

Medical Students' Attitude and Perception Towards Embryology Course at Debre Markos University, Ethiopia

Bickes Wube Sume

Department of Biomedical Sciences, School of Medicine, Debre Markos University, Debre Markos, Ethiopia

Correspondence: Bickes Wube Sume, Department of biomedical sciences, school of medicine, Debre Markos University, P.O. Box 269, Debre Markos, Ethiopia, Tel +251 918057604, Email bkswe123@gmail.com

Introduction: Medical students' attitudes and perceptions are crucial for designing an anatomy curriculum that meets the standards for safe medical practice.

Objective: To assess the attitude and perception of medical students towards the clinical relevance of embryology at Debre Markos University.

Methods: A cross-sectional study was conducted at Debre Markos University from March 10 to April 20, 2022. Data were collected using a self-administered questionnaire. The questionnaire includes students' attitudes, career choices, and perceptions of integration of embryology and teratology courses. All viewpoints were rated using a positive Likert scale ranging from "strongly disagree" to "strongly agree". Data were entered using EpiData version 3.1 and exported to SPSS version 25 for analysis.

Results: A total of 246 medical students participated in the study. About 159 (64.63%) medical students perceived that embryology requires understanding in the clinics. More than half of the respondents, 169 (68.70%) perceived that embryology is most clinically relevant for all basic sciences. About two-thirds of medical students, 189 (76.83%) agreed that integration of embryology and teratology courses in the first and second years was better than teaching each discipline alone. More than half of medical students, 145 (58.94%) also preferred problem-based learning that combines embryology and teratology. About 201 (81.71%) medical students perceived that virtual reality is more effective than images in the textbook for teaching embryology.

Conclusion: In this study, most of the medical students have a positive attitude toward the embryology course. The first-year curricular integration of embryology and teratology must be maintained, and great effort is required to improve students' passion for developmental anatomy/embryology. These findings might be utilized as an additional motivation for the improvement of the embryology course, with a focus on the practical application of knowledge in a clinical context.

Keywords: attitude, perception, embryology, Ethiopia

Introduction

Embryology is a branch of developmental biology that studies life before birth.¹ This is the study of the origin and development of the human from oocyte fertilization until the end of the eighth week of pregnancy and, by extension, during any stage of prenatal development.² It is often included in the medical school curriculum as part of the basic sciences taught in the first and second years of undergraduate education, and it is typically included in the anatomy course.³ Embryology is a crucial component of undergraduate education because it will help the students for better clinical management and understanding of the cases. In addition to understanding the developmental origins of the diverse anatomy of the human body, knowledge of embryology is vital for a number of specialties, such as pediatrics, general surgery, craniofacial surgery, obstetrics and gynecology due to its coverage of a number of clinical subjects, such as the basis of gametogenesis and fertilization, cleft palate, congenital anomalies, and the effect of intrauterine events, such as congenital infection on the development of the fetus.^{4,5}

Traditionally, embryology has been taught in a manner similar to that of gross anatomy, relying mainly on textbooks and lectures, with the inclusion of conventional teaching aids, such as two-dimensional images, models and in some circumstances preserved human embryos. Changes in the medical curriculum have resulted in a reduction in the amount of time available to students for exposure to learning resources.⁶ A major portion of embryology courses are taught as part of a combined curriculum, and there appears to be a tendency toward less laboratory experience during the course delivery.⁷

A number of recent studies have assessed the effect of more new teaching techniques, particularly multimedia approaches, in enhancing the educational process. This has demonstrated the ability to overcome various medical curricular issues, such as narrowing the gap between basic sciences and clinical training.⁸ Virtual reality technology, in particular, is proven to be extremely beneficial for three-dimensional visualization of structures as well as for offering a medium through which the students may interact with the material through a variety of features, while immersed in a computer generated virtual environment.⁹

