

PREFERRED MODALITIES FOR LEARNING GROSS ANATOMY PRACTICAL CLASSES: PERCEPTION OF MBBS STUDENTS

Rabita Kharbuja, Allin Pradhan, Anuja Jha, Shaligram Dhungel

Department of Human Anatomy, Nepal Medical College and Teaching Hospital, Attarkhel, Gokarneshwor-8, Kathmandu, Nepal

ABSTRACT

Learning anatomy by human dissection has been an integral part of the undergraduate medical curriculum; however innovative ways of teaching anatomy as well as shortage of cadavers perplexed the continuity of dissection. Meanwhile, this study aims to delve into the preference of students towards different learning modalities available for anatomy teaching. A cross-sectional, questionnaire based study was conducted among MBBS students of first, second, final year and interns of Nepal Medical College, Attarkhel, Gokarneshwor-8 from December 2025 to May 2026. Among 292 participants 56.0% were male and 44% were female. The cohort primarily consisted of 22 years medical students with age range of 18 to 28 years. The most preferred teaching modality was cadaveric dissection (81.8%) followed by Digital software (10.6%) among the respondents and was highly rated for improving anatomical understanding. Conversely, students valued prosection for time efficiency and plastic models for rapid revision. The preference of teaching modalities was significantly associated with level of study. Consequently, 78.1% of students strongly agreed that a blended approach using multiple modalities optimizes learning. Although cadaveric dissection is still regarded as the premier tool for anatomical education, medical students face significant challenges related to time and structural complexity. There is a strong student consensus that integrating dissection with digital 3D tools and synthetic models would provide a more efficient and comprehensive educational experience. Future curricula should prioritize this multimodal integration to address current learning barriers.

KEYWORDS

Cadaver, curriculum, dissection, learning modalities, prosection

Received on: June 08, 2026

Accepted for publication: September 01, 2026

CORRESPONDING AUTHOR

Ms. Rabita Kharbuja
Assistant Professor,
Department of Human Anatomy,
Nepal Medical College and Teaching Hospital,
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal
Email: 1rabitakharbuja@gmail.com
Orcid No: <https://orcid.org/0000-0001-8786-4829>
DOI: <https://doi.org/10.3126/nmcj.v28i3.101256>

Cite this paper as: Kharbuja R, Pradhan A, Jha A, Dhungel S. Preferred modalities for learning gross anatomy practical classes: perception of MBBS students. *Nepal Med Coll J* 2026; 28: 215-21.

INTRODUCTION

Human body Dissection has its origin in antiquity (3rd century) when Greek physicians Herophilus and Erasistratus conducted dissections in the scholarly city of Alexandria.¹ Herophilus is recognized as the “Father of Anatomy”, as he is the one to initiate dissection of human body² and after his death dissecting was prohibited. Because of the prohibition, Galen based his anatomical observation solely on animal dissections (principally Barberia monkeys) and wrote *Treaty of anatomy*.^{3,4} Over thousand years following Galen’s death, there was a virtual cessation of any form of dissection, this period was termed the Dark Ages. The first comprehensive human dissection (post-Alexandrian times) was performed in Bologna, in 1315 AD by Mondino de Luzzi, a Prof. of medicine, credited as the ‘restorer of anatomy’ at the university of Bologna.⁵ The next milestone in the history of dissection occurred in 1543, when Andreas Vesalius (Father of modern Anatomy), published *De Humani Corporis Fabrica Libris Septem*.⁶

Human dissection became an important part of medical education in the 18th and 19th centuries, while body donation for medical education began in the 20th century.¹ Since then, cadaveric dissection has remained a core component of anatomy teaching worldwide.^{7,8} As anatomy forms the foundation of safe medical practice, human cadavers have been used for over 500 years as a key learning resource.^{9,10} Dissection provides hands-on and tactile learning experiences that cannot be fully replicated by digital tools,¹¹⁻¹⁴ making cadavers valuable “silent mentors” and cadaveric dissection one of the most effective methods for learning anatomy.¹⁵⁻¹⁸

