

COVID-19 and Medical Education in Africa: A Cross Sectional Analysis of the Impact on Medical Students

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Abstract

Background: The African continent currently experiences 25% of the global burden of disease with only 1.3% of the world's healthcare workers. The COVID-19 pandemic has caused unprecedented disruption to medical education systems, increasing the strain on already-vulnerable regions. Our study examines the impact of COVID-19 on medical students across 33 countries in the African continent.

Methods: A 39-item anonymous electronic survey was developed and distributed to medical students across Africa through social networks to assess the impact of the COVID-19 pandemic on medical education. The survey assessed the domains of: class structure changes and timing, patient interactions, exam administration, learning environment satisfaction, mental health impacts, and volunteer opportunities/engagement.

Results: 694 students across 33 countries participated. 88% of respondents had their classes suspended for varied lengths of time during the pandemic, and from these students 51% of them resumed their classes. 83% of students felt they were in a supportive learning environment before the pandemic, which dropped to 32% since the start. The proportion of students taking exams online increased (6% to 26%, $p < .001$) and there was a corresponding decrease in the proportion of students seeing patients as a part of their education (72% to 19%, $p < .001$).

Conclusion: COVID-19 is harming medical students in Africa and is likely to worsen the shortage of the future's healthcare workforce in the region. Pandemic-related impacts have led to a degradation of the learning environment of medical students. Medical schools have shifted online to differing degrees and direct patient-care in training of students has decreased. This study highlights the urgent need for flexible and innovative approaches to medical education in Africa

Background

The pandemic-related disruption to medical education has worrisome implications for global public health. In Africa, 1.3% of the world's health care workers (HCW) care for people who experience 25% of the global burden of disease (1). Africa has 2.3 HCW per 1000 population, compared with 25 per 1000 in the Americas. Estimates suggest that the current training is insufficient to even maintain the current density of HCW (2). This shortage is likely to be exacerbated in parts of the world less able to adapt their medical education systems to the demands of the COVID-19 pandemic. At the time of writing, Covid-19 has infected over 125 million people with over 2.7 million deaths, causing unprecedented disruption to health and education systems (3). 11 countries in Africa lack even a single medical school, and 24 countries have only one medical school (4). To date, there is no comprehensive information about the impact of COVID-19 and related mitigation measures on medical education in Africa. Our study serves to fill this gap by examining the impact of the pandemic on medical students across the African continent.

According to UNESCO, at its peak, the pandemic affected over 75% of students across the world, with a higher percentage impacted in Africa (5). The reactions of medical school administrators to this

unprecedented stressor have varied, ranging from pausing all educational activities, to graduating students early to assist in fighting the pandemic (6,7). Additionally, E-learning has emerged as a central strategy in continuing education in the era of COVID-19 (8). However, many low- and lower-middle income countries (LMIC) struggle with e-learning due to challenges with infrastructure, resource availability, communication, and social barriers (9). A recent review of the transition to e-learning in pharmacy schools in Africa found numerous barriers related to poor accessibility in rural areas, high cost of internet data, and poor infrastructure in many areas (10,11).

Furthermore, students are likely to face new challenges in the learning environment. Even before the pandemic, medical students were already at a greater risk for mental health problems than their matched peers (12). The shift away from in-person education deprives students of social and professional interactions to the possible detriment of their education and mental well-being and we must understand the ways the pandemic has impacted student's learning environment.

Disruptions in medical training have the potential for largely detrimental impacts on the public health of a region already facing a disproportionate burden of disease. A thorough understanding of the disruption caused by the COVID-19 pandemic is necessary for the development of policies to limit the harm of this and future stressors to ensure the continued health of a region already facing a devastating shortage of trained providers. We examine medical student perspectives of the impact of the pandemic on their medical education across various domains in order to inform the development of future policy.

