

# Perceptions of First Year Indian Medical Students towards Different Teaching-learning and Assessment Methods in Human Anatomy: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Anatomy is considered a difficult subject with a broad curriculum, and many students encounter difficulty in understanding it effectively. Modern-day learning involves the integration and use of new technologies and resources.

**Aim:** To examine the perceptions of medical students regarding various teaching, learning, and assessment methods.

**Materials and Methods:** This cross-sectional survey was conducted among undergraduate medical students (n=266) of the American International Institute of Medical Sciences, Udaipur, Rajasthan, India, after obtaining ethical clearance. A structured questionnaire consisting of 28 questions encompassing the current teaching, learning, and assessment methods in anatomy was used for the study. The data obtained were analysed and represented as percentages.

**Results:** More than half of the participants, 164 (61.65%), believed that a one-year duration is adequate for proper understanding of the subject. About 82 (30.83%) of the participants felt that classical large-group lectures were the best teaching method. Students appreciated problem-based teaching, small-group demonstrations, and the use of advanced

teaching-learning methodologies. A total of 248 (93.23%) of the participants enjoyed teaching at the dissection table. The majority of participants found difficulty in learning embryology 190 (71.43%) and histology 140 (52.63%). They expressed difficulty in comprehending the sequence of events, inability to visualise structures, and inadequate time allocation in embryology, as well as difficulty in identifying structures under the microscope and insufficient lecture and practical time in histology. Participants were satisfied with continuous assessment methods such as weekly assessments and part-ending tests.

**Conclusion:** The survey received a mixed response from the participants. They were satisfied with the existing one-year anatomy curriculum. Participants appreciated classical chalkboard teaching and cadaveric dissection even in the age of multimedia and artificial intelligence. Problem-Based Learning (PBL) and clinical case discussions as part of Competency-Based Medical Education (CBME) encouraged critical thinking and application of knowledge among the participants. Students expressed anxiety regarding embryology and histology but appreciated continuous assessment strategies, as these aided ongoing learning and improved performance.

**Keywords:** Dissection, Medical education, Students' perception

## INTRODUCTION

Learning is defined as "a process that results in change, arising from experience that leads to improved performance and increased ability to learn in the future." Nevertheless, it is important to note that learning is not simply something imposed on students; rather, it is an active effort undertaken by the students themselves [1]. In the 21<sup>st</sup> century, the learning landscape has evolved significantly due to the integration of new technologies, online resources, and innovative teaching methods. Learning in the medical field is particularly challenging due to the extensive and complex nature of the curriculum [2].

Several studies have highlighted the prevalence of stress, fatigue, and burnout among medical students, along with the academic pressures imposed by medical institutions [2,3]. Stress and burnout affect approximately 50-60% of medical students and are more pronounced in this group compared to their age-matched peers in the general population [4]. In addition, psychological stressors adversely affect learning outcomes and professional performance. As a demanding subject, anatomy requires considerable effort and is often taught through superficial teaching techniques and rote memorisation [5,6]. The inadequate time allotted to this vast subject further makes it difficult for students to understand it effectively. Anatomy continues to present persistent challenges, particularly for transitional students [6].

In medical schools, anatomy poses ongoing challenges for students transitioning from secondary to higher education. Students who performed well in secondary school often find anatomy difficult in medical education, necessitating the adoption of new learning strategies. Learning human anatomy involves memorising thousands of details related to the human body, often within a limited time frame, which forces students to resort to superficial learning [6]. Anatomy serves as a crucial foundation for linking basic sciences with clinical practice. Anatomical knowledge is essential not only for surgeons but also for professionals involved in invasive procedures, radiological interpretation, and physical examination. A strong understanding of anatomy facilitates learning in other medical disciplines [6].

There is ongoing debate regarding the most effective methods for teaching and learning anatomy [7]. Medical institutions are expected to produce professionals equipped with appropriate knowledge, skills, and attitudes to excel in their future careers. Teaching methods significantly influence students' understanding of physiological principles and their clinical applications [8]. Although students may pass examinations, many struggle to apply their knowledge in clinical scenarios during internships [9]. This has raised concerns among clinicians regarding the adequacy of anatomical knowledge acquired during preclinical years. Several researchers have emphasised the importance of sound anatomical expertise in building a strong

foundation for future clinical performance and professional practice [10,11]. The concept of students' attitudes towards learning was initially introduced by educational psychologists [6]. Achievement of learning outcomes is largely influenced by learners' attitudes, personal characteristics, and situational factors [12].