Anatomy education, of which embryology is a subfield, has profited immensely from growing virtual reality technologies in recent years. Several virtual reality systems have been developed to teach the anatomy of various body parts, such as the heart and the ear, and some universities have even established virtual anatomy laboratories within educational multiuser virtual environments to provide a virtual space where students can learn and interact.^{10,11} Medical students' perceptions are crucial for the design of an anatomy curriculum that meets the requirements necessary for safe medical practice in the context of ever-changing diagnostic and therapeutic modalities.¹² Students are almost never involved in curriculum development or revision. It is therefore vital to know the students' views while modifying the curriculum, as well as the best teaching approach that would aid the learning process.¹³

Debre Markos University has adopted innovative curricula which are system-based approaches with some problem-based learning. The program under this curriculum lasted four years and six months. Our university's medical school enrolled 50 students every year on average.¹⁴ Currently, embryology is taught to medical students at Debre Markos University as part of the basic sciences curriculum, along with gross anatomy and histology in the first and second years, and the curriculum consists of a number of lectures with no dedicated laboratory time. The majority of the overall number of hours is devoted to gross anatomy education. Because gross anatomy is overemphasized in the curriculum, students are slower to emphasize the value of embryology, and their attitudes about embryology emerge early in the course delivery. To design successful learning approaches for teaching embryology, it will be necessary to first assess students' attitudes. In Ethiopia, the attitude and perception of medical students toward the clinical relevance of embryology have not been assessed yet. Therefore, the present study was conducted to assess the attitude and perception of medical students towards the clinical relevance of embryology at Debre Markos University.

Materials and Methods

Study Design, Area, and Period

The institution-based cross-sectional study was conducted, from March 10, 2022 to April 20, 2022, at the School of Medicine, Debre Markos University, Debre Markos, Ethiopia.

Data Collection Tool and Procedure

Data were collected using a pretested and structured self-administered questionnaire. The questionnaire was developed after reviewing related literature.^{15–18} A pretest was conducted on 5% of the total sample size to check the clarity of the questionnaire. The participants were medical students who took all of the embryology course evaluations. This study included all PC-II (Pre-clinical II or second-year medical students), C-I (Clinical year I or third-year medical students), C-II (Clinical year II or fourth-year medical students) and interns (fifth and sixth years medical students) at school of medicine, Debre Markos university. The questionnaire includes socio-demographic variables, students' attitudes toward embryology course, students' interests and career choices, alternative ways of teaching embryology, and students' perceptions of the integration of embryology and teratology courses. All viewpoints were rated using a positive Likert scale with responses ranging from "strongly disagree" to "strongly agree". Following data collection, the data have been reviewed for errors and completeness to ensure data quality.

Data Entry and Analyses

EpiData version 3.1 was used to clean, code, and enter the data for this study, which was subsequently exported to SPSS version 25 for analysis. All levels of opinion were considered. Pearson's chi-square test and descriptive statistics were employed.

Results

Socio-Demographic Characteristics

A total of 246 medical students participated in the study, with a 100% response rate. About 112 (45.53%) respondents were in the age group 26–30 years. More than two-third, 195 (79.27%), of respondents were males. Only one-third of the respondents, 74 (30.08%), came from urban residence of the country. More than half of the respondents, 134 (54.47%), were orthodox religion followers. Among all students participated, 68 (27.64%) and 65 (26.42%) were 2nd and 3rd year medical students, respectively (Table 1).

Medical Students' Attitude Towards the Embryology Course

About 159 (64.63%) medical students did not perceive that embryology requires little understanding in the clinics. Nearly half of the students, 117 (47.56%) agreed that embryology terminologies provide the foundation of medicine. However, only 49 (19.92%) medical students did not agree that embryology is a vital tool in medical practice. One

Table 1 Sociodemographic Characteristics of Medical Students at Debre Markos University, Ethiopia, 2022 (N = 246)

Variables		Frequency	Percent
Age	20–25	78	31.71%
	26–30	112	45.53%
	31–35	56	22.76%
Sex	Male	195	79.27%
	Female	51	20.73%
Residence	Rural	172	69.92%
	Urban	74	30.08%
Religion	Orthodox	134	54.47%
	Muslim	77	31.30%
	Protestant	35	14.23%
Ethnicity	Amhara	166	67.48%
	Oromo	50	20.33%
	SNNP	27	10.98%
	Tigray	3	1.21%
Study years	2nd year	68	27.64%
	3rd year	65	26.42%
	4th year	55	22.36%
	5th year	33	13.42%
	6th year	25	10.16%

Abbreviation: SNNP, southern nation and nationality people.

