

Original Article**The Impact of COVID-19 on The Teaching of Non-Medical Healthcare Professionals in Bangladesh: Observations and Implications From A Pilot Study**

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Abstract

Objective: At the start of the Covid-19 pandemic, educational establishments, including universities, were closed. Educators in high-income countries quickly shifted all education online, building on available infrastructures and approaches. However, there were concerns in developing countries regarding the necessary skills among students and faculty as well as financial support for equipment and the internet. Consequently, a pilot was undertaken in Bangladesh to determine the impact of Covid-19 on the non-medical education system, building on similar research with healthcare professionals. **Materials and Methods:** A purposively designed questionnaire was disseminated among eight non-medical healthcare educators in private and public universities in Bangladesh. **Results and Discussion:** Private university educators reported their universities readily adopted e-learning systems and resumed classes more quickly than public universities. Both private and public university educators shared similar challenges, including a lack of training on e-learning initially, variable internet connections, affordability of internet bundles, concerns with available devices, as well as mental stress of faculty and students. Private universities reduced their tuition fees, extended submission deadlines, and shared class recordings to address challenges. Public universities arranged student loans, established Covid-19 testing centers, and the trained students in biosafety practices and molecular tests to volunteer in testing facilities. **Conclusion:** Lessons learned from the pandemic emphasize introducing hybrid education systems with full technological and financial support, alongside biosafety education in the curriculum.

Keywords: Bangladesh, e-learning, non-medical healthcare educators, Covid-19, hybrid education system.

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Introduction

Covid-19 is a highly pathogenic contagious viral disease that has resulted in severe morbidity and mortality across countries^{1,2}, resulting in over 516 million cases and over 6 million deaths by 13 May 2022³. In the absence of effective treatments for the prevention and management of patients with Covid-19 at the start of the pandemic, including effective vaccines, countries typically introduce a variety of lockdown and other measures to control its spread⁴⁻⁸. However, the rapidity of their implementation, coupled with the stringency of their enforcement, impact morbidity and mortality rates in practice across countries, certainly in the early phase of the pandemic^{4,9-12}. Bangladesh was no exception introducing several lockdowns and other measures at the start of the pandemic^{13,14}. Initiatives included the closure of educational establishments, including universities¹³⁻¹⁶, with these measures subsequently having an appreciable impact on educational sectors

^{14, 17}. Universities typically need to postpone or immediately cancel all campus-related activities. All face-to-face teaching-learning programs and other academic activities, such as conferences, workshops, and sports activities, were also typically halted in the initial days following the Covid-19¹⁶⁻¹⁹. Subsequently, globally traditional face-to-face teaching was replaced by online or e-learning programs across countries¹⁹⁻²¹.

Online education, or e-learning, is a subcategory of a distance learning system that denotes educational models utilizing information technologies to provide teaching-learning instruction to pupils in variable locations, which was necessary following the closure of universities^{22,23}. However, this raised many issues, especially among low- and middle-income countries (LMICs), which included inadequate training of faculty members beforehand in e-learning techniques, affordability of internet bundles and computer equipment among students, and quiet locations for

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studying (Figure 1) ^{19,21,24,25}. This was less of an issue among high-income countries with typically greater utilization of online teaching-learning instructional

methods before the pandemic, better availability of necessary equipment, and affordability of internet bundles ^{20,21, 26-28}.