However, human anatomy is being gradually squeezed from the MBBS curriculum, in recent years. Time allocation and dissection in anatomy courses is being reduced in the curriculum of medical studies of many developed countries.¹⁹ The human cadaver has been used as the silent mentor for students in learning anatomy since 500 years,²⁰ later on pre-dissected specimens, anatomical models as well as plastinated specimens were used in addition to hands-on dissection. In most of the medical colleges under Kathmandu University, prosection along with dissection is in practice since 2011 as per curriculum of bachelor of medicine and bachelor of surgery revised version 2011. How to teach anatomy has been a moot point between those that favor dissection of human cadavers and those that support

newer teaching modalities like self-directed learning, problem based learning (PBL) and virtual dissection table.

In the Department of Human Anatomy, Nepal Medical College, we imply almost all teaching modalities like dissection, demonstration of prosected specimen, three-dimensional embryology charts and plastic models. Particular for musculoskeletal system, students dissect the cadaver in small groups, for embryology practical we use three-dimensional embryology charts while for gastrointestinal, renal and central nervous system we use prosected specimen. For demonstrating special senses like eye and ear we use the plastic models.

Over the past decade, anatomy teaching has evolved due to advances in technology and the impact of the COVID-19 pandemic.²¹ Factors such as the high cost of dissection facilities, limited availability of cadavers, time constraints, safety concerns, and shortages of qualified anatomists have encouraged the use of alternative learning methods. This paper aims to examine into students’ preferences for different anatomy learning modalities, including cadaveric dissection, prosection, 3D models/charts, and virtual learning resources.

MATERIALS AND METHODS

A cross-sectional study was conducted among medical students of Nepal Medical College, Kathmandu, Nepal, from December 2025 to May 2026. The study included MBBS students of first, second, final year and interns while excluded those who were not willing to participate. The Google Form questionnaire was distributed to the students via email, Viber, and WhatsApp after providing the necessary instructions and explaining the study in detail. The anonymity and confidentiality of respondents were maintained.

The data were collected using a questionnaire organized into five sections. The first section focused on understanding the respondent’s demographic profile. Second to fifth section comprises of questions comparing dissection, prosection, 3D lab models/charts and virtual online resources as forms of learning as well as questions about the preferred mode of learning anatomy. The questionnaires will focus on the following points:

- **Demographic details** of the students including level of study, age and gender
- **Preference/Effectiveness** - the most pre-

ferred one and ranking the modalities

- **Perception** where participants were given five Likert scale questions, for each of the questions, they had to indicate whether; strongly disagree, disagree, neutral, agree, or strongly agree by choosing 1, 2, 3, 4, or 5, respectively
- **Barriers and suggestion** – multiple choice questions and one open ended question

For Likert scale questions, students are to indicate whether they strongly disagree, disagree, neutral, agree, or strongly agree by choosing 1, 2, 3, 4, or 5, respectively. One open-ended question was included to draw feedback and suggestions from respondents. The data was entered and analyzed in SPSS-20 for the production of descriptive statistics in which the frequency of the replies were determined for each item of the questionnaire. Ethical approval was obtained (Ref. No.: 55-082/083) prior to conduct of the study from the Institutional Review Committee (IRC) of Nepal Medical College, Kathmandu, Nepal.

RESULTS

Fig. 1 illustrates the distribution of study participants based on gender and MBBS level. The total study participants were 292, among them majority were male 56.0%, while 44.0% were female. 30.0% were of third year MBBS and least number of participants were interns 22.0%.

Table 1 shows the descriptive statistics of age. The mean age of participants was 22.67 ± 2.09 , indicating that most respondents were within the typical age range of undergraduate medical students ranging from 18 to 28 years.