Methods

Study Design: Experts in survey methodology and medical education at the University of Michigan Medical School developed a 39-item survey assessing the following domains: class structure changes and timing, patient interactions, exam administration, learning environment satisfaction, mental health impacts, and volunteer opportunities/engagement. The survey was composed of Likert scale, dichotomous, and free-response items. It was modified with the assistance of students in St. Paul's Millennium Medical College through pilot administration and cognitive interviewing to ensure readability and ease of understanding in multiple countries. Full survey available in supplemental appendix 1. IRB approval was granted via St. Paul's Millennium Medical College Institutional Review Board. All research was performed in accordance with the Declaration of Helsinki and approved by an appropriate ethics committee. Informed consent to participate was elicited prior to survey administration with an option to opt-out prior to survey administration.

Survey Distribution: This anonymous electronic survey was sent to medical students across African countries to assess the impact of the COVID-19 pandemic on medical students (Google Forms, CA). Survey administration took place from September 15th to October 5th, 2020. The survey was widely distributed throughout Africa via the International Federation of Medical Students Association social network groups, including Facebook, WhatsApp, and Telegram. Participants were medical students, ranging from pre-clinical to final year medical students.

Data Analysis

Quantitative analysis was completed using SPSS version 27. Descriptive statistics were calculated for sociodemographic variables, as well as responses to each survey question. A Wilcoxon Signed Rank test was used to assess the differences between pretest and posttest responses. A Mann-Whitney U test was used to determine the pandemic's impact on students' mental health. Responses were analysed in aggregate.

Results

Sociodemographic information of survey respondents is shown in Table 1. 694 students participated in our study. Students participated from 33 countries in Africa and a majority of students were between 20 and 24 years of age, with an equal amount of male and female students. Most students were between their second and fifth years of medical school. The locations of medical students represented in our sample are shown in Figure 1.

Table 1: Sociodemographic information for the study sample

Age	
18-19 years	41 (6.5%)
20-21 years	165 (26.4%)
21-22 years	224 (39%)
23-24 years	184 (29.2%)
>24 years	127 (20.1%)
Sex	
Male	313 (48.7%)
Female	73 (49.6%)
Prefer not to say	11 (1.7%)
Current Enrolment Year	
Year 1	32 (5%)
Year 2	98 (15.4%)
Year 3	158 (24.7%)
Year 4	157 (24.6%)
Year 5	118 (18.5%)
Year 6	52 (8.1%)
>Year 6	23 (3.6%)

Educational Disruption due to COVID-19:

When asked about disruptions to their education, the majority of students, 88%, had their classes suspended during the pandemic, and from these students 51% of them resumed their class by the time of the study. 66% of students reported online classes since the start of the pandemic, with 18% reporting hybrid classes. 16% of students continued or resumed their education in person. Table 2 shows responses to survey variables.

Table 2: Education Disruption and Format Changes

Classes Suspended	
<i>Yes</i>	556 (88.2%)
<i>No</i>	76 (11.8%)
Classes Resumed	
<i>Yes</i>	331 (51.4%)
<i>No</i>	313 (48.6%)
Class Format after Resumption (for students with suspended classes)	
<i>Online</i>	232 (66.1%)
<i>In-Person</i>	56 (16%)
<i>Both in-person and online</i>	63 (17.9%)
Class Format after change (for students with no suspended classes)	
<i>Online</i>	38 (60.3%)
<i>In-Person</i>	20 (31.7%)
<i>Both in-person and online</i>	5 (7.9%)

Perspective of Learning Environment before and after COVID-19 related disruptions:

Students were asked about the learning environment. Overall, before the pandemic 83% of students felt they were in a supportive learning environment and since the pandemic, only 32% felt they were in a supportive learning environment. Even of the students who felt they were in a supportive learning environment before the pandemic, 67% felt that they were not in a supportive environment since the pandemic began. Table 3 outlines overall satisfaction with learning environment before and after pandemic related changes to the curriculum.

