



Transforming medical education in the COVID-19 pandemic

COVID-19 pandemisinde tıp eğitiminin dönüşümü

Bedriye Sena Aykul¹, Ayşe Nur Sarıoğlu²

¹Ankara University School of Medicine, bsenaaykul@gmail.com 0009-0009-7841-2711

²Bolu İzzet Baysal Devlet Hastanesi, aysenursarioglu@gmail.com, 0009-0001-4235-2413

ABSTRACT

This study aims to explore the transformation of medical education during the COVID-19 pandemic through the lens of online education. The pandemic has presented unprecedented challenges to medical education, forcing institutions to rapidly adopt online platforms to deliver course materials and maintain academic continuity. Using a mixed-methods approach, this study examines the learning preferences of medical students during the pandemic and assesses the challenges faced by educators in implementing online education. The study also investigates the effectiveness of online platform software and its impact on student learning outcomes. Data was collected through surveys and interviews with medical students and faculty members. Results indicate that while online education has been effective in maintaining academic continuity, it has also presented challenges in terms of adapting to new technology and maintaining student engagement. Furthermore, the study found that student response to the pandemic has been mixed, with some students reporting increased motivation and productivity, while others have struggled with the isolation and lack of face-to-face interaction. These findings highlight the need for ongoing evaluation and adaptation of online education in medical education, particularly in the context of a global pandemic.

ÖZ

Bu çalışma, COVID-19 salgını sırasında tıp eğitiminde yaşanan dönüşümü çevrimiçi eğitim merceğinden incelemeyi amaçlamaktadır. Pandemi, tıp eğitimine benzeri görülmemiş zorluklar getirmiş, kurumları ders materyallerini sunmak ve akademik sürekliliği sağlamak için hızla çevrimiçi platformları benimsemeye zorlamıştır. Karma yöntem yaklaşımını kullanan bu çalışma, tıp öğrencilerinin pandemi sırasındaki öğrenme tercihlerini incelemekte ve eğitimcilerin çevrimiçi eğitimi uygularken karşılaştıkları zorlukları değerlendirmektedir. Çalışma ayrıca çevrimiçi platform yazılımının etkinliğini ve öğrenci öğrenme çıktıları üzerindeki etkisini araştırmaktadır. Veriler, anketler ve tıp öğrencileri ve öğretim üyeleriyle yapılan görüşmeler yoluyla toplanmıştır. Sonuçlar, online eğitimin akademik sürekliliği sağlamada etkili olmakla birlikte, yeni teknolojiye uyum sağlama ve öğrenci katılımını sürdürme açısından zorluklar da ortaya çıkardığını göstermektedir. Ayrıca, çalışma, öğrencilerin pandemiye tepkisinin karışık olduğunu, bazı öğrencilerin motivasyon ve üretkenlik artışı bildirdiğini, diğerlerinin ise izolasyon ve yüz yüze etkileşim eksikliği ile mücadele ettiğini ortaya koymuştur. Bu bulgular, özellikle küresel bir pandemi bağlamında, tıp eğitiminde çevrimiçi eğitimin sürekli olarak değerlendirilmesi ve uyarlanması ihtiyacını vurgulamaktadır.

ARTICLE INFO/MAKALE BİLGİSİ

Key Words: COVID-19, Pandemic, Medical Education, Online Learning

Anahtar Kelimeler: COVID-19, Pandemi, Tıp Eğitimi, Çevrimiçi Öğrenme

DOI: 10.5281/zenodo.7985309

Corresponding Author/Sorumlu Yazar: Ankara University School of Medicine, bsenaaykul@gmail.com

Received Date/Gönderme Tarihi: 01.05.2023

Accepted Date/Kabul Tarihi: 30.05.2023

Published Online/Yayımlanma Tarihi: 10.07.2023

INTRODUCTION

The COVID-19 pandemic has had a profound impact on healthcare systems worldwide, including the way medical education is delivered. As the pandemic spread, medical schools and universities were forced to quickly adapt to new ways of teaching and learning, with many institutions turning to online education as a means of delivering courses and programs. While this shift to online learning has presented numerous challenges, it

has also created new opportunities for innovation and transformation in medical education.

In this paper, we examine the impact of the COVID-19 pandemic on medical education and the shift to online learning. We explore the advantages and disadvantages of online education for medical students, as well as the challenges faced by educators and institutions. Through thematic content analysis, we identify key themes and trends related to medical education during



the pandemic. Finally, we discuss the implications of these findings for the future of medical education and the need for flexible and adaptable programs that can respond to unexpected disruptions.

What is Coronaviruses?