The need for this study arises from persistent challenges and recent educational reforms in medical anatomy teaching. The Indian medical curriculum has undergone major changes with the introduction of CBME, which emphasises a shift from passive, teacher-centred approaches to active, student-centred, clinically integrated teaching and assessment methods. Traditionally, anatomy has been taught through didactic lectures and cadaveric dissection. Existing literature suggests that students often perceive anatomical knowledge as theoretical, with limited clinical correlation [13]. Anatomy education in Indian medical colleges faces challenges such as reduced teaching hours, limited availability of cadavers, and poor faculty–student ratios.

This study is comprehensive, examining students' perceptions of various teaching-learning and assessment methods rather than focusing solely on a single educational innovation such as early clinical exposure or the flipped classroom. Challenges such as cadaver availability, large batch sizes, and CBME curricular guidelines are unique to the Indian medical education system. Therefore, a study conducted in this context is more relevant and actionable for Indian medical colleges and regulatory bodies.

## MATERIALS AND METHODS

This cross-sectional survey was conducted in the Department of Anatomy at the American International Institute of Medical Sciences, Udaipur, Rajasthan, India, from June 2025 to October 2025. The study was approved by the Institutional Ethics Committee (EC/NEW/INST/2023/3533).

**Inclusion criteria:** The study was conducted among two batches of MBBS students (2022-2023 and 2023-2024) at the American International Institute of Medical Sciences, Udaipur, Rajasthan, who had completed their first year of study and successfully passed the First Professional Examination. Out of 300 eligible students, 266 participated in the study.

**Exclusion criteria:** Students who had not passed their first-year courses and those with incomplete responses were excluded from the study.

The sample size was determined based on feasibility and the availability of students during the study period. Informed consent was obtained from all participants.

## Study Procedure

A predesigned and prevalidated questionnaire consisting of 28 questions covering current teaching, learning, and assessment practices in anatomy was distributed to students via Google Forms. The questionnaire was developed by the authors based on previous studies [14,15]. It was assessed for face and content validity. Face validity was evaluated by the Head of the Department of Anatomy (third author), while content validity was assessed by experts from the departments of Anatomy and Medical Education. The experts reviewed the questionnaire for relevance, clarity, and necessity of each item. Based on their recommendations, the questionnaire was revised and finalised for the study.

The purpose of the research was briefly explained, and the survey link was shared with the participants. Students were allowed to respond freely and anonymously, ensuring unbiased responses without disclosure of identity. The survey focused on various aspects of current teaching-learning and assessment methods, including preferences for teaching aids, methodologies for theory and practical classes, and evaluation patterns for histology and embryology. The questions addressed students' perspectives on

traditional chalk-and-talk methods as well as advanced multimedia teaching. Items related to preferred learning resources such as videos and animations were also included. In addition, the survey explored students' perceptions of different assessment methods and identified problem areas in anatomy. Responses were expressed as percentages.

## STATISTICAL ANALYSIS

Data were collected using a structured questionnaire administered via Google Forms. Students independently selected their preferred responses anonymously to ensure unbiased participation. All responses were entered into an MS Excel worksheet and analysed using descriptive statistics, including frequency and percentage.

## RESULTS

A total of 266 medical students participated in the study. Of these, 156 (58.65%) were male and 110 (41.35%) were female. The mean age of the participants was  $21 \pm 4$  years. This demographic distribution provides a comprehensive overview of students' perceptions and ensures representation of diverse experiences.

In the present study, 164 (61.65%) of the students believed that a one-year anatomy curriculum was sufficient, while 70 (26.32%) felt that the duration should be longer. The remaining 32 (12.04%) were uncertain about the appropriate duration of the course. Integrated teaching (both vertical and horizontal integration) was appreciated by 162 (60.90%) of participants [Table/Fig-1].

Questions	Options	n (%)
How important is learning anatomy?	Not important	02 (0.75)
	Very important	264 (99.25)
Duration of one year curriculum is enough for learning anatomy properly?	Yes	164 (61.65)
	No	70 (26.32)
	No idea	32 (12.03)
Horizontal/ vertical integration is helpful	Yes	162 (60.90)
	No	02 (0.75)
	No idea	102 (38.35)

[Table/Fig-1]: Medical students' perception on duration of Anatomy Curriculum.

