
Impact of Pandemic COVID-19 on Anatomy Education and Its Aftermath

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Abstract

Objective: *Our objective was to see the impact of COVID-19 on anatomy education in Bangladesh and its aftermath.*

Method: *This cross-sectional descriptive study was carried out in the Department of Anatomy, Army Medical College Jashore, from July 2021 to October 2021. This study was conducted on 300 second-year medical students from Army Medical College Jashore, Jashore Medical College, Sir Salimullah Medical College, and International Medical College of the age group between 19-21 years. A close-ended multiple-choice questionnaire in Google Form was e-mailed to the subjects, and their responses were recorded.*

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Result: *None of the subjects was prepared for the sudden long-term closure of the institutions. The majority (98%) were worried about the sudden cessation of all academic activities & apprehended for the possibility of session clutter. (89.33%) subjects experienced learning disruption initially but (62%) adapted to online learning activities gradually. The major obstacles for virtual anatomy education were poor internet connection (57%), the small display screen of a smartphone (56%), and lack of valuable gadgets (38%). Anatomy virtual apps were used chiefly for dissection (36%), and live online classes were preferred for histology (57%) and embryology (51%). Pre-recorded videos on different social media were preferred for studying viscera (37%). (68%) became expert on handling computers and the internet, though (72%) felt only virtual education could never replace practical classes. Traditional anatomy classes were felt bored by (58%) subjects. After being introduced to online learning, (92%) preferred blended learning over only traditional anatomy classes (9%) or online classes (2%).*

Conclusion: *Lockdown in COVID-19 pandemic compelled us to install online learning to maintain the attachment of the academic activities with curriculum; in reality, the purpose served even more than expected. After this COVID-19 era and significant virtual development, blended learning became the most preferable and effective technique for studying anatomy.*

Keywords: Covid-19, medical students, medical education, virtual anatomy education

INTRODUCTION:

COVID-19 (Coronavirus 2019) is a highly contagious respiratory tract disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)¹. It was first detected in December 2019 in Wuhan city, Hubei Province, China². Within a few weeks, the virus has spread from China to 27 other countries³. This outbreak was declared a pandemic on March 11, 2020, by World Health Organization (WHO)⁴. Till July 5, 2021, a total of 184,573,435 confirmed cases and 3,993,597 deaths in 220 countries & territories, including Bangladesh, have

been reported⁵. In March, the virus spread in Bangladesh when the Institute of Epidemiology, Disease Control and Research (IEDCR) reported the first three confirmed COVID-19 cases. From that day on, the number of COVID-19 patients has been increasing⁶. According to WHO total of 977,568 confirmed cases and 15,593 deaths due to COVID-19 were reported in Bangladesh till July 7, 2021⁷. The Government of Bangladesh imposed a lockdown from March 26, 2020, throughout the country, aiming to protect the population from this contagious disease⁸. In addition, the Ministry of Education declared the closure of all educational institutions, including all medical colleges, on March 17, 2020⁹. Though the Government started withdrawing lockdown in different areas from May 31, 2020, all educational institutions remained closed for more than one and a half year^{10,11}. In these circumstances, around 53,825 medical students were directly affected. There are 112 recognized medical colleges in Bangladesh. Among them, 37 are public, 70 are private & 6 are administered by Bangladesh Armed Forces & are under the Ministry of Defense¹². Some medical colleges started taking unofficial classes virtually after the shutdown was declared. On March 23, 2020, University Grants Commission (UGC) asked to continue online classes for all public and private universities. Subsequently, Education Minister urged to keep educational activities online¹³. The main objective was to reduce the risk of transmission of this virus by avoiding face-to-face schooling and maintaining social distance to protect the students, teachers & associates¹⁴. Finally, the Government decided to reopen medical institutes from September 13, 2021, in the country after completing their vaccination¹⁵.