Table 2 Medical Students' Attitude Towards Embryology Course at Debre Markos University, Ethiopia, 2022 (N = 246)

Variables	Strongly Disagree/Disagree	Neutral	Strongly Agree/Agree
In the clinic, embryology requires little understanding.	159(64.63%)	62(25.20%)	25(10.16%)
Embryology terminologies provide the foundation of medicine.	36(14.63%)	93(37.80%)	117(47.56%)
Embryology is a vital tool in medical practice.	49(19.92%)	89(36.18%)	108(43.90%)
Embryology is a "necessary evil" in medical practice.	55(22.36%)	79(32.11%)	112(45.53%)
Embryology has minimal clinical benefit, but its importance was emphasized.	138(56.10%)	31(12.60%)	77(31.30%)
Embryology is important only in some medical fields.	92(37.40%)	88(35.77%)	66(26.83%)
Embryology has no significance in contemporary medicine.	164(66.67%)	59(23.98%)	23(9.35%)
Embryology is wastage of time in the basic medical years.	113(45.93%)	89(36.18%)	44(17.89%)
Embryology needs to be modernized to be considered useful in Medicine.	17(6.91%)	87(35.37%)	142(57.72%)
Every doctor must have a sound understanding of embryology.	42(17.07%)	106(43.09%)	98(39.84%)
If alternative and western medicine can exist without embryology, so can eastern medicine.	122(49.59%)	55(22.36%)	69(28.05%)
It is not possible to achieve good training of medical practice without embryology.	86(34.96%)	63(25.61%)	97(39.43%)
It is impossible to do a reasonable diagnosis without embryology.	29(11.79%)	82(33.33%)	135(54.88%)
Existence of medicine is not possible without sound knowledge of embryology.	38(15.45%)	93(37.80%)	115(46.75%)
The principles of medicine are not founded on embryological knowledge.	182(73.98%)	104(42.28%)	78(31.71%)
Most medical diseases do not require a great understanding of embryology.	105(42.68%)	84(34.15%)	57(23.17%)
Embryology is most clinically relevant for all basic sciences.	24(9.76%)	53(21.54%)	169(68.70%)
For satisfactory medical practice only limited knowledge of embryology is required.	117(47.56%)	51(20.73%)	78(31.71%)
Medical students should concentrate on clinical practice rather than learning embryology.	99(40.24%)	105(42.68%)	42(17.07%)
A doctor has limited effectiveness without good knowledge of embryology	119(48.37%)	56(22.76%)	71(28.86%)

hundred and thirty-eight (56.10%) medical students disagreed that embryology has minimal clinical benefit, but its importance was emphasized. Close to one-third of the respondents, 66 (26.83%) agreed that embryology is important only in some medical fields or specialties. More than half of the respondents, 169 (68.70%) perceived that embryology is most clinically relevant for all basic sciences (Table 2).

Medical Students' Interest and Future Career Choice of Embryology

One hundred and thirty-eight (56.10%) medical students were very much interested in embryology course. However, only 30 (12.20%) medical students planned to join embryology as a career choice. The three major reasons of medical students for not joining embryology were less chance of promotion (79, 32.11%), lack of future specialization (54, 21.95%) and less financial growth (53, 21.54%). Close to two third of medical students (175, 71.14%) perceived that the integrated curriculum increased their interest in ward embryology course (Table 3).