Overall, cadaveric dissection was the most preferred modality, chosen by 239 students (81.8%) followed by digital / 3D anatomy software (10.6%). This finding suggests that

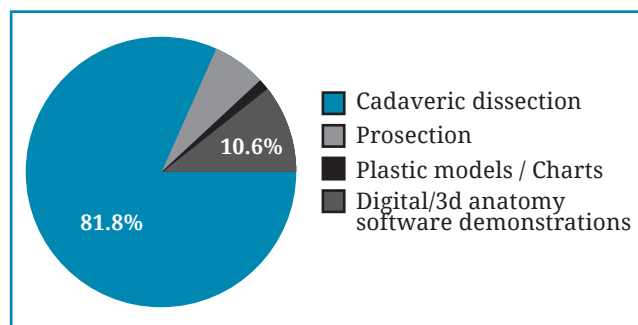


Fig. 1: Preferences of teaching modalities

Table 1: Descriptive data on age of study population (n=292)

Mean age	SD	Maximum	Minimum
22.67	2.09	28	18

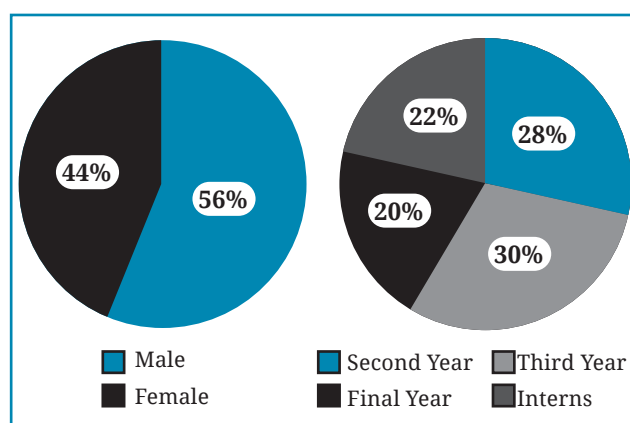


Fig. 1: Gender and MBBS level wise frequency of study population

students strongly value hands-on exposure to human anatomy through traditional cadaver-based learning.

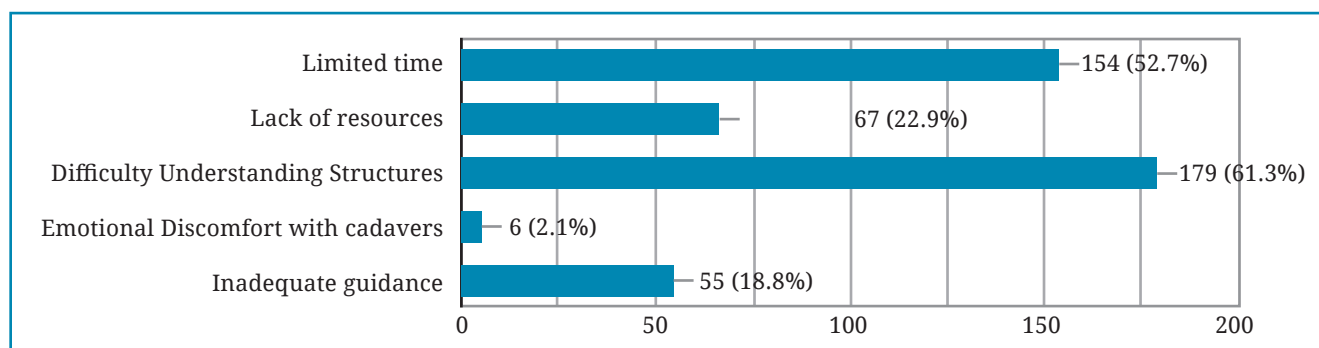
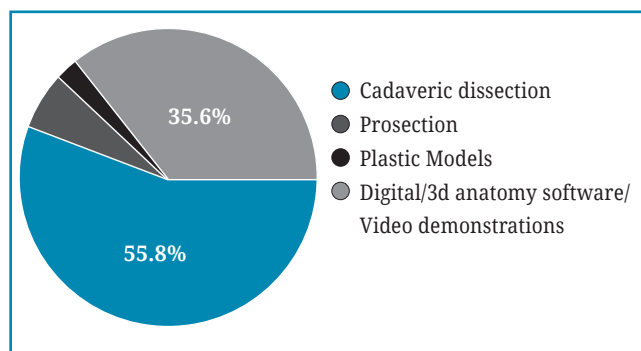
Table 2 shows that the preferred modality for learning gross anatomy practical classes varied significantly according to academic level (Fisher's Exact Test, $p = 0.042$). Cadaveric dissection was the most preferred modality