Anatomy is the keystone of medical science. To become successful professionals in the future, the students must have comprehensive knowledge of anatomy. However, in reality, anatomy is a vast and challenging subject to grasp thoroughly. Naturally, students become bored, feel monotonous, and get tired of studying this subject. Conventionally students study anatomy very superficially, mainly just memorizing to pass their exam.

In Bangladesh, the learning of this subject is based on cadaveric dissection, viscera, models, skeleton, bones, histology slides, museum specimens & other modalities. These are the principal tools for anatomy education. Medical students had lost their access to all

these supporting aids since the shutdown of the educational institutions. There was no option left in that scenario but to take both the lectures & laboratory classes virtually. In the history of Bangladesh, virtual education was never a part of anatomy education. To cope with online technology, both teachers and students had to educate themselves quickly & properly to adopt new learning methods to continue the academic activities ¹⁶.

Thus, this pandemic COVID-19 has created a new era for the virtual system of anatomy education in Bangladesh. Even after the reopening of schools, many medical institutions have incorporated the internet in the traditional anatomy classes. This system has brought an extensive inquest about the opportunities and obstacles for medical students in anatomy education. Many studies have been carried out throughout the world to evaluate the effect of virtual education on anatomy, but no such studies were done in Bangladesh. For this reason, this study was undertaken to visualize the benefits and drawbacks of virtual anatomy education which started during the pandemic COVID-19 and still going on.

MATERIALS AND METHODS:

It was a cross-sectional descriptive study carried out in the Department of Anatomy, Army Medical College Jashore, from July 2021 to October 2021. In this study, three hundred second-year medical students participated from Army Medical College Jashore, Jashore Medical College, Sir Salimullah Medical College, and International Medical College aged 19-21 years.

Data were collected from Army Medical College Jashore, Jashore Medical College, Sir Salimullah Medical College, and International Medical College. Study subjects were contacted telephonically and via e-mail. The nature and purpose of the study were described to the study subjects, and informed consent from them was taken via Google Form. A close-ended multiple-choice questionnaire was mapped out in Google Form and e-mailed to the subjects. Their responses were recorded. Confidentiality of the subjects was maintained. Data were collected and analyzed using Microsoft Office Professional Plus 2019 excel spreadsheet (Microsoft

Corp Redmond, WA, USA) and program SPSS 20.0 (SPSS Inc. Chicago, IL, USA).

RESULT:

Table 1 shows the demographic characteristics of the participants. Among 300 subjects, 188 were female, and 112 were male.

Table 1: Summary of demographic characteristics of participants

Variable	Population (n)	Percentage (%)
Gender:		
Male	112	37.33
Female	188	62.67
Total	300	100
Residence:		
Urban	173	57.67
Rural	127	42.33
Total	300	100

All subjects admitted that they were not prepared for the notice of long-term closure of the institutions & were shocked by the abrupt announcement. 207 (68.67%) subjects revealed that they had to vacate their halls and leave the campus on short notice, for which they failed to bring all the necessary items, including their books & other learning aids, with them. The majority of the subjects that was 294 (98%) were worried as their classes, examinations, and academic activities suddenly stopped & they were apprehended for the possibility of session clutter.

268 (89.33%) subjects admitted they experienced sudden learning disruption initially, but 186 (62%) coped with that situation & adapted to online learning activities. 275 (92%) understood that face-to-face learning activities were not possible and virtual learning was the only way for their education. 168 (56%) subjects confirmed they used smartphones, 113 (37.67%) used laptops or desktops, only 13 (4.33%) used tabs and 5 (1.67%) used other gadgets for e-learning purposes (Figure 1).

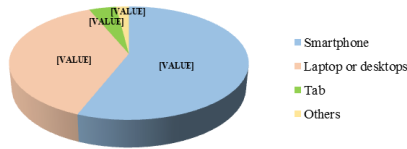


Figure 1: Pie chart showing usage of different gadgets for virtual education.

