

*Original article***Impact of the COVID-19 pandemic on dental and medical education in Bangladesh: a pilot study and the implications**Kona Chowdhury¹, Mainul Haque², Afzalunnessa Binte Lutfor³, Tosaddeque Hossain Siddiqui⁴, Rahnuma Ahmad⁵, Irin Sultana⁶, Paras Sharma⁷, Halyna Lugova⁸, Ayukafangha Etando⁹, Brian Godman^{10a,b,c}**Abstract**

Objective: Lockdown and other measures, including the closure of universities, introduced by Governments across countries in response to the COVID-19 pandemic have appreciably impacted on the education of dental and medical students across countries. Key challenges included the need to rapidly move to e-learning as well as instigate new approaches to practicals for health science students. This involves lecturers and students necessarily needing to rapidly adapt to e-learning and other approaches. There have also been affordability issues among students to regularly access the Internet, and purchase the necessary equipment, particularly among those from low- and middle-income countries such as Bangladesh. Consequently, there is an urgent need to assess current challenges among senior level physicians and educators in Bangladesh regarding the education of dental and medical students arising from the current pandemic, and how these are being addressed, to provide future direction. This is particularly important in Bangladesh with high rates of both infectious and non-infectious diseases. **Materials and Methods:** Pragmatic investigation involving a purposely developed questionnaire based on previous studies and the experience of the co-authors. The questionnaire was distributed to 15 senior-level educators with the findings analysed by themes. **Results:** Key issues included little experience with e-learning at the start of the pandemic among both staff and students, poor internet access and cost of internet bundles. In addition, fear and anxieties among both students and staff. The colleges responded by instigating teaching classes for educators on e-learning and providing adequate personal protective equipment for staff and students during teaching and practical sessions. These formed the basis of future recommendations. Other recommendations included increased flexibility among staff and students. **Conclusion:** The pandemic posed appreciable challenges to both staff and students attending dental and medical colleges in Bangladesh. Some of the key issues are starting to be addressed.

Keywords: Bangladesh, COVID-19, dental education, infectious diseases, medical education, non-communicable diseases

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Introduction

The current COVID-19 pandemic, and subsequent preventative measures to limit the spread of the virus, including social distancing measures, closure of borders, and cancelling of clinics, has resulted in considerable economic and healthcare consequences across countries¹⁻³. This includes issues with the routine immunisation of children, increasing future morbidity and mortality, although programmes are ongoing in Bangladesh to improve the situation^{2,4,5}. In addition, disruption of clinics for patients with non-communicable diseases (NCDs) alongside the mental health impact arising from lockdown and other activities which includes an increase in gender violence arising from the economic consequences of introduced measures^{1,6-11}.

There has also been an increase in the prescribing of antibiotics for patients with suspected or confirmed COVID-19 in Bangladesh, similar to other countries, despite only a limited number of patients with COVID-19 having confirmed bacterial or fungal infections¹²⁻¹⁵. This builds on existing high and inappropriate rates of prescribing and dispensing of antibiotics generally in Bangladesh and wider among low- and middle-income countries (LMICs) including among dentists¹⁶⁻²⁰. This is a concern as the over-use of antimicrobials increases antimicrobial resistance (AMR) with subsequent implications on morbidity, mortality and costs²⁰⁻²³. High AMR rates are a major issue in Bangladesh although there are ongoing Government and other activities to try and reduce these^{19,23-27}. Alongside this, we are aware that there was appreciable misinformation during the pandemic surrounding potential treatments for patients with COVID-19¹. This included misinformation surrounding hydroxychloroquine, which resulted in increased costs, morbidity and mortality^{1,28,29}.

We are also aware of rising prevalence rates of non-communicable diseases in Bangladesh, including coronary vascular diseases (CVD) and diabetes, with lockdown measures arising from COVID-19 exacerbating the situation³⁰⁻³². Deaths due to NCDs increased to 66.9% of total deaths in Bangladesh in 2015 from 43.4% in 2000, with the proportion likely to increase further unless pro-actively addressed^{30,33}, and the current pandemic will only exacerbate the situation unless addressed.