Table 2: Comparing preferred modalities gender and MBBS level wise (n= 292)

Preferred modalities	Gender		MBBS Level	
	Male	Female	Pre-clinical	Clinical
Cadaveric dissection	136 (56.9%)	103 (43.1%)	141 (59%)	98 (41%)
Digital/3D anatomy software	16 (51.6%)	15 (48.4%)	13 (41.9%)	18 (58.1%)
Plastic models/ Charts	3 (75%)	1 (25%)	2 (50%)	2 (50%)
Prosection	9 (50%)	9 (50%)	15 (83.3%)	3 (16.7%)
Total	164 (56.2%)	128 (43.8%)	171 (58.6%)	121 (41.4%)
Fisher's Exact Test	$\chi^2 = 1.168$, df = 3, p = 0.790		$\chi^2 = 8.222$, df = 3, p = 0.042*	
*Statistically significant				

Table 3: Comparison of teaching modality scores across gender and academic years (n=292)

Items	Gender		MBBS level	
	Male Mean±SD	Female Mean±SD	Pre-clinical Mean±SD	Clinical Mean±SD
Cadaveric dissection improves understanding of anatomical structures.	4.02±1.43	4.02±1.40	4.±1.41	4.05±1.42
Digital/3D tools enhance visualization of complex anatomy	3.81±1.27	3.98±1.38	3.85±1.27	3.92±1.39
Prosection saves time and improves learning efficiency	3.12±1.24	3.33±1.21	3.39±1.22	2.96±1.20
Models are useful for quick revision	3.56±1.31	3.46±1.21	3.54±1.22	3.48±1.33
Combining multiple modalities improves overall learning	4.02±1.41	4.14±1.46	4.05±1.41	4.11±1.46
Independent sample t test	Not significant		Not significant	

**Fig. 3: Challenges in learning gross anatomy****Fig. 4: Modality to be emphasized in curriculum**

overall and was favored particularly by pre-clinical students (59%), whereas digital/3D anatomy software was more preferred by clinical students (58.1%). Prosection and plastic models/charts were the least preferred modalities in both groups. These findings demonstrate that although cadaveric dissection remains the dominant and most valued modality for learning gross anatomy, senior students and interns show relatively greater inclination toward digital and technology-assisted learning approaches.

Table 4 : Item-wise Reliability Statistics (n=292)

Items	Mean ± SD	Cronbach's alpha
Cadaveric dissection improves understanding of anatomical structures	4.02 ± 1.41	α = 0.884, no. of item = 5 (≥0.7 acceptable)
Digital/3D tools enhance visualization of complex anatomy	3.88 ± 1.32	
Prosection saves time and improves learning efficiency	3.21 ± 1.22	
Models are useful for quick revision	3.52 ± 1.26	
Combining multiple modalities improves overall learning	4.08 ± 1.43	

Table 5: Ranking the modalities based on preference: 1 most preferred to 4 least preferred

Modalities	Rank			
	1	2	3	4
Cadaveric dissection	216 (74%)	26 (8.9%)	20 (6.8%)	30 (10.3%)
Prosection	61 (20.9%)	121 (41.4%)	76 (26%)	34 (11.6%)
3d Models/charts	33 (11.3%)	82 (28.1%)	100 (34.2%)	77 (26.4%)
Digital/3D anatomy software	81 (27.7%)	95 (32.5%)	65 (22.3%)	51 (17.5%)

Table 3 shows that students generally had positive perceptions of all anatomy learning modalities, with moderate-to-high mean scores across gender and MBBS levels. Cadaveric dissection was highly valued by all groups, while digital/3D tools were also favorably perceived, particularly among clinical students. Prosection received relatively lower ratings but was viewed more positively by pre-clinical students. Anatomical models were considered moderately useful, mainly as supplementary learning tools. The highest agreement was observed for the combined use of multiple modalities, indicating a strong preference for an integrated approach to anatomy education. No statistically significant differences were found between gender groups or MBBS levels (all $p > 0.05$).