All the smartphone users felt the phone’s screen was too small for doing all the online classes. 114 (38%) subjects felt they did not have proper gadgets for online classes. In addition, 171 (57%) subjects reported internet issues (poor network) which disrupted their classes & was a significant obstacle in their online learning. 206 (68.67%) had a Wi-Fi connection, and 94 (31.33%) purchased cellular data for virtual education. 54 (18%) subjects informed they felt destructed by home environment, the main reasons behind this were that they did not have any separate rooms and had to participate in the household work, which they did not have to do in their institutional hostel (Figure 2).

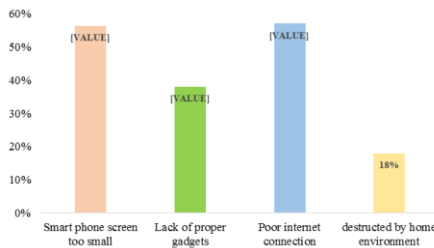


Figure 2: Drawbacks of virtual anatomy education felt by the subjects.

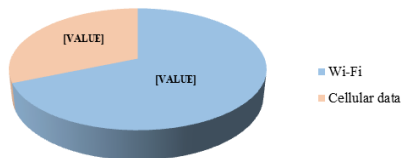


Figure 3: Pie chart showing mode of usage of internet.

216 (72%) said they could not bring all their books home as they had to vacate their hostel on concise notice. Initially, they were using e-

books and pdf books, Google & YouTube for learning purposes. However, later within a few months, they (95%) that is 285 subjects, managed to bring back their books from hostels, a few of them that is 12 (4%) subjects, bought new sets of books for their home and only 3 (1%) were solely dependent on the virtual system without any books.

For dissection, 108 (36%) subjects were dependant more on virtual apps. For studying viscera, pre-recorded videos were preferred more by 111 (37%) subjects. On the other hand, for bones, histology, and embryology, 96 (32%), 171 (57%), and 153 (51%) subjects relied more on live online classes than other modalities. Virtual apps were used least to study histology and embryology by 6 (2%) and 3 (1%) subjects, respectively (Figure 4). They downloaded the anatomy virtual apps from Google Play Store and Microsoft Store. The majority (99%) were using the free version of the apps and only (1%) had the paid version. They acknowledged that their teachers also encouraged them to use the apps as well.

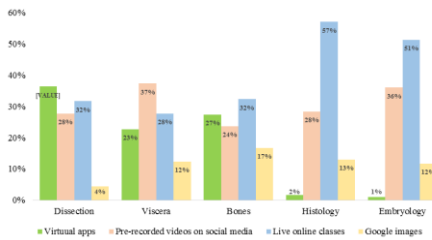


Figure 4: Different modalities used for studying different components of anatomy in virtual education.

157 (53.33%) confirmed that YouTube videos help them a lot, and they could repeatedly watch the desired portion of the videos at any time from anywhere they want. 122 (40.67%) subjects used different Facebook pages and groups for study purposes as well. They watched different educational videos on Facebook and even did group discussions and exchanged notes as needed. Few subjects also utilize Instagram, Twitter, and other apps for educational purposes (Figure 5). For live online classes, most of the subjects that were 256 (85.33%) used the Zoom app. They confirmed that the Zoom app was the most user-friendly among other online class platforms (Figure 6).

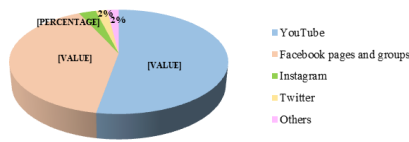


Figure 5: Pie chart showing different social media used for virtual anatomy education.

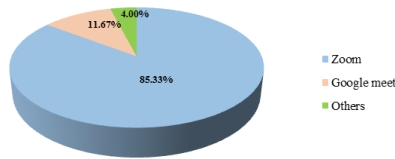


Figure 6: Different Apps used for live online classes.