Regarding teaching methodology for theory classes, 82 (30.83%) of students considered classical large-group lectures to be the best approach. Small-group interactive sessions were preferred by 72 (27.07%), problem-based teaching by 46 (17.29%), and small-group demonstrations by 64 (24.06%). Only 2 (0.75%) reported benefiting most from studying three-dimensional models [Table/Fig-2].

Questions	Options	n (%)
Best teaching method for anatomy theory class should be	Classical Lectures/ Large group teaching	82 (30.83)
	Interactive sessions	72 (27.07)
	Problem based learning	46 (17.29)
	Small group teaching	64 (24.06)
	3D models	02 (0.75)
In your opinion what is the best teaching aid for theory classes?	Chalk and talk	110 (41.35)
	PowerPoint	156 (58.65)
Best source of study material	Textbooks	180 (67.67)
	Internet/ YouTube videos	40 (15.04)
	Teacher's notes/ PPTs	46 (17.29)
Handout of lecture should be given	Yes	248 (93.23)
	No	18 (6.77)
Handout of lecture should be given, if yes	Before lecture	110 (41.35)
	After lecture	138 (51.87)

[Table/Fig-2]: Participants' responses on different methods of didactic lectures.

For practical sessions, 240 (90.23%) of participants believed that dissection table teaching was the most effective method for understanding anatomy [Table/Fig-3]. The importance of integrating multimedia into the teaching-learning process was highlighted by 244 (91.73%) of participants, whereas 16 (6.01%) were unaware of the role of multimedia in anatomy teaching. Problem-Based Learning (PBL) and clinical scenario discussions were enjoyed by 204 (76.69%) of the participants [Table/Fig-4].

Questions	Options	n (%)
<b>Preferred practical method</b>	Dissection	240 (90.23)
	Prosection (study of specimens)	6 (2.26)
	Educational videos	8 (3.00)
	Anatomical Models	10 (3.76)
	All above	2 (0.75)
<b>How effective is the teaching/ learning on dissection table</b>	Very effective	248 (93.23)
	Somewhat effective	18 (6.77)
<b>Learning from Prosected specimens</b>	Allows easy exposure to structure that needs hours to find	172 (64.66)
	Flexible; available at any time	94 (35.34)
<b>Learning from Cadaver dissection</b>	Enhances active and deep learning	44 (16.54)
	Helps in improving practical /manual skill	22 (8.27)
	Helps to identify anatomical variations	4 (1.50)
	All of the above	190 (71.42)
	Time consuming	6 (2.25)
<b>Learning from Digital models</b>	Enhance independent learning and problem solving	46 (17.3)
	Allow students to visualise, dissect, and interact with simulated objects in 3D space	154 (58)
	Provide the opportunity to learn gross anatomy anywhere	18 (6.8)
	Independence in choosing different videos and angles	12 (4.51)
	Allows the students to explore whole body and changing various systems	16 (6.01)
	Do not provide physical manipulation of organs	12 (4.5)
	Do not reveal anatomical variations	8 (3.00)
<b>Learning from Anatomy Models</b>	Safe and easy to handle	200 (75.19)
	Odourless/ Convenient storage	36 (13.53)
	Do not reveal anatomical variations	30 (11.28)

[Table/Fig-3]: Opinion of participants on various methods of practical classes.

Questions	Options	n (%)
How effective is the problem based learning/ solving clinical cases/ in Anatomy?	Not important 1	62 (23.31)
	Very important 5	204 (76.69)
Integration of multimedia in teaching learning process is helpful?	Yes	244 (91.73)
	No	6 (2.26)
	Do not know	16 (6.01)
Effectiveness of multimedia teaching depends upon	Teaching method (PPT, Videoclips)	32 (12.03)
	Skill of teacher	40 (15.04)
	Ability to understand relationships	8 (3.00)
	All of the above	186 (69.92)

[Table/Fig-4]: Participants opinion on different teaching methods.

Difficulties in learning embryology were reported by 190 (71.43%) of students, while 140 (52.63%) faced challenges in histology. Students cited difficulties such as inability to comprehend sequences of events, poor visualisation, and inadequate time allocation in embryology, as well as difficulty identifying structures on slides and insufficient lecture and practical time in histology. Students suggested that

simplifying concepts helped improve retention and understanding [Table/Fig-5].