Coronaviruses, which excel as zoonotic pathogens, are prone to interspecies transmission and are found in both humans and a variety of animals. Their characteristic feature is a tendency to mutate frequently, which facilitates their adaptation to new hosts and promotes viral diversity. Consequently, this high mutation rate contributes to the wide clinical heterogeneity associated with coronavirus infections, ranging from asymptomatic infection to severe respiratory disease requiring hospitalization in the intensive care unit. (1-3). coronaviruses were not regarded as formidable pathogens in terms of their pathogenicity towards humans. However, the paradigm shifted dramatically with the advent of the severe acute respiratory syndrome (SARS) outbreak in Guangdong province, China. This seminal event highlighted the capacity of coronaviruses to induce severe respiratory distress and propelled intensive research into understanding their mechanisms of pathogenesis and host interactions(3-5).

Among the diverse coronaviruses, CoV OC43 and CoV 229E have emerged as the most extensively studied species due to their frequent association with mild symptomatic infections in individuals possessing competent immune systems. Nonetheless, the emergence of the novel SARS-CoV-2 virus, which precipitated the global Covid-19 pandemic, underscored the potential for coronaviruses to pose unprecedented challenges to public health, surpassing the historical understanding of their limited pathogenicity (3-5).

The SARS-CoV-2 virus, identified in Wuhan, China, in December 2019, precipitated a pandemic with profound implications. Consequently, to mitigate the scarcity of personal protective equipment, medical students' direct patient care activities were discontinued, leading to concerns about potential disparities resulting from optional clinical courses. Face-to-face education was suspended, serving as a pivotal moment for the adoption of online education, previously less prevalent. This transition has prompted inquiries regarding the long-term efficacy and merits of online education.

It is important to highlight the initiatives taken by medical students, across various institutions in the world, to actively contribute to the COVID-19 response. At Harvard Medical School, students established a COVID-19 Medical Student Response Team, engaging in medical and community education as well as activism

to effectively mobilize their peers in combating the COVID-19 crisis. Furthermore, medical students nationwide are actively volunteering at equipment donation centers, offering support to medical personnel by providing sustenance, assisting with childcare, and fulfilling errands for residents and doctors. Utilizing telecommunication tools, some students facilitate patient visits through language translation, while others partake in supervised telemedicine encounters, including virtual antenatal health visits. The remarkable ingenuity and selflessness exhibited by these students in devising means to assist and mobilize resources reflect their unwavering dedication. Their collective sentiment underscores the desire of medical students to contribute and be prepared for future challenges in healthcare(6).

Online Education in Pandemic

As a result of the prevailing circumstances, there has been a widespread transition from traditional face-to-face to online education. In response, most educational institutions have quickly adopted distance learning, choosing the easiest and most accessible methods. These include the use of teleconferencing platforms, e-mail communications, and telephone interactions that enable effective teaching and learning experiences at a remote distance (7).

Online learning can be divided into synchronous and asynchronous learning. Synchronous learning includes options such as video conferencing, audio conferencing, online chat, which allow live interaction between the student and the instructor, while asynchronous learning includes options such as delayed e-mail, forum, and previous video recordings (8).

In a study conducted at the University of Paris, surgical students participated in an online lecture on diverticulitis using the Google Hangouts app, which is freely accessible to everyone and allows students to connect at the right time, similar to regular lectures that are easily found in the app list for Gmail users. All they needed was a webcam and a microphone. They could see and hear the lecturer and also ask questions aloud to the whole group. There was no time limit (8). The overall level of satisfaction with online education was found to be high, and students' attitudes towards online learning as a new teaching method were very positive (9).

Learning Preferences in Pandemic

It is obvious the preferences effected by different roles and generational cohorts. In a separate study conducted at Alfaisal Medical School, 208 respondents participated, including 38 (18.3%) academic staff, 31 (14.9%) postgraduates, and 139 (66.8%) medical students.

The response rates of academic staff, postgraduates, and medical students were approximately 53.5%, 62.0%, and 11.9%, respectively. Of the respondents, 114 (54.8%) reported being female, 125 (60.1%) were born between 1997 and 2012 (Generation Z or Post-Millennials), and 66 (31.7%) were born between 1981 and 1996 (Generation Y or Millennials) (7).

The same study highlight the respondents' level of experience and confidence in online teaching. While a significant proportion of faculty members (57.9%), graduate students (42%), and medical students (37.4%) reported having limited or no prior experience, an overwhelming 70.7% of respondents expressed increased confidence in the effectiveness of online teaching and learning methods during the first weeks of the COVID-19 pandemic. In addition, the majority of respondents (76%) expressed an intention to incorporate the knowledge and skills they had gained from online education during the pandemic into their future teaching and learning approaches (7).