204 (68%) subjects acknowledged they became efficient and more familiar with handling computers and the internet than before, and 156 (52%) accepted their self-learning capability increased. 171 (57%) mentioned another advantage of online classes: they could watch recorded classes repeatedly from anywhere and anytime. They could also review the portion again and again where they did not understand. 81 (27%) subjects said they could attend the classes anywhere even if someone was sick, which was not possible in traditional institutional classes (Figure 7).

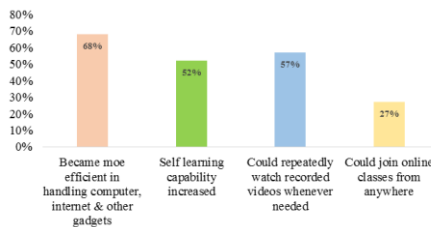


Figure 7: Advantages of virtual anatomy education.

Contrary to these advantages, 217 (72.33 %) subjects felt only virtual education could never replace practical classes in which they learned in person. 266 (88.67%) think they could learn better if they could learn and practice on the cadaver and with viscera in their hand. 196

(65.33%) missed their friends, and 174 (58.33%) missed face-to-face interaction with teachers. 233 (77.67%) subjects yearned for sports and cultural events that they were missing.

In the case of traditional anatomy classes, 138 (46%) felt bored as they had to sit in lecture classes monotonously for long hours. 114 (38%) noticed that back-benchers did not get much attention from the teachers as the subjects sitting in the front benches did. The 36 (12%) also claimed it was sometimes difficult to see the black or whiteboards from the back. 78 (26%) subjects said that when the teachers demonstrated on a viscera or a cadaver, all students could not watch with full attention properly at a time in a congested situation (Figure 8).

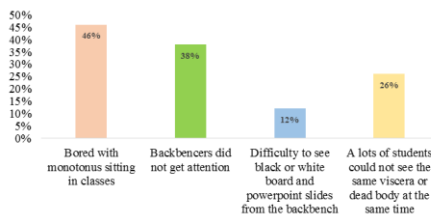


Figure 8: Drawbacks of traditional anatomy classes.

When the institutions reopened after the COVID-19 era, the situation was different. Subjects studied the cadaver, viscera, bones, models, and microscopic slides practically; side by side, they used Google, Google images, different anatomy apps with the guidance of their teachers, and 267 (89%) felt it was the most effective way for learning anatomy.

When finally asked, 267 (89%) subjects opined they wanted 'blended learning' over only traditional anatomy classes or only online classes, which were preferred only by 27 (9%) and 6 (2%) subjects, respectively (Figure 9).

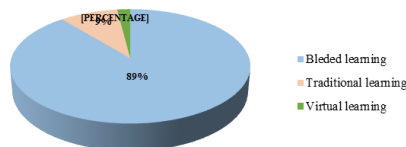


Figure 9: Pie chart showing the preferred learning methods.

DISCUSSION:

Observation of our study indicates that the subjects were not ready to face the situation they had to experience due to the sudden closure of all educational institutions. However, they accepted that it was the only way to prevent infection from person to person. This finding coincides with studies conducted in Bangladesh, Brazil, and India^{17,18,19}.

Our research finding reveals that more subjects used smartphones over laptops or desktops or tabs for virtual learning, similar to the findings of previous studies in Brazil and India^{18,19}.

In our study, many subjects felt they did not have proper gadgets for virtual education. Similar findings were reported in Brazil, Malaysia, and India. They revealed that subjects felt difficulty with online classes due to a lack of valuable gadgets^{18,19,20}.

The majority addressed poor internet connection as a significant obstacle in their virtual learning process. This study is similar to the studies in Bangladesh, Brazil, Malaysia, and India^{17,18,19,20}.

Our study found that different anatomy virtual apps helped most subjects to study dissection, viscera, and bones. Previous studies in the United States, Turkey, Brazil, and India also support this finding^{18,19,21,22,23}.

Similar to our finding, other studies in Ireland and Qatar also reported that YouTube videos helped the subjects with their virtual anatomy education^{24,25}.