Questions	Options	n (%)
<b>Any problems in understanding Embryology?</b>	Yes	190 (71.43)
	No	38 (28.57)
<b>Problems in understanding Embryology</b>	Inability to visualise/ imagine the series of events in embryology	76 (28.57)
	Inability to comprehend the sequence of events	60 (22.55)
	Inadequate time allotted for embryology	48 (18.04)
	All the above	82 (30.82)
<b>Best possible solution for better understanding of Embryology</b>	Simplify information	112 (42.10)
	Give less details	22 (8.27)
	Use of more visual aids/models	78 (29.32)
	Group discussion	34 (12.78)
<b>Any problems in understanding histology?</b>	Yes	140 (52.63)
	No	126 (47.37)
<b>Problems in understanding Histology</b>	Inadequate time	26 (9.77)
	Difficult to identify the structures in slides	134 (50.27)
	Difficult/ confusing concepts	28 (10.52)
	Difficulty in differentiating	2 (0.75)
	All of the above	62 (23.30)
	No problem	14 (4.51)
<b>Best possible solution for better understanding of Histology</b>	Slow and repetitive reinforcement	94 (35.33)
	Group discussion	46 (17.29)
	Audio visual aids	16 (6.01)
	All of the above	104 (39.09)
	No problem	6 (2.25)

[Table/Fig-5]: Students opinion on problems faced in learning Embryology and histology.

Continuous assessment methods were perceived to enhance learning and performance by 248 (93.23%) of students. Participants felt that region-wise tests aided revision and preferred assessment patterns that included descriptive questions, multiple-choice questions, and short-note questions [Table/Fig-6].

Questions	Options	n (%)
<b>How much important is the continuous assessment like PCTs in learning anatomy?</b>	Not helpful	18 (6.77)
	Very helpful	248
<b>Best assessment technique to measure knowledge in theory</b>	Weekly test	14
	PCT	90
	Semester exams	30
	Yearly exams	20
	All	112
<b>Best assessment technique to measure knowledge in practical</b>	Viva	20
	Spotting	28
	Skill	16
<b>What should be the criteria for allowing students in examinations</b>	All	202
	Attendance	48 (18.05)
	Performance	100 (37.59)
	Both	90 (33.83)
<b>Pattern of examinations should be</b>	No idea	28 (10.53)
	Descriptive	4 (1.5)
	Short answer questions	16 (6.01)
	MCQ	34 (12.78)
	All of the above	212 (79.70)

[Table/Fig-6]: Participants perspectives on various assessment methods in Anatomy.



## DISCUSSION

This study explored the perceptions of first-year Indian medical graduates regarding different teaching-learning and assessment methods in human anatomy. Several studies have collected learner feedback to examine the complex nature of anatomy instruction [6,11]. Students' perceptions help identify the strengths and weaknesses of existing methods and contribute to curriculum improvement and the development of future programs.

The current duration of the anatomy curriculum in India is one year, as prescribed by the National Medical Commission. The majority of participants, 164 (61.65%) were in favour of the one-year curriculum. In a study by Shrivastav UG and Makandar UK, 54% of participants expressed concerns regarding the duration of the anatomy curriculum [12]. Participants in that study felt that although the current duration was sufficient for passing examinations, it was inadequate for gaining comprehensive knowledge and competing at higher levels.

Regarding preferred methods for didactic lectures, 30.83% favoured classical large-group lectures, 27.07% preferred interactive sessions, 17.29% preferred PBL, 24.06% favoured small-group learning, and 0.75% preferred learning from 3D models. Jaiswal R et al., observed that small-group learning with interactive media was the most effective method for theory classes [13].

Chalkboard instruction and dissection hall teaching are traditionally considered optimal for teaching and learning anatomy [2]. However, conventional chalk-and-talk methods have certain drawbacks, as artistic limitations in representing three-dimensional diagrams and poor handwriting may reduce student interest compared to PowerPoint presentations [3]. In the present study, 17.29% of students favoured PBL in theoretical lectures, while 24.06% preferred small-group instruction using interactive technologies. A total of 41.35% of learners believed that the classical chalk-and-talk method was the best teaching approach. Similarly, Gupta A et al., reported that 39.3% of students preferred this method, appreciating it for clearer lecture content, natural pauses, and facilitation of note-taking [16].

PowerPoint presentations have become a standard teaching tool in contemporary classrooms. In the current study, 58.65% of participants preferred PowerPoint-based lectures. According to Punja R et al., PowerPoint slides and videos were the most effective tools for didactic lectures [15]. Gupta A et al., also reported that 60.7% of participants preferred PowerPoint presentations, citing clarity of content, better understanding of new terms, and improved visibility of diagrams. Both PowerPoint and chalkboard methods were found to have distinct advantages and disadvantages [16].

