.2006.02625.x.
3. McLachlan JC, Bligh J, Bradley P, Searle J. Teaching anatomy without cadavers. *Med Educ.* 2004;38(4):418-424. doi:10.1111/j.1365-2929.2004.01795.x.
4. Patel KM, Moxham BJ. The relationships between learning outcomes and methods of teaching anatomy as perceived by medical students. *Clin Anat.* 2006;19(5):493-500. doi:10.1002/ca.20206.
5. Sugand K, Abrahams P, Khurana A. The anatomy of anatomy: a review for its modernization. *Anat Sci Educ.* 2010;3(2):83-93. doi:10.1002/ase.139.
6. Turney BW. Anatomy in a modern medical curriculum. *Ann R Coll Surg Engl.* 2007;89(2):104-107. doi:10.1308/003588407X168244.
7. Fitzgerald JE, White MJ, Tang SW, Maxwell-Armstrong C, James DK. Are we teaching sufficient anatomy at medical school? The opinions of newly qualified doctors. *Clin Anat.* 2008;21(7):718-724. doi:10.1002/ca.20778.
8. Smith CF, Mathias HS. What impact does anatomy education have on clinical practice? *Clin Anat.* 2010;23(5):560-567. doi:10.1002/ca.21046.
9. Bergman EM, Prince KJAH, Drukker J, van der Vleuten CPM, Scherpier AJJA. How much anatomy is enough? *Anat Sci Educ.* 2008;1(4):184-188. doi:10.1002/ase.35.
10. Miller SA, Perrotti W, Silverthorn DU, Dalley AF, Rarey KE. From college to clinic: reasoning over memorization is key for understanding anatomy. *Anat Rec.* 2002;269(2):69-80. doi:10.1002/ar.10071.
11. Biggs J. Enhancing teaching through constructive alignment. *High Educ.* 1996;32:347-364. doi:10.1007/BF00138871.
12. Nicol DJ, Macfarlane-Dick D. Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Stud High Educ.* 2006;31(2):199-218. doi:10.1080/03075070600572090.
13. Prober CG, Heath C. Lecture halls without lectures—a proposal for medical education. *N Engl J Med.* 2012;366(18):1657-1659. doi:10.1056/NEJMp1202451.
14. Drake RL, McBride JM, Lachman N, Pawlina W. Medical education in the anatomical sciences: the winds of change continue to blow. *Anat Sci Educ.* 2009;2(6):253-259. doi:10.1002/ase.117.
15. Muraleedharan A, Ragavan S, Bage NN, Devi R. Perceptions of medical undergraduate students on curricular changes in anatomy: an embedded design mixed-method study. *J Adv Med Educ Prof.* 2022;10(1):22-29.
16. Konar S, Sarkar S, Mondal MK, Aggarwal P. A study based on perception of first-phase undergraduate medical students and faculty on integrated teaching in anatomy. *Natl J Clin Anat.* 2023;12(4):186-190.
17. Bharti A, Sarkar KN, Rohatgi R, Ranjan N. Re-envisioning anatomy education: a student-centered appraisal of teaching modalities and assessment strategies in medical training. *Int J Life Sci Biotechnol Pharma Res.* 2025;14(9):530-538. doi:10.69605/ijlbpr_14.9.2025.88.
18. Skaria S, Joshi K, Johri A. Perceptions of first-year Indian medical students towards different teaching-learning and assessment methods in human anatomy: a cross-sectional study. *J Clin Diagn Res.* 2026;20(4):AC07-AC11.
19. Vaidya M, Lahariya SN, Thalor DS, Randa V, Sarkar PD. Undergraduate medical students' perceptions of competency-based medical education: a systematic review of benefits, challenges, and implementation experiences. *Int J Med Pharm Res.* 2026;7(4):142-153.