According to the subjects, most of them also used different Facebook pages and groups, which were very helpful. Similar findings were found in the United Kingdom and Canada^{26,27}.

Our study showed that for live online classes, subjects used the Zoom app mostly. This finding coincides with Australia, Singapore, and Ireland^{28,29,30}. On the other hand, a study in Brazil showed that they switched to Google Meet for live online classes, contrary to our finding¹⁸. It might be due to the time limitation of the Zoom app in the free version that is up to 40 minutes. Opposite to that, Google Meet is a free app, and there is no time limitation.

This research revealed that most subjects became more efficient in handling computers and the internet than before for study purposes. A study in China also reported a similar finding³¹.

We found their self-learning capability increased and they watched recorded classes repeatedly whenever needed. It coincides with a previous study in India¹⁹.

Our study acknowledged that virtual education could never be a complete replacement for anatomy education. The subjects could learn better if they could practice on a cadaver, viscera in the institutions. It was similar to the findings of a study conducted in the United States of America and India^{19,28}.

Similar to our findings, a previous study in India revealed that most subjects missed their friends, teachers, and institutional environment¹⁹.

We found that most subjects felt bored in the traditional anatomy classes, which differed from the study conducted in India^{19,31}. Most of the subjects chose blended learning over only traditional anatomy classes or online classes in our study. Previous studies in Australia and India support this finding^{19,33}.

CONCLUSION:

Distance learning of anatomy was inevitable as the social distance was the only best option to save the students and other related persons from COVID-19 infection. Virtual education was not opted by choice; instead, it was chosen for having no other choice. Lockdown in the COVID-19 pandemic compelled us to install online learning to maintain the subject's attachment with the academic curriculum. In reality, the purpose served even more than expected. This virtual journey ultimately expertized both the teachers and the students to use higher technologies in the education field. For anatomy, virtual education is not a permanent substitute for the regular college campus system. In addition, students did not prefer only traditional methods after being introduced to the internet facilities. After this COVID-19 era and significant virtual development, intermingling the traditional method with the virtual method is the most effective technique for learning anatomy and is widely accepted.

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REFERENCES:

1. Of the International CS. The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nature microbiology*. 2020;5(4):536.
2. Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *Journal of medical virology*. 2020 Apr;92(4):401.
3. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real-time. *The Lancet infectious diseases*. 2020 May 1;20(5):533-4.
4. Khanna RC, Cicinelli MV, Gilbert SS, Honavar SG, Murthy GV. COVID-19 pandemic: Lessons learned and future directions. *Indian Journal of Ophthalmology*. 2020 May;68(5):703.
5. <https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/>
6. Islam MT, Talukder AK, Siddiqui MN, Islam T. Tackling the COVID-19 pandemic: The Bangladesh perspective. *Journal of Public Health Research*. 2020 October 14;9(4).
7. <https://covid19.who.int/region/searo/country/bd>
8. "Coronavirus: Bangladesh declares public holiday from March 26 to April 4". *Dhaka Tribune*. March 23, 2020. Archived from the original on March 23, 2020. Retrieved March 27, 2020.
9. <https://www.thedailystar.net/backpage/news/coronavirus-scare-all-educational-institutions-shut-till-march-31-1881658>
10. "Bangladesh has extended lockdown by 11 days". *Oman Observer*. April 11, 2020. Archived from the original on April 11, 2020. Retrieved April 11, 2020
11. <https://www.globaltimes.cn/page/202109/1234272.shtml>
12. https://en.wikipedia.org/wiki/List_of_medical_colleges_in_Bangladesh
13. <https://www.dhakatribune.com/bangladesh/education/2020/05/02/covid-19-educational-institutions-engaging-in-online-virtual-classes>
14. Gonzalez T, De La Rubia MA, Hincz KP, Comas-Lopez M, Subirats L, Fort S, Sacha GM. Influence of COVID-19 confinement on students' performance in higher education. *PloS one*. 2020 Oct 9;15(10):e0239490.
15. <https://www.dhakatribune.com/bangladesh/2021/09/02/medical-universities-colleges-and-nursing-institutes-to-reopen-from-september-13-in-phases>.
16. Evans DJ, Bay BH, Wilson TD, Smith CF, Lachman N, Pawlina W. Going virtual to support anatomy education: A STOPGAP in the midst of the Covid-19 pandemic.
17. Dutta S, Smita MK. The impact of COVID-19 pandemic on tertiary education in Bangladesh: students' perspectives. *Open Journal of Social Sciences*. 2020 Sep 4;8(09):53.
18. Pacheco LF, Noll M, Mendonça CR. Challenges in teaching human anatomy to students with intellectual disabilities during the Covid-19 pandemic. *Anatomical Sciences Education*. 2020 Sep;13(5):556-7.
19. Singal A, Bansal A, Chaudhary P, Singh H, Patra A. Anatomy education of medical and dental students during COVID-19 pandemic: a reality check. *Surgical and Radiologic Anatomy*. 2021 Apr;43(4):515-21.