However, there can be considerable concerns with the appropriate management of NCDs in countries such as Bangladesh exacerbated by high rates of

patient co-payments, which can be catastrophic for families^{30,34-37}. As a result, dentists and physicians need to be aware of the costs of the medicines they prescribe, which may not always be the case in low- and middle-income countries (LMICs)³⁸. In addition, there needs to be activities among other key stakeholder groups, including the government, to help address the situation including the economic consequences. This includes improved record keeping especially in public hospitals, which is currently being investigated in Bangladesh.

Consequently, in view of the increasing challenges with managing patients with both infectious and non-infectious diseases in Bangladesh, it is important that new physicians and dentists are appropriately trained to enhance the rational use of medicines across disease areas. However, we are aware of the challenges in healthcare professional education in Bangladesh during the pandemic, including for physicians and pharmacists, arising from the closure of universities and transfer to e-learning across Bangladesh and wider^{1,39-43}. We are also aware of the impact of the pandemic on the mental health of students and university staff across countries including medical students⁴⁴⁻⁴⁷.

As a result, there is an urgent need to assess among senior-level physicians and dental educators in Bangladesh the challenges with the education of future physicians and dentists arising from lockdown and other measures. In addition, how these issues and challenges are being addressed by university personnel in Bangladesh to ensure the necessary skill levels among future graduates. These were the objectives of this study, building on similar research across Africa⁴⁸.

Materials and Methods

We used a pragmatic investigative framework with a representational model approach among senior-level physicians and dental educators to explore key issues and challenges in this pilot study⁴⁹⁻⁵¹. This approach built on the recently conducted study in Africa regarding the impact of COVID-19 on physician and pharmacy education combined with previous cross-country and cross-national studies undertaken by a number of the co-authors across disease areas among LMICs including COVID-19 related topics^{20,48,52-57}.

Bangladesh is a South Asian Country with a current population of over 164 million a GDP per capita of US\$ 1,968.8, and a literacy rate of 74.91 %, as reported by the World Bank for 2020^{58,59}. Bangladesh currently

has both public and private medical and dental colleges (Table 1)⁶⁰. In addition, Bangladesh has one postgraduate medical university, Bangabandhu Sheikh Mujib Medical University (BSMMU), that controls Bangladesh's postgraduate medical education.

Table 1: List of Medical and Dental Colleges in Bangladesh.

Affiliation	Medical College		Dental College	
	Public	Private	Public	Private
University of Dhaka	12	40	4	14
Chittagong Medical University	4	10	1	1
Rajshahi Medical University	10	12	2	4
Bangladesh University of Professionals	6	-	-	-
Sylhet Medical University	1	4	1	1
Total	33	66	8	20

The questionnaire was developed based on the study undertaken in Africa regarding the impact of COVID-19 on physician and pharmacy education combined with publications from Bangladesh and other countries discussing similar issues and challenges alongside the experiences of the senior-level co-authors^{1,39-43,48}. Four questions were contained in the questionnaire to address the aims and objectives of the study. Among the four questions, up to 4-5 responses, were asked expected. Additionally, another five questions were asked to support the first four questions.

The questions were:

1. What challenges has COVID-19 presented to health sciences education?
2. How did health sciences institutions respond immediately to the challenges presented by the COVID-19 pandemic in Bangladesh?
3. What support was harnessed to help mitigate the challenges faced by higher learning institutions?
4. What lessons can be learned to prepare higher learning institutions in health sciences education for future pandemics?
5. Did all students have access to the necessary equipment, e.g., computers, etc., to undertake eLearning at the start of the pandemic (computers had to be bought for students in Africa) – especially given comments in question 4? If not – how was this addressed in reality?
6. Could all students afford the various internet bundles to undertake eLearning at the start of the pandemic?