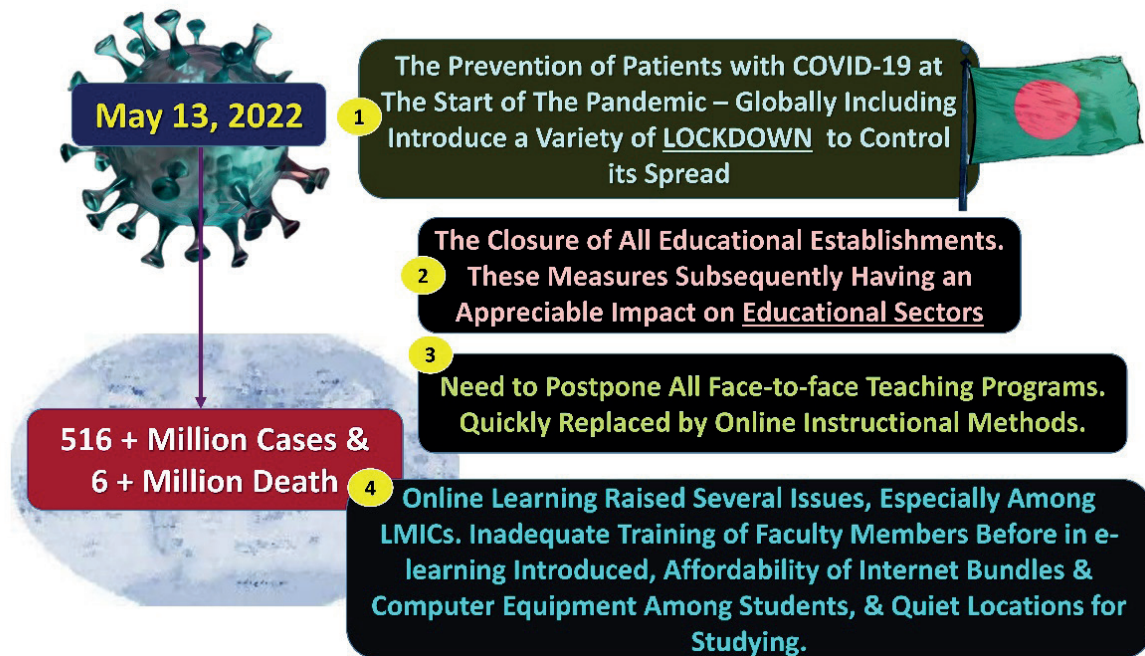


Figure 1: Lockdown Consequences in Educational Institutes.

It has been reported that Bangladesh and many other LMICs had limited experience with online learning at the start of the Covid-19 pandemic among academic staff and students and poor internet access, and high prices for the internet ^{19, 21, 29}. Other studies have revealed that improved faculty training on e-learning among LMICs, students supported financially to purchase the necessary equipment and internet bundles, launching Covid-19 prevention protocols including providing protective equipment, video-recorded lectures, tutorials to make up for a lost time, and simulated methods to teach clinical aspects, have all helped address identified barriers, with hybrid approaches to learning likely to stay ^{19, 21, 30-32}. Other identified issues include addressing stress and mental health issues ^{16, 19, 23}.

It is essential in LMICs, including Bangladesh, with its high burden of infectious and non-infectious diseases ^{10, 13, 16, 33-37}, to ensure healthcare professionals (HCPs), including non-medical, are fully trained on graduation. The alternative is continued increases in morbidity, mortality, and associated costs with inappropriate use of antimicrobials and sub-optimal management of chronic non-communicable diseases,

including diabetes ³⁷⁻⁴².

Consequently, this study aims to assess non-medical HCP academic staff perceptions regarding the current challenges of Covid-19 on online teaching systems. This builds on the earlier study regarding dental and medical education in Bangladesh following the closure of universities in Bangladesh and similar studies in other LMICs ^{16,19,21,31,43}.

2. Materials and Methods

2.1. Approach

This study used a pragmatic approach to ascertain and review challenges and difficulties regarding teaching non-medical HCPs at the start of the pandemic ⁴⁴⁻⁴⁶. This is because pragmatism allows an adaptable and thoroughly instinctive research strategy, thereby logically holding deductive and inductive form judgments ^{47, 48}. Consequently, we believed the current research methodology was the most relevant to address such critical research questions ⁴⁹.

Non-probability sampling was utilized for this pilot study based on the expert knowledge of the co-authors, who are themselves non-medical health

professional educators. This improved the capacity to acquire a rich data source from a limited sample^{50,51}. To augment the study's credibility, transferability, and dependability, a data source triangulation method was used with participants from non-medical and other health professional disciplines⁵²⁻⁵⁴. The initial sample of eight participants included five educators from public and three from private universities to ensure complete coverage, similar to the previous pilot study in Bangladesh¹⁶. The participants covered various subjects, including microbiology, pharmacy, Biotechnology & Genetic Engineering. No students participated in this pilot study as we wanted to gain an understanding from the educators first.

A qualitative semi-structured questionnaire was adopted based on recent research conducted among African and Asian countries^{16, 19, 43}. Respondents had enough time to construct and amend their answers before being sent back^{14, 55}. Participants were encouraged to remain in constant communication with the researchers to clarify any details regarding the research as needs arose.