Table 3: Learning Environment Prior and Since COVID

Supportive Learning Environment - Prior to COVID	
<i>Yes</i>	526 (83.1%)
<i>No</i>	107 (16.9%)
Supportive Learning Environment - Since COVID	
<i>Yes</i>	196 (31.3%)
<i>No</i>	430 (68.7%)
Feel Safe with School's Response to COVID	
<i>Yes</i>	351 (55.3%)
<i>No</i>	284 (44.7%)

Specifically, students were asked about their satisfaction levels with varying aspects of the teaching environment before and during the Covid-19 pandemic (Table 4). After the start of the pandemic, 33% of students reported being “very dissatisfied” or “dissatisfied with the ease of reaching faculty for questions compared with 8% of students reporting dissatisfaction before the pandemic ($p < .001$). Before Covid-19, 6% of students reported dissatisfaction with faculty engagement. In contrast, since the start of the pandemic 37% of students were dissatisfied with faculty preparedness for classes. Figure 2 shows the change in satisfaction levels with aspects of the learning environment and the changes in online exams.

Table 4: Response data for participants before and during the Covid-19 pandemic

	Before Covid	Since Covid	p
Satisfaction with...			
Faculty Engagement			
<i>Very dissatisfied or dissatisfied</i>	36 (5.7%)		
<i>Neither satisfied or dissatisfied</i>	101 (16.2%)		
<i>Very satisfied or satisfied</i>	487 (78%)		
Reaching Faculty for Questions			
<i>Very dissatisfied or dissatisfied</i>	47 (7.7%)	253 (32.5%)	<.001
<i>Neither satisfied or dissatisfied</i>	101 (16.5%)	170 (28.6%)	
<i>Very satisfied or satisfied</i>	465 (75.8%)	172 (28.9%)	
Time Available for Academics			
<i>Very dissatisfied or dissatisfied</i>	107 (17.4%)	153 (25.6%)	<.001
<i>Neither satisfied or dissatisfied</i>	106 (17.2%)	190 (31.8%)	
<i>Very satisfied or satisfied</i>	403 (65.5%)	255 (42.6%)	
Volume of Material			
<i>Very dissatisfied or dissatisfied</i>	101 (16.4%)	196 (33.3%)	<.001
<i>Neither satisfied or dissatisfied</i>	123 (20%)	179 (30%)	
<i>Very satisfied or satisfied</i>	390 (63.6%)	219 (36.7%)	
Peer-to-Peer Learning			
<i>Very dissatisfied or dissatisfied</i>	59 (9.6%)	267 (44.5%)	<.001
<i>Neither satisfied or dissatisfied</i>	69 (11.2%)	168 (28%)	
<i>Very satisfied or satisfied</i>	487 (79.1%)	166 (27.7%)	
Flexibility of Time			
<i>Very dissatisfied or dissatisfied</i>	143 (23.3%)		
<i>Neither satisfied or dissatisfied</i>	155 (25.2%)		

<i>Very satisfied or satisfied</i>	317 (51.5%)
Faculty Preparation for Classes	
<i>Very dissatisfied or dissatisfied</i>	221 (36.6%)
<i>Neither satisfied or dissatisfied</i>	197 (32.6%)
<i>Very satisfied or satisfied</i>	187 (31%)
<i>p-values calculated with Wilcoxon signed rank test</i>	

When asked about other aspects of the learning environment, 26% were dissatisfied with time available for academics, compared with 17% before the pandemic began ($p < .001$). 33% of students were dissatisfied with the volume of material, compared with 16% before the pandemic ($p < .001$). Students were also more dissatisfied with peer-to-peer learning opportunities, with 45% reporting dissatisfaction compared with only 10% before the pandemic ($p < .001$)

Curricular Structure Changes related to COVID-19 Pandemic.

Students reported several changes to the structure of their education. The proportion of students taking exams online increased from 6% to 26% since the start of the pandemic ($p < .001$). There was a corresponding decrease in the proportion of students seeing patients as a part of their education, from 72% to 19% ($p < .001$). (Table 5)

Table 5: Curricular Changes

Interacting with Patients	Before covid	Since Covid	P value
<i>Yes</i>	455 (71.8%)	122 (19.2%)	$< .001$
<i>No</i>	179 (28.2%)	496 (80.3%)	
Exams Administered online	38 (6.1%)	158 (25.8%)	$< .001$
<i>p-values calculated with Wilcoxon signed rank test</i>			

Effect of Pandemic Related Changes to Mental Health:

Students reported differering impacts of the pandemic on their mental health, with 44% reporting a negative change in their mental health, 23% reporting a positive change,

and 34% reporting no change (table 6). Class suspensions were not significantly assoicated with impact on mental health ($p = 0.332$).