7. Were any courses/ tutorials instigated early by the medical schools at the start of the pandemic for the teachers to become familiar with the new platforms such as Zoom, etc.?
8. Were there any challenges with students undertaking eLearning at home, including access to a quiet room, reliable internet facilities, etc.?
9. Have any support services now been introduced for students and lecturers due to the pandemic? If so, please describe

The questionnaire was subsequently distributed to 15 senior-level educators in Bangladesh in both public and private colleges who volunteered to be part of the pilot study using a purposeful sampling approach^{61,62}. We included both public and private colleges in this pilot study to ensure a full breadth of colleges (Table 1). If necessary, one co-author from each institute consolidated the responses based on their experience combined with consultations with the others to aid the analysis.

The responses to the nine open-ended questions were analysed into themes to aid interpretation of the findings. Subsequently, to see if the pilot questionnaire needed adaptation before a full study was undertaken across Bangladesh^{63,64}.

There was no need for ethical approval as we were not dealing with patients. This is similar to other studies conducted by the co-authors^{28,29,48,52,53}.

Results

Data was collected from four public and four private colleges in Bangladesh from the total number of colleges (Table 1). The number of responders was 15, with 8 from public and 7 from private colleges, giving a 100% response rate. The educators taking part were from a range of departments. These included educators from biochemistry, clinical pharmacology, forensic medicine and toxicology, medicine, microbiology, ophthalmology, orthopaedics, paediatrics, physiology and surgery including paediatric surgery. The objective was to give a range of specialities to enhance the robustness of the findings from this pilot study.

Table 2 summarises the findings from the top eight challenges faced by the educators taking part in the pilot study regarding the education of physicians and dentists in their colleges at the start of the pandemic in Bangladesh.

Table 2 – Summary of the top eight challenges faced by college personnel at the start of the pandemic in Bangladesh.

College	Initially little experience with e-learning and teaching	Hampering clinical teaching and practicals	Interruption academic year and closure of colleges	Reduced direct teacher: student Interaction	Unaffordability of the cost of data bundles and ICT among Students	Inadequacy of online Class	Poor Internet access and networks	Fear and Anxiety among students and teachers
Public -1		√	√	√	√			
Public- 2	√	√		√				
Public -3	√	√	√	√		√		
Public -4	√	√		√		√		√
Private-1	√	√	√		√		√	√
Private-2	√		√				√	
Private-3	√	√	√	√			√	
Private-4			√		√		√	

Table 3 summarises the top six immediate responses among personnel from both public and private colleges to the challenges posed by lockdown and other measures at the start of the pandemic

Table 3 - Summary of immediate responses among the medical schools at the start of the pandemic

College	Initiation of online classes and exams	Instigating of online classes which were regularly monitored by the authorities	Training of academic staff on platforms such as Zoom for e-learning	Ensuring safe distancing during teaching rotations	Adequate supply of PPE to faculty members and students	Some lectures continued face to face with reduced numbers and social distancing
Public -1	√	√				
Public- 2	√	√	√			
Public -3	√	√	√			
Public -4	√			√		√
Private-1	√	√			√	
Private-2	√		√	√		
Private-3	√	√				
Private-4	√					

NB: PPE= personal protective equipment

Table 4 provides examples of support and other measures provided by medical and dental colleges in Bangladesh in response to the pandemic.

Table 4 - Examples of support and other measures harnessed by the targeted colleges in Bangladesh in response to the pandemic

College	Support
Public-1	<ul style="list-style-type: none"> • Providing materials for online sessions • Organizing the teaching staff according to need • Monitoring of teaching activities • Conducting online examinations
Public-2	<ul style="list-style-type: none"> • Use of modern technologies to minimize the communication gap • Creating an expert team who would help the teachers to take an online class • The motivation of the students for adoption with new learning methods • Training of teachers to make them experts in new learning methods
Public-3	<ul style="list-style-type: none"> • Regular monitoring of the classes by the authority • Development of a network to take online courses smoothly • Arrangement of IT training program for the faculty members • Duties by rotation were implemented to ensure safety • Establishment of free internet connection in college premises
Public-4	<ul style="list-style-type: none"> • Staff were provided with PPE • Establishment of free internet connection • Proper treatment of COVID infected staff and students were ensured • Several IT training sessions was arranged for the teachers
Private-1	<ul style="list-style-type: none"> • Transport facilities and PPE were provided for the staff • Verbal order to take online classes
Private-2	<ul style="list-style-type: none"> • Arrangement of training on infection control and COVID-19 management • Internet access was provided for the teachers from the institutional. • The authorities provided mask, gloves and sanitizers
Private-3	<ul style="list-style-type: none"> • Teachers and students were trained to use the online platform efficiently • Internet was made available on college premises • Recording of various practical classes • Vaccination for COVID 19 was arranged for students
Private-4	<ul style="list-style-type: none"> • Masks, PPEs, and other safety equipment were supplied, though very late

