


# Facility-Related Factors Affecting Academic Performance of Medical Students in Human Anatomy

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Shibabaw Tedla Tiruneh  
Belta Asnakew Abegaz   
Abebe Ayalew Bekel  
Yibeltal Wubale Adamu   
Mengistu Desalegn Kiros  
Dawit Habte Woldeyes 

Biomedical Department, College of  
Medicine and Health Sciences, Bahir Dar  
University, Bahir Dar, Ethiopia

**Introduction:** Medical students' academic performance plays an important role in producing qualified graduates who will become great practitioners and workforce for the country's health sector responsible for controlling, diagnosing, and treatment of diseases. The purpose of this study was to identify college facility-related factors affecting medical students' academic performance in the human anatomy course.

**Methods:** To achieve the objective of this study, a cross-sectional study design was carried out between January 13 and March 30, 2019. One hundred twenty study participants were recruited in the study. Data were collected using self-administered questionnaires. Binary and multinomial logistic regression were applied to analyze the data.

**Results:** A total of 120 participants were included in the study. Of which, 81 (67.5%) were male while 39 (32.5%) were females. Dormitory crowdedness (AOR 3.16 (95% CI: 0.83–2.01,  $p = 0.11$ ), large class size (AOR = 2.36; 95% CI: 1.11–4.64  $p = 0.005$ ), inadequate classroom facilities (AOR = 1.56; 95% CI: 1.51–4.91,  $p = 0.001$ ), low internet access (AOR = 1.99; 95% CI: 1.07–3.22,  $p = 0.015$ ) and inadequate anatomy-teaching model (AOR = 2.63; 95% CI: 1.17–6.12,  $p = 0.003$ ) were significantly associated with low performance of students in human anatomy course exam. However, college library (AOR = 0.23; 95% CI: 0.1–0.48  $p = 0.061$ ) did not show significant association with academic performance ( $p = 0.61$ ).

**Conclusion:** Dormitory crowdedness, large class size, inadequate classroom facilities, low internet access, and inadequate anatomy-teaching models were independent factors, which affect the performance of medical students in the human anatomy course exam. However, there was no significant association between the college library and the performance of study participants in this particular course.

**Keywords:** academic performance, medical students, facility-related factors

## Introduction

Medical student's academic performance plays an important role in producing the best quality graduates who will become great practitioners and workforces responsible for the country's health development.<sup>1,2</sup> Academic achievement is one of the major issues considered by employers in hiring workers specifically for medical students.<sup>3,4</sup> Medical students have to put the greatest effort into their human anatomy course study to obtain good grades and to prepare themselves for future opportunity in their career at the same time to fulfill the countries health sector demand.<sup>5,6</sup> Therefore, Human Anatomy is the language of medicine and the

Correspondence: Shibabaw Tedla Tiruneh  
College of Medicine and Health Sciences,  
Bahir Dar University, Po. Box: 79, Bahir  
Dar, Ethiopia  
Tel +251 918 375 554  
Email shibabawtedila@gmail.com

foundation of medical students in their clinical course performances and clinical practices.<sup>7</sup> Investigation of factors related to the academic performance of medical students becomes a topic of growing interest in the higher educational circle. Many recent studies were carried out to explore factors affecting medical students' academic performance.<sup>8</sup> Research report showed that students' performance is affected by many factors. Among these factors, facility-related factors such as classroom facilities and environment, internet access, overcrowding, dormitory environment, availability of library, and reference books are identified.<sup>9</sup> Classroom environment is a combination of physical characteristics of the room. These physical facilities of the classroom are one of the stimulating factors that play a fundamental role in improving the academic performance of students in the school system.<sup>10</sup> For example, a study was done on more than 2000 classrooms in California, Washington, and Colorado, students who were exposed to a larger amount of daylight, optimum temperature, and well-ventilated classroom in their classroom had higher math and reading test scores than students who were exposed to less daylight, high temperature, and less ventilated classroom.<sup>11</sup> The Internet is a very useful medium for quick access to information, especially for students. In particular, social networking sites facilitate students in communication, socialization, coordination, collaboration, and entertainment, but internet usage can cause addiction and lead to time-wasting, information overload, and physical isolation from society.<sup>12–14</sup> Determinants of medical students' academic performance and their teaching-learning process were not investigated well in our school. In addition to this, on random observations, some medical students scored under in anatomy course for the last three successive years in their preclinical course. This condition needs research. Thus, this study proposed to identify facility-related factors affecting the academic performance of medical students in the human anatomy course.