Table 3 Medical Students' Interest and Future Career Choice of Embryology at Debre Markos University, Ethiopia, 2022 (N = 246)

Variables	Rate	Frequency	Percent
How much you are interested in embryology course?	Very much	138	56.10%
	Minimal	83	33.74%
	Null	25	10.16%
Do you have a plan to join it as a future career?	Of course	30	12.20%
	May be	91	37.00%
	Never	185	75.20%
Will you guide your junior to join the embryology as a career?	Of course	44	17.89%
	May be	60	24.39%
	Never	142	57.72%
What are the reasons for not joining the embryology field?	Less chance of promotion	79	32.11%
	Less financial growth	53	21.54%
	Difficulty of the subject	41	16.67%
	Absence of role model	19	7.72%
	Lack of future specialization	54	21.95%
Does embryology teachers encourage the students to join this field	Yes	188	76.42%
	No	58	23.58%
Will integrated curriculum increase the interest of medical students to the embryology course?	Yes	175	71.14%
	No	49	19.92%
	I do not know	22	8.94%

Medical Students' Perception Toward Teaching Methodology of Embryology

More than two third of medical students, 189 (76.83%) agreed that integration of embryology and teratology courses in the first and second years were better than teaching each discipline alone. More than half of medical students, 145 (58.94%) also preferred problem-based learning that combines embryology and teratology. About 201 (81.71%) medical students perceived that virtual reality is more effective than images in the textbook for teaching embryology. In addition to this, 111 (45.12%) medical students perceived that it was more successful to learn embryology using adopted embryos. However, half of the medical students, 125 (50.81%) did not agree that limiting embryology lab material in the first year to what needs to be compared with typical teratologic disorders (Table 4).

Discussions

A variety of methods were tested to increase students' understanding and long-term retention. Students at our university complete a general embryology course at the end of the second semester of the second year. The primary objective of this course is to teach students how to recognize and comprehend the normal and abnormal development in the embryonic and fetal periods of the developing human. This is a prerequisite for students to be exposed to abnormal organ structure and function in subsequent years of study or clinical years. Furthermore, their ability to integrate knowledge gained in basic and clinical medical courses will be dependent on their ability to appropriately and critically identify and treat varied illnesses in their future medical practice.¹⁹

Table 4 Medical Students' Perception Toward Teaching Methodology of Embryology at Debre Markos University, Ethiopia, 2022 (N = 246)

Improving Methods	Strongly Disagree/Disagree	Neutral	Strongly Agree/Agree
Integrating embryology and teratology courses in the first and second years are better than teaching each discipline alone.	21(8.54%)	36(14.63%)	189(76.83%)
It is preferable to include case studies (problem-based learning) that combine embryology and teratology.	23(9.35%)	78(31.71%)	145(58.94%)
Virtual reality is more effective than images in the book for teaching embryology.	17(6.91%)	28(11.38%)	201(81.71%)
Using adopted embryos to teach embryology is more successful.	36(14.63%)	99(40.24%)	111(45.12%)
When teaching embryology, it is preferable to produce graphs and charts.	67(27.24%)	86(34.96%)	93(37.80%)
It is preferable to observe both normal and abnormal organ development at the same time.	51(20.73%)	91(36.99%)	104(42.28%)
The systematic method to teaching embryology is more successful than each discipline alone.	66(26.83%)	83(33.74%)	97(39.43%)
It is preferable to limit embryology lab material in the first year to what needs to be compared with typical teratologic disorders.	125(50.81%)	59(23.98%)	62(25.20%)

In the present study, more than half of the medical students perceived that embryology requires understanding in the clinics. Nearly half of the medical students perceived that embryology is a vital tool in medical practice. In addition to this, more than half of the students also perceived that embryology is most clinically relevant for all basic sciences. This is supported by a study conducted in Pakistan that revealed that medical students perceived that embryology is most important for medical studies.¹⁷ The current findings were also supported by a reported study in Serbia suggested that medical students had a positive attitude towards embryology course.⁵

In our study, 56.10% of medical students were very much interested in embryology course. However, only 12.20% of medical students planned to join embryology as a career choice. The main reasons of medical students for not joining the embryology field were less chance of promotion, lack of future specialization and less financial growth. This finding was in agreement with studies conducted in Ethiopia, Malaysia and South Asia, which revealed that there are few opportunities in basic medical science, which are limited to teaching, research, and diagnostic laboratories.^{15,20,21} The current study also showed that nearly two third of medical students perceived that integrated curriculum with other basic sciences increased their interest in ward embryology course. This finding was higher than a reported study by Teshome et al which revealed only one third of medical students perceived that integrated curriculum with other basic sciences increased their interest in ward histology course.¹⁵ This discrepancy might be due to the difference between the two courses.