NB: PPE= personal protective equipment

The lessons learnt by the educators from the eight participating colleges to guide activities in the future regarding e-learning, as well as conducting practicals and examinations during future pandemics, are discussed in Table 5.

Table 5: Lessons learned from the pandemic among personnel from the eight colleges taking part in the pilot study

College	Lessons learned
Public-1	<ul style="list-style-type: none"> • Conducting teaching on line in any form is helpful, to some extent, and is better than stopping all activities • Safety is more important than conducting lectures and examinations without precautions • Early vaccinations are needed for medical students and teachers to reduce future disruptions
Public-2	<ul style="list-style-type: none"> • The need for rapid adoption among teachers and students of modern technologies • Mental adaptation of students with self-learning • Building up expert human resources which will help in building communications between teachers and students during future pandemics
Public-3	<ul style="list-style-type: none"> • Health science institutions must collaborate to develop policies and make a universal platform on virtual teaching and learning going forward • Capacity building for health science institutions in the use of online learning platforms by giving training to both teachers and students • Health science institutions should form a rapid response team to prevent confusion and chaos during a pandemic • Provision of free internet access not only for institutions but also for the students
Public-4	<ul style="list-style-type: none"> • Awareness of infection control and prevention should be a priority • Establishment of proper training and guidance to take an online class • Everybody should learn to be sympathetic to each other, and institutions also need to develop a psychosocial support system going forward
Private-1	<ul style="list-style-type: none"> • Both teachers and students should know about e-learning and have proper training • Internet packages and ICT products should be made affordable for all students especially disadvantaged students • Provision of internet access for an institution is a must • Every medical college should have an online library to facilitate e-learning
Private-2	<ul style="list-style-type: none"> • Hands-on practical training and clinical training of health science students should never be substituted with 100% online learning and assessment • Institutions need to develop online resources and update them regularly • Faculty members need to be more flexible with greater e-learning in the home environment and the challenges it brings • More research regarding Covid-19 and its implications on education should be conducted to develop effective strategies to mitigate against future pandemics

College	Lessons learned
Private-3	<ul style="list-style-type: none"> • Training on E-learning is essential for both students and teachers • Internet access should be provided not only for teachers but also for all students • Computers, laptops and internet data bundles should be affordable to all especially students
Private-4	<ul style="list-style-type: none"> • Development and training of faculty members for conducting online classes and acquaint them with innovations and technologies • Building proper infrastructure, development of ICT • Financial support for teachers and students • Monitoring and surveillance of quality control in health education institutions • Provide sufficient safety measures and equipment for face-to-face classes

Affordability and access to the necessary equipment and internet bundles is essential with two thirds of responders in the pilot study stating that most students at the start of the pandemic did not have computers. However, all students among the colleges taking part in the pilot study appeared to have smart phones and most of them attended classes through their android phones, which helped. Encouragingly, 60% of those surveyed stated that their colleges had instigated training for the educators to become familiar with platforms such as Zoom if this was a problem.

Another concern was that 53.3% of participating educators stated that the students in their facilities could not fully afford the various internet bundles at the start of the pandemic, appreciably impacting on their e-learning experiences. In addition, 86.7% of those surveyed stated that most students experienced poor and interrupted Internet connections, as well as lacking a quiet room for their studies, further impacting on their learning experiences. Some of these issues are now being addressed by support services introduced in the colleges for lecturers; however, this was a minority (Table 6). No support services had been introduced for the students except monitoring of the class via online. Internet connection and laptops were only provided for the teachers in a few of the surveyed colleges (Table 6). There currently appeared little support to address the mental health issues of both students and faculty arising from the consequences of the measures introduced to prevent the spread of the virus.