## Method and Materials

A cross-sectional study design was carried out from January 13 to March 30, 2019, at the College of Medicine and Health Sciences, Bahir Dar University, Northwest Ethiopia. All medical students (120) were included in the study. In this study, the outcome variable (letter grade) was scaled as high ( $\geq 70\%$ ) and low ( $< 70\%$ ) based on the standard of the Ethiopian Higher Education Grading system. Self-administered structured questionnaires were used to

collect the socio-demographic character of participants and facility-related factors after clear orientation about the purpose of the study. The data collection tools were revalidated by two expertise and a pilot study was performed in two private colleges before the actual data collection. Data were entered and analyzed using the Statistical Package for Social Sciences 22. Descriptive statistics were used to describe the demographic characteristics of the participants. Bivariable logistic regression was used to identify factors associated with academic performance. Multivariable logistic regression was used to assess the impact of independent variables on the outcome variables. The odds ratio was used to measure the strength of the association and the p-value  $\leq 0.05$  was considered statistically significant. This study was approved by the College of Medicine and Health Sciences Research Review committee (No. CMHSRRC-12359/2018). Written informed consent was taken from each study participant before the administration of questionnaires and data collection. Besides these, a supportive letter was obtained from the biomedical department. Personal identifiers were not used. Data were retrieved for only study purposes to ensure confidentiality. The results of this study were submitted to the College of Medicine and Health Sciences Academic Director Office and the biomedical department. The recommendation was given to them to fulfill college facilities important for improving students' achievement.

## Result

One hundred twenty students participated in this study. Among the participants, 12 (10%) were age 20 years and below while 108 (90%) were above 20 years. Eighty-one (67.5%) and 39 (32.5%) were male and female participants, respectively. Forty-two (35%) students were coming from rural areas while 78 (65%) students were from urban. Nineteen (15.83%), 28 (23.33%) and 73 (60.8%) students were from families who were unable to read and write, able to read and write and complete primary school and above. Among 120 study participants, 48 (48.3%) were got B and above in their anatomy course while 62 (51.7%) of students scored below "B" (Table 1).

In this study, those students who said there is crowdedness in the dormitory (AOR 3.16 (95% CI: 2.01–0.83) were scored 3.16 times less grade than those who said no crowdedness in the dormitory. Those students who said dormitory crowdedness affect their performances (AOR = 2.20; 95% CI: 0.95–4.74) were more likely to have less score on the human anatomy exam than those who said

**Table 1** Analysis of Demographic Characteristics of Study Subjects

Parameters		Frequency	Percent (%)
Age	=< 20 years	12	10
	> 20 years	108	90
Sex	Male	81	67.5
	Female	39	32.5
Address	Rural	42	35
	Urban	78	65
Family educational status	Unable to read and read	19	15.8
	Able to read and write	28	23.3
	Primary school and above	73	60.8
Preclinical one student		48	40
Clinical one students		72	60
Grade performance	Get "B" and above	58	48.5
	Get below "B"	62	51.7

that dormitory crowdedness did not affect their grade performances. Large class size (AOR = 2.36; 95% CI: 1.11–4.64) was independent factors that decrease students' grade performance in the human anatomy course. Similarly, study participants who said the class contains inadequate necessary facilities (AOR = 1.56; 95% CI: 1.51–4.91) were scored less in the human anatomy exam than those participants who said that the class contains the necessary facilities. The presence of separate and well-furnished libraries for medical students (AOR = 0.23; 95% CI: 0.1, 0.48) were not independent factors that affect students' grade performance in the human anatomy course. Those students who said that there were not enough anatomy references in both quality and quantity (AOR = 1.26; 95% CI: 1.21, 4.76) were scored less in the anatomy course exam than those who said there were enough anatomy reference books in both quantity and quality. Study participants who said there was low internet access for searching reference books (AOR = 1.99; 95% CI: 1.07, 3.22) were scored less grade than those who said there was internet access for searching reference books. In this study, those students participated in the study who said there were not enough and quality anatomy model in the laboratory room (AOR = 2.63; 95% CI: 1.17, 6.12) were scored

less grade in the anatomy course exam than those who said there were enough and quality models in anatomy laboratory (Table 2).

## Discussion

In this study, those students who said there was dormitory crowdedness were scored 3.16 times less grade than those who said there was no dormitory crowdedness ( $p = 0.011$ ). This study agrees with a study done in Ghana which described those study participants who said there were university students dormitory crowdedness (more than 4 students in a single room) were scored 2.10 times less grade than those who said there was no dormitory crowdedness in their campus.<sup>15</sup> On the contrary, a study done in India demonstrated that there was not any significant difference in academic performance between participants who said there were dormitory crowdedness and those who said there was not any dormitory crowdedness in their campus.<sup>16</sup> This deference may be due to a small sample size included in the study or economical disparity and University standards between the two countries.