In the current study, more than two third of medical students agreed that the integration of embryology and teratology courses in the first and second years was better than teaching each discipline alone. This finding was similar to a reported study that revealed integration of embryology and teratology.¹ Our finding also supported by a related study, which revealed that medical students perceived that the integration of histology and pathology courses in the first and second years was better than teaching each discipline alone.¹⁵

More than half of medical students also preferred problem-based learning that combines embryology and teratology, and most of the medical students perceived that virtual reality is more effective than images in the textbook for teaching embryology. Besides this, almost half of the medical students perceived that it was more successful to learn embryology using aborted embryos (resulted from unintended pregnancy or other causes) for illustrating embryological structures, for instance limb buds and pharyngeal arches. This finding was similar to studies conducted by Osman et al²² and Chaudhary et al²³ which revealed

technology in the form of three-dimensional videos and animations transformed medical students' attitude for studying and increased their learning capacities. It gave satisfaction by improving their learning and knowledge about the subject.

Conclusions

This cross-sectional study looked at medical students' attitudes and perceptions about embryology courses at Debre Markos University in Ethiopia. In this study, most of the medical students have a positive attitude toward the embryology course. The first-year curricular integration of embryology and teratology must be maintained, and great effort is required to improve students' passion for developmental anatomy/embryology. These findings might be utilized as an additional motivation for the improvement of embryology course, with a focus on the practical application of knowledge in a clinical context. Curriculum designers and anatomists should integrate three-dimensional videos and animations in embryology lecture hours to improve students' affinity for developmental anatomy.

Data Sharing Statement

The raw data sets used for analysis in the current study were available from the corresponding author upon a reasonable request.

Ethics Approval and Consent to Participate

The ethical approval was obtained from the ethical review committee of the School of Medicine, Debre Markos University. The ethical review committee has scrutinized the proposed study for ethical issues and approved it with a reference number (Ref. No: SOM/701/19/12. RTTD-006). Each participant provided written informed consent and participated voluntarily. Finally, the author confirmed that this study was carried out in conformity with the Helsinki Declaration.

Acknowledgments

I gratefully acknowledge the involvement of all medical students who participated in the study.

Disclosure

The author declares no conflicts of interest in relation to this work.

References

1. Moxham BJ, Brichova H, Emmanouil-Nikoloussi E, Chirculescu AR. Embryology and teratology in the curricula of healthcare courses. *Eur J Anat.* 2017;21(1):77–91.
2. Dorland W. *Dorland's Medical Dictionary for Health Consumers*. Saunders, an imprint of Elsevier; 2007.
3. Alfalah S, Falah JF, Muhaidat N, Elfalah M, Falah O. Investigating learners' attitudes toward virtual reality learning environments in embryology education. *Mod Appl Sci.* 2019;13(1):57–68.
4. Scott KM, Charles AR, Holland AJ. Clinical embryology teaching: is it relevant anymore? *ANZ J Surg.* 2013;83(10):709–712. doi:10.1111/ans.12213
5. Zaletel I, Marić G, Gazibara T, et al. Relevance and attitudes toward histology and embryology course through the eyes of freshmen and senior medical students: experience from Serbia. *Ann Anat.* 2016;208:217–221. doi:10.1016/j.aanat.2016.07.002
6. Patel K, Moxham B. The relationships between learning outcomes and methods of teaching anatomy as perceived by professional anatomists. *Clin Anat.* 2008;21(2):182–189. doi:10.1002/ca.20584
7. 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
8. Moraes SG, Pereira LAV. A multimedia approach for teaching human embryology: development and evaluation of a methodology. *Ann Anat.* 2010;192(6):388–395. doi:10.1016/j.aanat.2010.05.005
9. Dimitropoulos K, Manitsaris A, Mavridis I. Building virtual reality environments for distance education on the web: a case study in medical education. *Int J Soc Sci.* 2008;2(1):62–70.
10. Falah J, Charissis V, Khan S, Chan W, Alfalah SF, Harrison DK. Development and evaluation of virtual reality medical training system for anatomy education. In: *Science and Information Conference: 2014*. Springer; 2014:369–383.
11. Nicholson DT, Chalk C, Funnell WRJ, Daniel SJ. Can virtual reality improve anatomy education? A randomised controlled study of a computer-generated three-dimensional anatomical ear model. *Med Edu.* 2006;40(11):1081–1087. doi:10.1111/j.1365-2929.2006.02611.x
12. Shayah A, Qaedi Choo MA, Quane KA, et al. Relevance of anatomy to medical education and clinical practice: perspectives of medical students, clinicians, and educators. *Perspect Med Educ.* 2016;5(6):338–346. doi:10.1007/s40037-016-0310-4
13. Jaiswal R, Sathe S, Gajbiye V, Sathe R. Students perception on methods of anatomy teaching and assessment; 2015.
14. Abraham Y, Azaje A. The new innovative medical education system in Ethiopia: background and development. *Ethiop J Health Dev.* 2013;27(1):36–40.