Table 6: Mental Health Impacts.

Mental Health Impacts	
<i>Extremely negative or negative</i>	279 (43.6%)
<i>Neither positive or negative</i>	214 (33.5%)
<i>Extremely positive or positive</i>	146 (22.8%)

Discussion

COVID-19 and associated mitigation measures are harming medical students in Africa, a region already suffering from a severe shortage of trained healthcare workers. The disruption to medical education appears to be different from that in high-income countries (HIC) countries such as the United States, where medical schools are able to follow guidance from the Association of American Medical schools. This guidance included a temporary pause to in-person clinical rotations and shift towards online education (13). Standards and timelines for testing and graduation requirements were rearranged to meet the demands of the pandemic while ensuring continued focus on learner progress (14). Medical students in African countries may have suffered from a lack of similar templates to follow. In contrast to the responses in HIC, the responses across the African continent were more uneven, with many schools remaining closed for the duration of our survey period. Between March and July 2020, temporary mandates to close all universities (including medical schools) were issued in 44 of 54 countries in Africa (15,16). Our results add to this context, indicating that majority of medical students had their medical schools closed, for widely divergent lengths of time due to the pandemic, with many students not able to resume their medical education even after several months. Delays and cancellations of medical training have already caused some delay in the entrance of physicians into the workforce and this problem is likely to continue without intervention (16).

The pandemic related changes to medical education have likewise been detrimental to the environment for students. Even among those who were able to continue their education, the majority felt they were not in a supportive learning environment after the start of the pandemic. This is in direct contrast to their views before the pandemic. Many students were more dissatisfied with all aspects of the educational environment, including availability of faculty for questions and their preparedness for classes and around half felt unsafe with their schools' response to the pandemic. These findings confirm the myriad challenges facing teaching faculty at medical training institutions in Africa from COVID-19 and represent a significant opportunity to improve the learning environment. Most medical schools receive governmental grants to fund research and salary for their medical faculty and the projected economic contraction on the African continent is likely to cause limitations in funding for faculty members, further exacerbating the challenges in the learning environment (16).

Students across Africa endorsed a shift to online learning and exams, although this transition appears to be less drastic than in HIC (17). The large increase in online testing speaks to the need for robust and reliable internet access and online programming in Africa. Even before COVID-19, there had been a shift towards technology-integrated learning and self-directed work in many medical schools across the world. The pandemic has accelerated these trends, with varying levels of success (18). However, many countries within Africa lack the reliable broadband access, consistent electricity and advanced smartphones necessary to access online learning content (19,20). There is a need to accommodate this accelerated trend to ensure adequate training of the healthcare workforce, particularly in Africa, where barriers to online learning have the potential to derail this trend.

The challenges in medical school have had a direct impact on student wellbeing. About half of students felt that the pandemic negatively impacted their mental health, a finding consistent with a recent global survey of young people that found a majority believe that the pandemic, school closures, and restricted social connections worsened pre-existing mental health conditions (21). One contradicting finding was that around a quarter of respondents endorsed a positive change in their mental health due to the pandemic. It is possible that these students may have benefited from the temporary lessening in their educational responsibilities, but this remains an area for further research.

Our study had several important limitations. We distributed our survey through student networks, and our response rate varied by country and school, with some medical schools providing few respondents. This may be partially due to the variations in medical school prevalence, with 24 countries in sub-Saharan Africa having only one medical school, and 11 countries having no medical schools (4). Our data represents a snapshot of the experience of medical students in Africa to the unprecedented global stressor of COVID-19 and speaks to the need for a deeper assessment of individual-country responses.

Conclusion

The response of medical schools to the COVID-19 pandemic has the potential to represent a transformational shift in education; a shift toward increased flexibility and adaptability, internet-based learning, and curricular innovation. However, this study highlights the urgent need for flexible and innovative approaches to continuing medical education in Africa. Without an effective mitigation strategy, the current disruption in medical training has the potential to impact medical care and the availability of healthcare workers across the continent in the years to come.

Declarations

Ethics approval and consent to participate.