Class size is defined as the number of students in a single classroom. Smaller class sizes increase teacher–student interaction; make students participate in classroom activities; foster greater interaction among students and helping them understand one another and increase their desire to assist one another.<sup>17</sup> But study done by Adeyela found out the large class size was not conducive for serious academic work.<sup>18</sup> In our university, 100 preclinical students have attended an anatomy course in a single class. Thus, study participants who said there was a large class size were about two times more likely to score less in anatomy course exam than those who said there was not large class size ( $p = 0.005$ ). This study was consistent with research reports noted in the USA which stated that students in smaller classes scored higher on standardized tests than did those in large classes, smaller classes had fewer behavioral problems and a teacher felt more productive in smaller classes.<sup>19</sup> However, a study done in Nigeria demonstrated no significant relationship between class size and students' learning outcomes.<sup>17,20,21</sup> In the present study, participants who said classrooms seat, seat arrangement, the color of classroom, light, temperature, ventilation, acoustics, site and number of the window were not comfortable or inadequate for learning were about one time lower odds of scoring in anatomy course exam than those participants who said the classroom contained the necessary facilities ( $p = 0.001$ ). This study was in contrast

**Table 2** Analysis of Facility-Related Factors Affecting Academic Performance of Medical Students in Anatomy

Variables		Grade Performance		COR (95% CI)	P value	AOR (95% CI)	P value
		High	Low				
Is there any Crowdedness in the dormitory	Yes	49	48	3.52(1.2–10.25) 	0.021	3.16(0.83–2.01) 	0.011
	No	18	5				
Is there dormitory crowdedness affect your performance	yes	33	44	2.25(1.04–4.83) 	0.038	2.20(0.95–4.74) 	0.021
	No	27	16				
Was the class size comfortable for teaching learning?	Yes	22	35	2.41(1.16–5.05) 	0.018	2.36(1.11–4.64) 	0.005
	No	38	25				
Did the classes have the necessary facilities?	Yes	51	3	 2.65(1.20–5.81)	0.015	 1.56(1.51–4.91)	0.001
	No	7	49				
Was there library with anatomy reference books in both quality and quantity?	Yes	38	27	 0.41(0.19–0.85)	0.017	 0.23(0.1–0.48)	0.061
	No	20	35				
Did you get internet connection to access books/references?	Yes	46	31	 2.41(1.12–5.21)	0.025	 1.99(1.07–3.22)	0.015
	No	16	26				
Were there appropriate models for Anatomy	Yes	24	10	 3.03(1.29–7.11)	0.011	 2.63(1.17–6.12)	0.003
	No	38	48				

with findings from a previous study where they found classroom environment and physical conditions had an insignificant influence on the academic performance of students.<sup>22</sup> However, a study done in Pakistan demonstrated that students attended their class in a well-equipped classroom with physical facilities had a significant positive effect on the academic performance of students than those who attended their class in an unequipped classroom.<sup>10</sup> This indicates that creating a conducive school environment for students' learning is a must for each country.

Libraries are essential for generating and seeking knowledge, provide place students and faculty members to do research and advanced their knowledge; has roles to collect, process, store, disseminate, and utilize information.<sup>23</sup> In our university, there is one separate medical library for both medical and other health science students with limited reference books. In this study, there was no significant difference between participants who said there was no well-equipped library with anatomy reference books and those who said there was a well-equipped library with anatomy reference books ( $p = 0.061$ ). However, research findings showed that those study participants who said there was a well-furnished library with adequate references were got a higher grade than those participants who said there was no easy

accessible library.<sup>23</sup> This may be due to variations in the utilization of limited library services between the two populations.

The Internet is an essential part of our society, which provides easy access to social, political, economical, and academic information's across the world without leaving their place of residence. However, there are drawbacks such as impaired academic performance, health problems, personal relationship problems, and social dysfunctions when it is used in a wrong and uncontrolled way.<sup>24</sup> In our university, the problems of internet service are limited access, low speed, frequent disruption, low maintenance, and low coverage. Thus, students have no access to the internet when they need academic work activities. This study's results showed that participants who said there was no internet connection to access books and references were about one time more likely to score less grade than those who said there was an internet connection to access books and references. Similar studies done in Uganda showed that study participants who said there was internet connection access without limitation were scored high grades than those who had no access to the internet.<sup>25</sup> Another study done in Ecuador demonstrated that those students who accessed and used internet for academic coursework scored higher as compared to students who did not access internet connection.<sup>26,27</sup>

Human teaching models are important tools to teach anatomy course for medical students. This study finding demonstrated that those students who participate in the study who said there was no appropriate teaching model were scored 2.63 times less grade than those who said there were enough and appropriate models ( $p = 0.003$ ). This study agreed with a study done in the United Kingdom.<sup>28</sup>

## Limitation of the Study

Because of budget constraints, the authors did not include more samples from other medical schools. Finally, even though academic performance is affected by many other factors, this study focuses only on facility-related factors.

## Conclusions

Dormitory crowdedness, large class size, classroom facilities, internet access, and anatomy-teaching models are independent risk factors for low academic performance in the human anatomy course exam. However, there was no significant association between the college library with academic performance of preclinical medical students.

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## Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare no conflict of interests in this work.

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