The questionnaire consisted of four main open-ended questions coupled with prompt questions. The main questions focused on the challenges presented by the Covid-19 pandemic, the response and support the educators and their universities provided to address them, and lessons learned for future pandemics. These four questions included:

- I. What challenges has Covid-19 presented to HCP education in Bangladesh?
- II. How did your university/institution respond immediately to the challenges presented by the Covid-19 pandemic?
- III. What support was harnessed to help mitigate the challenges faced by your higher learning institution?
- IV. What lessons can be learned to prepare HCP educators for non-medical HCPs in Bangladesh for future pandemics?

2.2. Analysis

A framework method of data analysis was applied, similar to previous studies^{16,19,43}, which provides a detailed outline of individual observations and enables themes to develop deductively and emerge inductively from participants' experiences and views^{56,57}.

The main themes from the responses were predetermined deductively by the research questions and stored using different sheets of Microsoft Excel. The further analysis relied on inductive reasoning in which sub-themes emerged through repeated evaluation of the questionnaire data. Initially, one research team member independently coded the responses (KC) from the same eight questionnaires and subsequently developed a set of codes to form the initial analytical framework. Some of the codes were later grouped into categories. Several codes were subsequently mapped using diagrams to explore the relationship between the subthemes. In addition, patterns among the different types of participants were identified.

2.3 Ethical Considerations

Ethical approval was not needed for the study, similar to other pilot studies and similar studies conducted by the co-authors in the absence of patients^{9,10,13,16,19,40,43,58-60}. However, written informed consent was taken from the participants before starting the pilot project to ensure that they fully comprehended all aspects of the study and voluntarily agreed to participate. Participants were subsequently informed that their identities would be kept confidential, guaranteeing respect for autonomy and trust.

3. Results

We will first document the participants' demographic details (Table 1) before discussing key and additional challenges faced by the non-medical HCPs at the start of the pandemic (Tables 2 and 3).

Table 1: Demographic Characteristics of Participants.

University	Type of University	Department
Jahangirnagar University	Public	Microbiology
Noakhali Science and Technology University	Public	Microbiology
Mawlana Bhashani Science and Technology University	Public	Pharmacy
Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj	Public	Biotechnology & Genetic Engineering
Comilla University	Public	Pharmacy
BRAC University	Private	Pharmacy
Stamford University	Private	Microbiology
Prime Asia University	Private	Microbiology

Table 2 discusses the top six challenges reported by faculty members teaching non-medical HCPs at the pandemic based on their replies to the various questions. Table 3 discusses additional challenges that emerged from the study.

Table 2: Summary of Top Six Challenges Reported by participating HCPs

Institutions	Top six responses					
	Lack of practical training	Interruption of research project due to scarcity of funding	One-way interaction	Fear and anxiety	Lack of training on e-learning	Poor Internet Connection
Public-1	√			√	√	
Public-2	√	√		√		
Public-3		√	√	√		√
Public-4		√			√	√
Public-5	√	√	√			
Private-1						√
Private-2			√		√	
Private-3	√		√	√	√	

Table 3: Additional challenges Faculty members and students face at the start of the pandemic.

Questions	Non-Medical Health Care Professional Institutions		Total
	Public	Private	
Did all students have access to the necessary equipment, e.g., computers, etc.,	No (5, 100%)	No (3, 100%)	No (8, 100%)
Could all students afford the various internet bundles to undertake eLearning	No (5, 100%)	Yes (1, 33.33%) No (2, 66.67%)	Yes (1, 12.5%) No (7, 87.5%)
Any courses/ tutorials instigated early in the pandemic for the teachers to become familiar with new platforms such as Zoom.	Yes (2, 40%) No (3, 60%)	Yes (2, 66.67%) No (1, 33.33%)	Yes (4, 50%) No (4, 50%)
Were there any challenges with students undertaking eLearning at home	Yes (5, 100%), e.g., poor Internet connection, family chaos, costly Internet bundles, inadequate devices, conflicting time schedules	Yes (3, 100%) Mainly internet and technical issues	Yes (8, 100%)
Due to the pandemic, have any support services been introduced for students and lecturers?	Yes (2, 40%), e.g., loans for students and teachers to buy ICT products and arrangement of online class No (3, 60%)	Yes (3, 100%) e.g., Counselling and mental motivation, Deadline relaxation for tuition fee submission, arrangement of online class, class recording, tuition waiver	Yes (5, 62.5%) No (3, 37.5%)

There were various immediate responses to the challenges of e-learning and taking safety measures among the educators and students. These included concerns among students with the potential financing of home computers/smartphones and internet bundles. In addition, addressing limited knowledge regarding e-learning approaches among faculty members at the start of the pandemic (Table 4).