Table 6: Extent of support services introduced for lecturers due to the pandemic

Response	Number	Percentage
No support services introduced	12	80%
Free Wi fi connection where concerns	1	6.7%
SIM Card	1	6.7%
Computers purchased for the department	1	6.7%

Discussion

We believe this is the first study in Bangladesh to fully investigate the impact of lockdown and other measures on dental and medical education since the start of the current pandemic. This builds on earlier studies discussing the situation generally with a paradigm shift to e-learning at the start of the pandemic as well as possible ways forward for hepatology residents in Bangladesh^{43,65}. In addition, concerns generally with the e-learning readiness of students in Bangladesh at the start of the pandemic⁶⁶. Alongside this, we are aware of the introduction of blended learning approaches for qualified practitioners in Bangladesh, including those as part of continual professional development for general practitioners, to help address the situation⁶⁷.

Similar to other LMICs, including those across Africa, there were appreciable challenges to the education of dental and medical students at the start of the pandemic including mentorship^{39,41,48,68,69}. This included the need for both staff and students to rapidly become familiar with e-learning approaches including addressing a lack of direct contact between students and faculty members (Table 2). Alongside this, concerns with a lack of computers as well as access to, and the costs, of the internet and associated pertinent bundles (Table 2). These issues and concerns need to be addressed going forward to adequately prepare dental and medical students for graduation given, as mentioned, ever rising prevalence rates for both infectious and non-infectious diseases in Bangladesh as well as concerns with rising AMR rates. This is particularly important during the current pandemic given the level of misinformation that has prevailed regarding the virus and potential treatments⁷⁰. Alongside this, concerns with excessive prescribing of antibiotics for an essentially viral infection¹². This is very different to the situation in higher income countries such as Saudi Arabia that had invested heavily in e-learning approaches and facilities before the start of the pandemic⁷¹. This made the transition to e-learning much smoother at the start of the pandemic in Saudi Arabia compared

with LMICs such as Bangladesh combined with appropriate preventative measures^{72,73}.

It was encouraging to see the surveyed colleges and educators introducing a number of measures to address concerns. This included ensuring the educators had training in the necessary skills to undertake e-learning, providing materials to support on-line learning, and providing PPE to staff and students when face-to-face teaching took place (Tables 3 and 4). There were though still concerns at the limited support to date to address key issues including the cost of computers as well as access to appropriate internet facilities to properly participate in e-learning (Table 6). This especially for students with little support to date. This contrasts with the current situation across Africa with a number of ongoing initiatives to address such concerns⁴⁸. There is also a need to address the mental health issues of both staff and students arising from lockdown and other measures. Greater awareness of these issues combined with everyone being more sympathetic to each other should help here (Table 5).

We will continue to research and monitor key issues and challenges regarding the education of dental and medical students across Bangladesh building on the findings of this pilot study. This is important given the level of challenges and concerns identified; however,

these are starting to be addressed. We will keep the same questionnaire for the full study given the level of detail obtained (Tables 2 to 6), which allowed us to meet the study objectives.

A key limitation of this study was its pilot nature. In addition, no students were approached to discuss their experiences. However, we believe the findings of this pilot study are robust given the wide range of colleges and specialities taking part, already providing direction on additional steps necessary for all key stakeholders in Bangladesh to undertake to improve the education of students during the current and future pandemics.

Conclusion

There were a number of issues and challenges to transferring dental and medical education on-line at the start of the pandemic, which is similar to other LMICs. These challenges are starting to be addressed. This is important given concerns with the level of AMR in Bangladesh coupled with increasing rates of NCDs and their consequences, both exacerbated by the current pandemic. We are exploring these issues further.

Conflicts of interest and funding

The authors declare they have no conflicts of interest and there was no funding for this paper.

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