A total of 292 responses were included in the reliability analysis, with no missing data. The five-item teaching modalities perception scale demonstrated good internal consistency, with a Cronbach's alpha of 0.884. Item means ranged from 3.21 to 4.08, indicating generally positive perceptions across modalities. Overall, the scale demonstrated satisfactory internal consistency and was considered reliable for further analysis.

Cadaveric dissection was the most preferred learning modality, with 74.0% of students ranking it as their first choice and only 10.3% ranking it last, highlighting its central role in anatomy education. Digital/3D anatomy software was the second most preferred modality, reflecting growing acceptance of technology-assisted learning. Prosection received moderate preference and was commonly ranked second or third, indicating a supportive role in learning. In contrast, 3D models/charts were generally ranked third or fourth, suggesting that students viewed them primarily as supplementary learning aids.

The major challenge reported by students was difficulty in understanding anatomical structures (61.3%), followed by limited time for learning anatomy (52.7%). Lack of resources (22.9%) and inadequate guidance (18.8%)

were reported less frequently, while emotional discomfort with cadavers was minimally reported (2.1%). These findings suggest that cognitive complexity and time constraints are the primary barriers in learning gross anatomy rather than emotional factors associated with cadaver exposure.

More than half of the students (55.8%) preferred cadaveric dissection to be emphasized in the anatomy curriculum, highlighting its perceived educational value in understanding three-dimensional anatomical relationships. Digital/3D anatomy software and video demonstrations were the second most preferred modalities (35.6%), indicating substantial student interest in integrating technological tools into anatomy teaching. In contrast, only a small proportion preferred prosection or plastic models, suggesting comparatively lower educational preference for these methods.

DISCUSSION

In present study, 74.0% of students listed dissection as the most preferred one and more than 50.0% of the students suggested to emphasize dissection in medical curriculum. In alignment with our study, a study by Van *et al*²² found that majority of students (70.0%) reported dissection to be beneficial in understanding anatomy and gaining skill. The study confirms that cadaveric dissection remains an effective method for teaching basic anatomy. Similarly, a study by Mansur *et al*²³ determined cadaveric dissection as the most important tool for practical classes according to 69.1% of student and Alhassan *et al*²⁴ in Ghanaian medical students has shown a strong positive perception towards the use of cadaveric dissections. These similarities across different educational settings suggest that cadaveric dissection continues to hold universal educational value in anatomy learning.

The current data highlights that 78.1% of students agreed and strongly agreed in combining multiple modalities improves overall learning, while choosing modality to emphasize

in curriculum; 55.8% cadaveric dissection was followed by 35.6% digital software. Also, highest mean perception score was observed for the statement regarding multimodal learning, indicating broad consensus among students. These results are in consistent with the findings of Mwachaka *et al*²⁵ and Sharma *et al*²⁶ who found statistically significant percentage of students stated dissection being beneficial for their studies concluding that dissection should be part of study in medical curriculum and computer based education can be additive to the dissection which should be used as supplement rather than replacement. These findings collectively support the concept of blended anatomy education that combines traditional and modern teaching modalities for improved learning outcomes.

The present study also revealed a statistically significant association between MBBS level and preferred learning modality. Pre-clinical students demonstrated greater preference for cadaveric dissection, whereas clinical students showed relatively higher preference for digital and 3D anatomy software. This trend may reflect changing educational requirements during medical training. Early-stage learners may benefit more from direct anatomical exposure and foundational spatial understanding obtained through dissection, while senior students may prefer digital resources because of their accessibility, flexibility, and usefulness in clinical correlation and revision.