Table 4: Summary of Top Six Immediate Responses among the non-medical HCP educators at the start of the pandemic.

Institutions	Top Six Responses					
	Online classes and exams on theory courses	Training of faculty members on online teaching	Covid-19 awareness program and training	Student loan	Started manufacturing hand sanitizers	Establishment of the COVID-19 test center, including the availability of rt-PCR test
Public-1	√	√				
Public-2		√	√		√	
Public-3		√				√
Public-4			√	√	√	
Public-5	√	√				
Private-1	√					
Private-2	√					
Private-3			√			√

There were several responses among the universities to assist students and faculty members with e-learning approaches during the initial stages of the pandemic. These are summarized in [Table 5](#).

Table 5: Examples of Support and Other Measures among the Targeted Universities in Bangladesh in Response to The Pandemic.

Support	Total Number and Percentage (n = 8)	Number of Universities	
		Public	Private
Financial support for students	5 (62.5%)	Public	2
		Private	3
Shifting the in-person class system into digital teaching-learning	4 (50%)	Public	3
		Private	1
Several psychological support campaigns for mentally stressed students	2 (25%)	Public	1
		Private	1
Providing training to faculties for digital teaching-learning system	2 (25%)	Public	2
		Private	0
Arrangement of online webinars, workshops, etc. to exchange knowledge	2 (25%)	Public	1
		Private	1
Computers and mobiles were made more accessible for the faculty members	1 (12.5%)	Public	0
		Private	1
Awareness program among teachers, students, and community members regarding prevention of COVID 19 transmission	1 (12.5%)	Public	1
		Private	0

Examples of financial support mentioned by the participants included reduced accommodation fees,

arrangements of loans to students to enable them to buy ICT devices, and reduced tuition fees (25%) to support the internet costs.

There were also several lessons learned about educating non-medical HCPs students during the early stages of the pandemic (Table 6). These developments facilitate hybrid learning approaches in the future, with such strategies likely to stay.

Table 6: Lessons learned among personnel from the eight Universities.

Colleges	Lessons Learned
Public 1	<ul style="list-style-type: none"> • There should have a dedicated infection control unit for each higher learning institution • Teachers, students, and nearby communities should be trained periodically about potential pandemic infection control measurements. • The infrastructure of the virtual education system should be built properly so that education can be continued in any unforeseen pandemic situation • Some subsidized digital equipment should be made available for students during any future pandemic • Sufficient training should be provided to teachers and students so that they can rapidly adapt to digital teaching-learning in any future pandemic
Public 2	<ul style="list-style-type: none"> • Online based education advancement • Universities' website improvement • Developing international communication and collaboration to learn from each other • Funding extension for education sectors • Research laboratory build-up
Public 3	<ul style="list-style-type: none"> • Online education improvement • Digital platform development • Funding extension for education sectors • Awareness and preparedness for other pandemics
Public 4	<ul style="list-style-type: none"> • Students' accommodation with individual seats • Training for online activities • Online-offline hybrid education improvement • Funding extension for educational sectors • Research laboratories refined to deal with future pandemics
Public 5	<ul style="list-style-type: none"> • The education curriculum must be updated • Offline and online-based assessment techniques must be implemented • Assessment criteria and process must be revised • Digital education systems and techniques must be available for all students
Private 1	<ul style="list-style-type: none"> • The online platform should be continued to some extent • Academic sessions should not be hampered by the pandemic • 30% of the student classes can be taken online
Private 2	<ul style="list-style-type: none"> • The hybrid education system is here to stay
Private 3	<ul style="list-style-type: none"> • Introduction of primary health sciences education in schools • Cross-training between different health sciences education division • More accessibility to computers and electronic devices for learning

Discussion

Similar to other nations and continents, the pandemic severely disrupted traditional educational approaches in Bangladesh^{9,16,17,61,62}. There were significant hurdles to be addressed to fully prepare non-medical HCPs in Bangladesh for their activities post qualification at the onset of the pandemic, which was similar to other LMICs⁶³⁻⁶⁵. The topmost challenges among private

and public universities (Table 2) included a lack of prior training regarding e-learning approaches and tools before the pandemic. However, this was more prevalent among public versus private universities. Educators from other LMICs^{19,43,61,65,66} also faced this challenge. There was also a scarcity of funding and the ability to undertake a research project at the start of the pandemic; however, again, this mainly

occurred among public versus private universities.