In the present study, 67.67% of students preferred textbooks over multimedia resources, while 91.73% believed that multimedia integration was helpful in the learning process. Interestingly, 6.01% of participants were unaware of multimedia incorporation in teaching. Additionally, 69.92% felt that multimedia aids helped in understanding complex anatomical structures and spatial relationships more clearly. Aarti et al., suggested that advance distribution of study materials could enhance the learning experience [17]. The majority of participants (93.23%) believed that lecture handouts should be provided, with 41.35% preferring them to be distributed in advance.

Problem-based learning and clinical scenario discussions combine theoretical knowledge with practical experience and enhance critical thinking and application of information [18]. In this study, 76.69% of participants enjoyed PBL and clinical scenario discussions. Several authors have reported that clinical integration strengthens comprehension, promotes active participation, and enhances critical thinking [19].

Cadaveric dissection remains a consistently favoured approach for achieving important learning objectives in anatomy [3,13]. In this study, 90.23% of learners favoured dissection hall teaching. These

findings are consistent with a study conducted in Bhopal, where 89.14% of students preferred the dissection method [12]. Cadaveric dissection promoted active and deep learning, improved practical skills, and helped students identify anatomical variations. However, some students felt that dissection was time-consuming. Others expressed that learning from prosected specimens was easier due to their ready availability. Similarly, Alghamdi MA et al., reported that students believed cadaveric dissection enhanced active learning and improved understanding of three-dimensional structures [11].

Participants reported difficulties in understanding embryology and histology. In this study, 71.43% of participants found embryology difficult due to challenges in visualisation, understanding the sequence of events, and insufficient time. Karner B and Soley JT, noted that first-year medical students often struggle to grasp three-dimensional embryological concepts within a limited time frame [20]. Complicated concepts, poorly structured lectures, and inadequate time allocation may also reduce interest in histology [20]. In the present study, 52.63% of participants experienced difficulty in histology, consistent with findings by Jaiswal R et al., [13]. Difficulties included identifying structures under the microscope and insufficient time for learning. Participants suggested that simplification of content, reduced detail, and increased use of visual aids could enhance interest in histology.

Interactions with clinicians and discussions of case scenarios were well appreciated by participants. Students believed that clinical exposure would be more effective if small groups were taken to hospitals for demonstrations of relevant cases, procedures, and examinations. Nagar SK et al., also emphasised the importance of integrated teaching [3].

Assessment and evaluation are integral components of the educational system. In this study, 93.23% of participants believed that continuous assessment methods, such as weekly assessments and end-of-part tests, improved performance. Other studies have reported student preferences for viva voce examinations, quizzes, and question-answer sessions over dissected specimens as assessment tools [3,13,15]. In the present study, 37.59% of participants believed that internal assessment performance alone should determine eligibility for university examinations, while 33.83% favoured a combination of performance and attendance. In contrast, Rafique S and Rafique H, reported that most students believed both performance and attendance should be considered [21].

## Limitation(s)

Response bias is a common limitation of survey-based studies. Participants may provide responses that reflect socially desirable opinions rather than their true perceptions. Students may have overreported satisfaction with traditional teaching approaches. Additionally, recall bias may have influenced responses, as participants were second- and third-year medical students reflecting on experiences from the previous academic year.

## CONCLUSION(S)

This comprehensive study explored student perceptions of various teaching-learning and assessment methods in anatomy and provided valuable insights. Participants generally found the current one-year anatomy curriculum sufficient. Although multimedia tools were appreciated, chalkboard instruction and cadaveric dissection remained the most preferred teaching methods. Problem-based learning and clinical case discussions encouraged critical thinking and application of knowledge. Embryology and histology were identified as particularly challenging subjects. Continuous assessment strategies were viewed as beneficial for ongoing learning and performance improvement. Overall, the study emphasises the importance of a student-centred, blended approach to anatomy education. Student feedback plays a crucial role in curriculum design and improvement, helping policymakers align educational strategies

with learner needs and contemporary best practices, ultimately enhancing learning outcomes and professional preparedness.

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### PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Oct 27, 2025
- Manual Googling: Dec 27, 2025
- iThenticate Software: Dec 30, 2025 (5%)

### ETYMOLOGY: Author Origin

### EMENDATIONS: 7

### AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 18, 2025**

Date of Peer Review: **Nov 19, 2025**

Date of Acceptance: **Jan 01, 2026**

Date of Publishing: **Apr 01, 2026**