Digital and 3D anatomy software emerged as the second most preferred modality in the present study. More than one-third of students recommended greater incorporation of digital tools and video demonstrations into the curriculum. Furthermore, clinical students demonstrated comparatively higher perception scores toward digital modalities. These findings indicate increasing student acceptance of technology-assisted anatomy learning and support the growing role of blended learning approaches in medical education. Digital anatomy platforms enhance visualization of complex structures, allow repeated self-directed learning, and facilitate interactive learning experiences. However, despite their advantages, students still viewed these modalities primarily as complementary rather than substitutive to cadaveric dissection.

The reliability analysis demonstrated that the perception scale used in the present study had good internal consistency, with a Cronbach's alpha value of 0.884. This finding is consistent with established methodological standards, where alpha values above 0.70 are considered

acceptable and values above 0.80 indicate strong reliability.²⁷ The high reliability observed in the present study (0.884) indicates that the questionnaire items consistently measured students' perceptions regarding anatomy teaching modalities.

Overall, the present study demonstrates that cadaveric dissection continues to be the cornerstone of gross anatomy education among MBBS students. However, increasing preference for digital learning tools, particularly among clinical students, indicates the evolving nature of anatomy education. Therefore, a balanced multimodal teaching strategy integrating cadaveric dissection with digital and technology-assisted learning resources may provide the most effective approach for contemporary medical education.^{28,29}

Limitation of the study: This study was conducted in a single institutional context, which may affect generalizability to other settings with different teaching infrastructures or cultural contexts.

Innovative ways of teaching anatomy as well as shortage of cadavers for dissection perplexed the continuity of dissection. The current data demonstrate that cadaveric dissection remains the most preferred modality for learning gross anatomy among MBBS students. Nearly three-fourths of participants ranked dissection as their first choice, and more than half recommended greater emphasis on cadaveric dissection within the medical curriculum. The study also highlights that 78.1% of students agreed and strongly agreed in combining multiple modalities improves overall learning, while choosing modality to emphasize in curriculum; 55.8% cadaveric dissection was followed by 35.6% digital software.

In conclusion, there is a strong student consensus that integrating dissection with digital 3D tools and synthetic models would provide a more efficient and comprehensive educational experience. Future curricula should prioritize this multimodal integration to address current learning barriers.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to all the anatomy departmental faculties and students of Nepal medical college who participated in the study for their invaluable support.