Of concern was that most students, particularly among public universities, did not have access to a computer and other required equipment or could afford the various internet packages for e-learning at the start of the pandemic (Table 3). Most of the non-medical HCP educators in the public sector were also unfamiliar with online meeting platforms during the early stages of the pandemic (Table 2). Furthermore, when educators undertook classes from home, they encountered problems, including internet outages due to inadequate connections. This was also a major concern among education across Africa and other LMICs; ²¹ however, potentially less of an issue in India ^{16,19, 21,43,67}. This was less of an issue in Saudi Arabia and other high-income countries, which had already made significant investments in e-learning approaches before the pandemic, smoothing the transition from in-person to online learning at the pandemic ^{21,27,68}.

Other key issues that arose at the start of the pandemic included non-medical HCP educators concerned that students lacked adequate feedback for studies or projects, exacerbated by the inability to undertake complete supervision. There was also a need to ensure a calm and quiet environment at home for teaching and learning. This is recognized as more challenging in LMICs, especially when all family members, including children, are forced to stay at home in cramped conditions during successive lockdowns causing turmoil and distraction. Students also lost touch with their classmates and teachers, and faculty members have also lost touch with their students and colleagues ⁶⁹.

These issues had a significant psychological and emotional impact on both educators and students in Bangladesh and across countries (Table 5), with the mental stress caused needing to be addressed going forward ^{6,19,63, 67,70-73}. This has been helped in Bangladesh by private universities providing full support to their students and faculty members through scheduling counseling sessions to inspire and build mental strength and minimize stress, which has proved beneficial ^{74,75}. Other activities (Table 5) include helping with tuition fees and relaxing the submission deadline. Public universities have also assisted their teachers and students through arranging loans to purchase ICT equipment, similar to examples across Africa ¹⁹.

Overall, educators in Bangladesh were quick to

adapt to the online learning mode at the start of the pandemic. However, initial challenges included skill development and the necessary digital infrastructure ⁷⁶. The universities typically provide webinars and online workshops to exchange and update knowledge (Tables 4 and 5). Public universities also established Covid-19 awareness programs and transmission prevention training by making hand sanitizers and distributing masks. One private and one public university also established Covid-19 sample collection booths and performed RT-PCR tests, a confirmatory test for Covid-19 ⁷⁷. Moreover, non-medical HCP educators, specifically microbiologists, trained their students for Covid-19 diagnosis, who later became volunteers at the RT-PCR testing facility all over Bangladesh. We also observed that the experiences and challenges posed by the Covid-19 pandemic on the non-medical healthcare professional are not unique but related to studies in other LMIC countries on medical healthcare professionals ^{16, 24}.

Lessons learned from this pandemic will provide suggestions to deal with the future pandemic. Recommendations included (Table 6) creating a specialized infection control unit for each institution and providing periodic infection control training. Participants also recommended expanding digital platform capabilities across universities and distributing ICT equipment to those in need. Improvements to the university website and training for both students and faculty members in e-learning and hybrid learning were also recommended to ensure unbroken academic sessions in future pandemics. This alongside providing adequate funding for internet bundles.

We are aware of several limitations of this study. These include that only a few universities with non-medical HCP educators were approached for this pilot project. Secondly, the sampling procedure was purposeful in achieving the study's goals and objectives. Thirdly, students were purposefully excluded from this discussion so that their perspectives could not be examined in full. Despite these constraints, we feel that our findings are sound and that they will contribute to a future pandemic response strategy.

Conclusion

Covid-19 and the shift from traditional classrooms to online environments had an appreciable impact on the education of non-medical HCPs at the start of the pandemic. Several concerns and obstacles need to be addressed with the shifting of education

to an e-learning environment. Challenges included a lack of prior training in e-learning methodologies, lack of ICT equipment, and the cost of internet subscriptions. The pandemic also caused appreciable mental stress among both educators and students. These are starting to be addressed, indicating a path forward. The study's findings also emphasize the need for HCP educational institutions to pay close attention to teacher-student issues and the influence of lockdown on academic careers.

The next stage of this research will be a more comprehensive study among non-medical HCPs to

offer a complete picture for future guidance.

Conflict of Interest

The authors have no relevant conflicts of interest to declare

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Data Availability

Additional data is available on reasonable request to the corresponding authors.

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