Challenges Faced in the COVID-19 Pandemic:

The table below lists the challenges faced in online education during the pandemic according to participants' responses.

Table 1. Challenges to online education during the COVID-19 pandemic (7) (N=200)

The challenges to online education	n (%)
Connection	118 (59.0)
Evaluation of the students	115 (57.5)
Use of technological and assistive tools (hardware and software).	113 (56.5)
Experience of online education/learning	110 (55.0)
Psychological health (such as stress, anxiety)	96 (48.0)
Adaptation to unfamiliar technology (learning curve)	71 (35.5)
Managing time	70 (35.0)
Evaluation of students by faculty	48 (24.0)
Technophobia	34 (17.0)
Other	9 (4.5)

Case simulations and virtually standardized patients complement face-to-face teaching rather than replacing it, as highlighted by previous research (10). However, online education presents challenges in terms of equitable access and quality of teaching. Some students face limitations in accessing online resources due to the unavailability of laptops or high-speed

internet at home. Additionally, older internet users may encounter difficulties with online education due to technophobia. It is worth noting that technophobia is not limited to students but can also affect lecturers who may feel anxious or lack confidence in utilizing computer hardware and software in their classrooms (7). Addressing these challenges is crucial to ensure inclusivity and effectiveness in online education. Thematic Content Analysis of the Pandemic

The qualitative study used virtual focus group discussions with seven open-ended questions as a discussion guide to involve 60 students from Unaizah College of Medicine and Medical Sciences at Qassim University, United Arab Emirates. The thematic content analysis of the study identified four main themes:

- The effect on education
- How to manage time
- The difficulties encountered
- The preferences for the future (8)

The methods used by Unaizah Medical College and the Faculty of Medical Sciences included lectures, case discussions, online seminars, online laboratory demonstrations (8).

The Paradox of Online Education

In another study, student feedback provided an intriguing insight into the perception of online education. Despite the overall satisfaction expressed by students towards the online platform, nearly 50% of them maintained a preference for the physical classroom over the virtual one (11). This paradoxical finding raises questions about the unique advantages and limitations of each learning environment and highlights the need for further investigation into the factors that contribute to students' preferences in educational settings.

Online Platform Software and Education

The pandemic has seen a remarkable increase in the user base of online education apps such as Zoom, which saw a breathtaking growth from 10 million to 300 million users between December 2019 and April 2020 (12). However, effective participation in online education via video conferencing platforms requires a conducive environment with minimal disruptions and a reliable internet connection. In addition, instructors who were accustomed to the traditional practice of communicating concepts visually by transferring images to a whiteboard now face the challenge of adapting their teaching methods to create compelling online content that effectively conveys the same important points in an online conferencing environment (12). These changes

Themes	Sub-themes	Definition	Example
1 education impact	content conception	Enhancement of education due to better comprehension of knowledge	"Yes, online classes are definitely better than campus-based classes because the recorded lectures are very useful. They have helped me a lot in my academic performance this year."
	Challenges of content perception	Challenges in understanding the information provided online due to variations in the requirement for the content to be acquired by students	"Some lectures in the online sessions were not easy to follow, especially those related to x-rays."
2 Time management	–	Improved planning and utilization of time through online learning	"The online sessions gave me a great opportunity to study and I learned how to manage my time better."
3 Challenges faced	Methodological challenges	Quality control issues in content delivery and execution issues of online learning	"There were too many lessons packed in one day! Honestly, I couldn't study them properly..."
	Technical challenges	Challenges due to technological obstacles of internet connection and poor usage of online tools	"Poor internet connection and software malfunction were frequent technical issues..."
	Behavioral challenges	Barriers to adoption of online learning influenced by individual personality characteristics	"I learn best by seeing and doing so it worked for me"
4 Choices for the future	–	Students' preferences for learning methods for the next academic year	"I have to confess that even though online classes have made my grades better, ..."

in teaching and learning methods underscore the need for educators to acquire new digital skills and adapt their pedagogical approaches to ensure effective online education.