20. Rashid AA, Rashid MR, Yaman MN, Mohamad I. Teaching medicine online during the COVID-19 pandemic: a Malaysian perspective. *Bangladesh Journal of Medical Science*. 2020 Jul 20:77-S.
21. Doubleday EG, O'Loughlin VD, Doubleday AF. The virtual anatomy laboratory: Usability testing to improve an online learning resource for anatomy education. *Anatomical sciences education*. 2011 Nov;4(6):318-26.
22. Peterson DC, Mlynarczyk GS. Analysis of traditional versus three-dimensional augmented curriculum on anatomical learning outcome measures. *Anatomical sciences education*. 2016 Nov;9(6):529-36.
23. Küçük S, Kapakin S, Göktaş Y. Learning anatomy via mobile augmented reality: Effects on achievement and cognitive load. *Anatomical sciences education*. 2016 Oct;9(5):411-21.
24. Barry DS, Marzouk F, Chulak-Oglu K, Bennett D, Tierney P, O'Keefe GW. Anatomy education for the YouTube generation. *Anatomical sciences education*. 2016 Jan;9(1):90-6.
25. Mustafa AG, Taha NR, Alshboul OA, Alsalem M, Malki MI. Using YouTube to learn anatomy: Perspectives of Jordanian medical students. *BioMed research international*. 2020 April 3;2020.
26. Pollock W, Rea PM. The use of social media in anatomical and health professional education: a systematic review. *Biomedical visualization*. 2019:149-70.
27. Jaffar AA, Eladl MA. Engagement patterns of high and low academic performers on Facebook anatomy pages. *Journal of medical education and curricular development*. 2016 Jan;3:JMECD-S36646.
28. Evans DJ, Bay BH, Wilson TD, Smith CF, Lachman N, Pawlina W. Going virtual to support anatomy education: A STOPGAP in the midst of the Covid-19 pandemic.
29. Srinivasan DK. Medical Students' Perceptions and an Anatomy Teacher's Personal Experience Using an e-Learning Platform for Tutorials During the Covid-19 Crisis. *Anat Sci Educ*. 2020:318-9.
30. Byrnes KG, Kiely PA, Dunne CP, McDermott KW, Coffey JC. Communication, collaboration and contagion: "Virtualisation" of anatomy during COVID-19. *Clinical Anatomy*. 2021 Jan;34(1):82-9.
31. Jiang Z, Wu H, Cheng H, Wang W, Xie AN, Fitzgerald SR. Twelve tips for teaching medical students online under COVID-19. *Medical education online*. 2021 January 1;26(1):1854066.
32. Ghosh SK. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. *Anatomical sciences education*. 2017 Jun;10(3):286-99.
33. Estai M, Bunt S. Best teaching practices in anatomy education: A critical review. *Annals of Anatomy-Anatomischer Anzeiger*. 2016 Nov 1;208:151-7.