IRB approval was granted via St. Paul's Millennium Medical College Institutional Review Board. All research was performed in accordance with the Declaration of Helsinki and approved by an appropriate

ethics committee. Informed consent to participate was elicited prior to survey administration with an option to opt-out prior to survey administration.

Consent for Publication:

Not applicable.

Availability of Data and Materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests:

The authors declare that they have no competing interest.

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Not applicable

Author's Contribution:

AB contributed to study design, study concept, manuscript review, assisted with data analysis, significant contributed to manuscript preparation and writing, and assisted with statistical analysis of the data. GI contributed to study design, study concept, manuscript review, data analysis and significantly contributed to manuscript preparation and writing. NB contributed to the study design, study concept, manuscript review, data analysis and significantly contributed to manuscript preparation and writing. AN contributed to survey design and coordinated the distribution among medical students in Africa, and assisted with manuscript review. DT contributed to survey design, coordinated the distribution among medical students in Africa, and assisted with manuscript review. BA contributed to survey design, coordinated the distribution among medical students in Africa, and assisted with manuscript review. EH conducted statistical analysis of the data and assisted with manuscript review.

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Figures

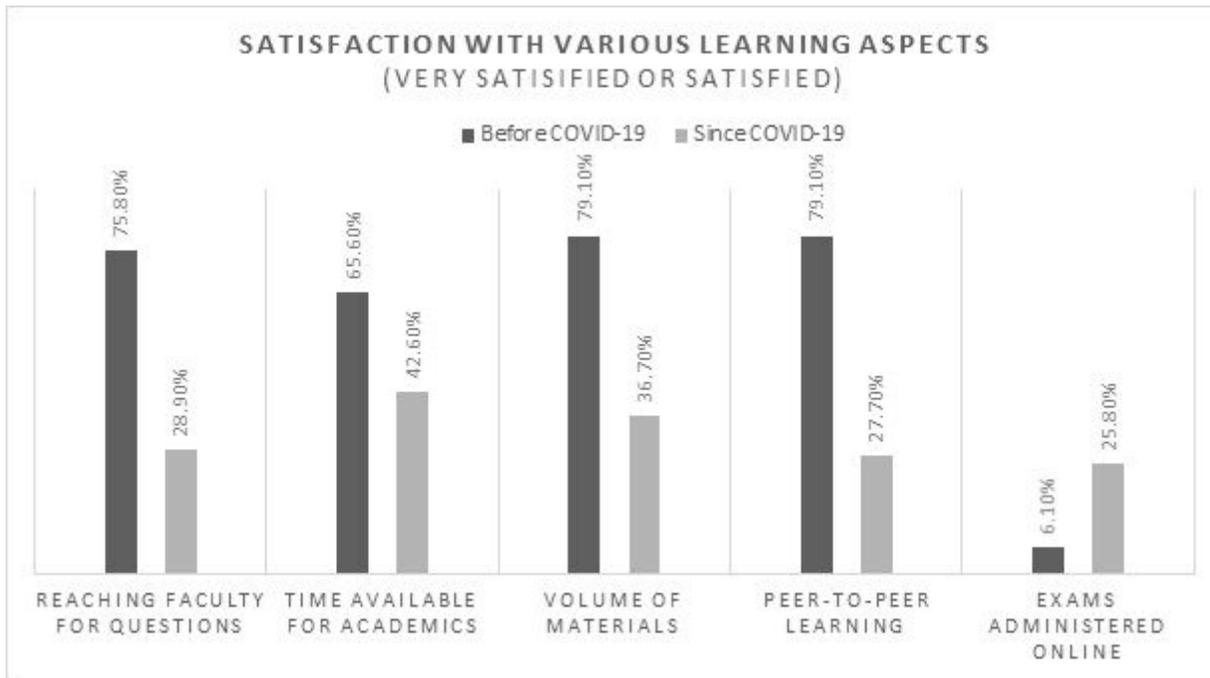


Figure 2

Proportion of sample reporting high satisfaction with various aspects of the learning environment and proportion of exams administered online before and after the start COVID-19 pandemic.

Supplementary Files

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- [SupplementalAppendix1.docx](#)