Student Response to the Pandemic

Motivated by their altruistic efforts, students have enthusiastically agreed to volunteer and contribute to both the clinical mission of their school and the broader community by taking on tasks such as assembling home care kits for COVID-19 patients or helping medical professionals care for their children (13). In a notable initiative at the Icahn School of Medicine at Mount Sinai, the establishment of the Medical Corps program has given students the opportunity to actively participate in various tasks, including entering patient orders, writing correspondence, and facilitating communication with patients' families, thereby making a valuable contribution to health care (12). These student-led efforts not only demonstrate their commitment and dedication to serving others, but also underscore the importance of their involvement in addressing the multifaceted challenges posed by the current health care crisis. In addition, such initiatives provide invaluable opportunities for students to gain practical experience and develop important skills while supporting the

health care system and fostering collaboration within the medical community. At a university in Denmark, 31% of medical students (142 students) worked in nine pandemic emergency departments (14). In the UK, HealthSHIP helped students with childcare, "National Health Supporters" or "Helping Hands" helped deliver medicines to elderly and vulnerable patients, MedSupplyDriveUK helped coordinate the distribution of personal protective equipment, "Becoming a Doctor" team members ensured accurate information flow, and St. George's University students translated Covid-19 guidelines into various languages to close health inequalities (15).

In the US, they volunteered at equipment donation centers, food drives, providing childcare for medical staff, grocery shopping for residents and doctors, translating patient visits, and participating in supervised telemedicine visits such as prenatal health visits (6).

CONCLUSION

In conclusion, the COVID-19 pandemic has significantly impacted medical education worldwide, forcing a rapid shift to online learning. While online education has presented challenges for students and educators alike, it has also brought new opportunities and innovative solutions. The pandemic has highlighted the need for

flexible and adaptable medical education programs that can respond to unexpected disruptions.

Moving forward, it is important to continue to evaluate the effectiveness of online education and to develop strategies to address the challenges it presents. As the pandemic continues and new ones may arise, the medical education community must continue to work together to ensure that medical students receive high-quality education and training, regardless of the circumstances. By embracing new technologies and approaches, we can transform medical education and prepare the next generation of healthcare professionals for the challenges they will face.

REFERENCES

1. Woo PC, Huang Y, Lau SK, Yuen K-Y. Coronavirus genomics and bioinformatics analysis. *Viruses*. 2010;2(8):1804-1820.
2. Drexler JF, Gloza-Rausch F, Glende Jr, Corman VM, Muth D, Goettsche M, et al. Genomic characterization of severe acute respiratory syndrome-related coronavirus in European bats and classification of coronaviruses based on partial RNA-dependent RNA polymerase gene sequences. *Journal of Virology*. 2010;84(21):11336-11349.
3. Yin Y, Wunderink RG. MERS, SARS and other coronaviruses as causes of pneumonia. *Respirology*. 2018;23(2):130-137.
4. Peiris J, Lai S, Poon L, Guan Y, Yam L, Lim W, et al. Coronavirus as a possible cause of severe acute respiratory syndrome. *The Lancet*. 2003;361(9366):1319-1325.
5. Peiris JS, Guan Y, Yuen K. Severe acute respiratory syndrome. *Nature Medicine*. 2004;10(Suppl 12):S88-S97.
6. Rolak S, Keefe AM, Davidson EL, Aryal P, Parajuli S. Impacts and challenges of United States medical students during the COVID-19 pandemic. *World Journal of Clinical Cases*. 2020;8(15):3136.
7. Rajab M, Gazal A, Alkattan K. Challenges to online medical education during the COVID-19 pandemic. *Cureus*. 2020; 12 (7): e8966-e8976.
8. Khalil R, Mansour AE, Fadda WA, Almisnid K, Aldamegh M, Al-Nafeesah A, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. *BMC Medical Education*. 2020;20:1-10.
9. Moszkowicz D, Duboc H, Dubertret C, Roux D, Bretagnol F. Daily medical education for confined students during coronavirus disease 2019 pandemic: A simple videoconference solution. *Clinical Anatomy*. 2020;33(6):927-928.
10. Iancu AM, Kemp MT, Alam HB. Unmuting medical students' education: utilizing telemedicine during the COVID-19 pandemic and beyond. *Journal of Medical Internet Research*. 2020;22(7):e19667.
11. Singh K, Srivastav S, Bhardwaj A, Dixit A, Misra S. Medical education during the COVID-19 pandemic: a single institution experience. *Indian Pediatrics*. 2020;57:678-689.
12. Hilburg R, Patel N, Ambruso S, Biewald MA, Farouk SS. Medical education during the coronavirus disease-2019 pandemic: learning from a distance. *Advances in Chronic Kidney Disease*. 2020;27(5):412-417.
13. Gallagher TH, Schleyer AM. "We signed up for this!" - student and trainee responses to the COVID-19 pandemic. *The New England Journal of Medicine*. 2020;382(25):e96.
14. Rasmussen S, Sperling P, Poulsen MS, Emmersen J, Andersen S. Medical students for health-care staff shortages during the COVID-19 pandemic. *The Lancet*. 2020;395(10234):e79-e80.
15. Kinder F, Harvey A. Covid-19: the medical students responding to the pandemic. *BMJ*. 2020;369.