15. Teshome D. Attitude and perception of medical students towards histology subject at Wollo University, Ethiopia. *Adv Med Educ Pract.* 2022;13:337. doi:10.2147/AMEP.S359703
16. Moxham BJ, Emmanouil-Nikoloussi E, Standley H, et al. The attitudes of medical students in Europe toward the clinical importance of embryology. *Clin Anatomy.* 2016;29(2):144–150. doi:10.1002/ca.22667
17. Waseem N, Iqbal K, Anwar N, Rehman I, Kundi H, Qamar A. Medical students' attitudes towards the clinical importance of embryology. *J Pak Med Assoc.* 2021;71(4):1167–1170. doi:10.47391/JPM.A.015
18. Ali SMH, Zil-E-Ali A. Medical students' attitudes towards the clinical importance of embryology. *J Pak Med Assoc.* 2021;71(9):2289.
19. Gupta S, Gupta AK, Verma M, Kaur H, Kaur A, Singh K. The attitudes and perceptions of medical students towards basic science subjects during their clinical years: a cross-sectional survey. *Int J Appl Basic Med Res.* 2014;4(1):16. doi:10.4103/2229-516X.125675
20. Teshome D, Tiruneh C, Berhanu L, Berihun G. Medical students' attitude and perception towards basic medical science subjects at wollo university, Northeast Ethiopia. *Adv Med Educ Pract.* 2021;12:431. doi:10.2147/AMEP.S309440
21. Kumar A, Mitra K, Nagarajan S, Poudel B. Factors influencing medical students' choice of future specialization in medical sciences: a cross-sectional questionnaire survey from medical schools in China, Malaysia and regions of South Asian Association for Regional Cooperation. *N Am J Med Sci.* 2014;6(3):119. doi:10.4103/1947-2714.128473
22. Osman M, Adnan A, Kutty MK, Al-Naggar RA. Evaluation of laboratory medicine teaching and learning by medical students in hybrid integrated curriculum Data from public Malaysian university. *J Basic Appl Sci Res.* 2014;4:151–157.
23. Chaudhary P, Arora K, Dhir SK. Combining traditional embryology lectures with technology and perception of students toward it. *Chrimed j Health Res.* 2018;5(4):290. doi:10.4103/cjhr.cjhr_79_18

Advances in Medical Education and Practice

Dovepress

Publish your work in this journal

Advances in Medical Education and Practice is an international, peer-reviewed, open access journal that aims to present and publish research on Medical Education covering medical, dental, nursing and allied health care professional education. The journal covers undergraduate education, postgraduate training and continuing medical education including emerging trends and innovative models linking education, research, and health care services. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <http://www.dovepress.com/advances-in-medical-education-and-practice-journal>