Conflict of interest: None

Source of research fund: None

REFERENCES

- Snider L. Inside the cadaver lab, Part 1: The past, present, and future of cadaver dissection (2019). Available from: <https://www.visiblebody.com/blog/inside-the-cadaver-lab-part-1-the-past-present-and-future-of-cadaver-dissection>. (Assessed on: February 2026)
- Von SH. The discovery of the body: human dissection and it's cultural contexts in ancient Greece. *Yale J Biol Med* 1992; 65: 223-41.
- Elizondo OR, Guzman LS, Garcia RM. Dissection as a teaching tool: Past, present, and future. *Anat Rec Part B: New Anatomist* 2005; 285 B:11-15.
- Roberts E. History of Medicine 21: Human dissection—from Galen to the great revelations of Andreas Vesalius (2011). Available from: <http://www.brainblogger.com/2011/08/20/human-dissection-from-galen-to-the-great-revelations-of-andreas-vesalius/> (Accessed on: May 2021)
- Gurunluoglu R, Gurunluoglu A, Williams S, Cavdar S. The history and illustration of anatomy in the Middle Ages. *J Med Biography* 2013; 21: 219-29.
- Zampieri F, Maghawry M, Zanatta A, Thiene G. Andreas Vesalius: Celebrating 500 years of dissecting nature. *Global Cardiol Sci Prac* 2015; 5: 66.
- Rajkumari AB and Singh YI. Body donation and its relevance in anatomy learning: A review. *J Anat Soc India* 2007; 56: 1-6.
- McLachlan JC and Patten D. Anatomy teaching: ghosts of the past, present and future. *Med Edu* 2006; 40: 243-53.
- Older J. Anatomy: A must for teaching the next generation. *Surgeon* 2004; 2: 79-90.
- Mclachlan J, Bradley P, Searle J, Bligh J. Teaching anatomy without cadavers. *Med Edu* 2004; 38: 418-24.
- Rajkumari A, Kumar DB, Gracelee TN, Singh YI. Attitudes and views of first year medical students toward cadaver dissection in anatomy learning. *Calicut Med J* 2008; 6: e2.
- Arraez-Aybar LA, Castano-Collado G, Casado-Morales MI. Dissection from the Spanish anatomist's perspective: aims, attitudes, and related aspects. *Anat Rec Part B: New Anatomist* 2004; 281: 15-20.
- Bay BH and Ling EA. Teaching of anatomy in the new millennium. *Singapore Med J* 2007; 48: 182-3.
- Prakash LV, Rai R, Costa DS, Jiji PJ, Singh G. Cadavers as teachers in medical education: knowledge is the ultimate gift of body donors. *Singapore Med J* 2007; 48: 186-90.
- Maguire P. Barriers to psychological care of the dying. *Brit Med J* 1985; 291: 1711-13.
- Winkelmann A, Guldner FH. Cadavers as teachers: the dissecting room experience in Thailand. *Brit Med J* 2004; 329: 1455-57.
- Izunya AM, Oaikhen GA, Nwaopara AO. Attitudes to cadaver dissection in a Nigerian Medical School. *Asian J Med Sci* 2010; 2: 89-94.
- Oyeyipo IP and Falana BA. Attitude of preclinical students to cadaver dissection in a South West Nigeria Medical School. *Int'l J Trop Med* 2012; 7:1-5.
- Morris H and Jacques S. Dissection should remain a key part of medical education. *Aust New Zealand J Surg* 2018; 88: 10-11.
- Thidar AM, Myint TT, Naing DK, Mustapha ZA. Preferred modalities for learning anatomy: medical student's opinion. *Borneo J Med Sci* 2016; 10: 1-13.
- WHO Regional Office for Europe. WHO announces COVID-19 outbreak a pandemic Copenhagen: WHO Regional Office for Europe (2020). Available from: <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/3/who-announces-covid-19-outbreak-a-pandemic> (Accessed on: May 2020).
- Van WJ and Rennie CO. Learning anatomy through dissection: perceptions of a diverse medical student cohort. *Int'l J Morphol* 2015; 33: 89-95.
- Mansur DI, Shrestha P, Maskey S et al. Perception of students about teaching and learning anatomy at Kathmandu University School of Medical Sciences. *J Chitwan Med Coll* 2022; 12: 84-88. doi:10.54530/jcmc.1315.
- Alhassan A, Majeed S. Perception of Ghanaian medical students of cadaveric dissection in a problem-based learning curriculum. *Anat Res Int'l* 2018; 1-7.
- Mwachaka P, Saidi H, Mandela P. Is cadaveric dissection vital in anatomy education? perception of 1st and 2nd year medical students. *J Exp Clin Anat* 2016; 15: 14-8.
- Sharma HP, Islam M. Impact of dissection on under graduate and post graduate study in medical colleges. *Sch J App Med Sci* 2015; 3: 551-4.
- Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int'l J Med Edu* 2011; 2: 53-5.
- Lackey-Cornelison W, Bauler L, Smith J. A comparison of the effectiveness of dissection and prosection on short-term anatomic knowledge retention in a reciprocal peer-teaching program. *Adv Physiol Edu* 2020; 44: 239-46.
- Estai M and Bunt S. Best teaching practices in anatomy education: a critical review. *Ann Anat* 2016; 208: 151-7.