

A Pilot Study Regarding the Consequences of the COVID-19 Pandemic on Healthcare Education in India and the Implications

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Abstract

Introduction: The early approaches to prevent the spread of COVID-19 included lockdown and social distancing measures, leading to university closures. These measures forced unparalleled changes to the delivery of healthcare education. Concerns included the preparedness of faculty and students to e-learning as well as the routine availability and funding of equipment and internet bundles. This needed addressing with fully trained healthcare professionals required given rising inappropriate use of antibiotics in India, growing prevalence of non-communicable diseases as well as an increasing number of patients with joint comorbidities. Consequently, there is a need to ascertain the current impact of the pandemic on healthcare student education across India. **Materials and Methods:** This was a pilot study among 10 purposely selected healthcare educators in both private and public universities. The questionnaire built on published studies. **Results:** Identified challenges included a lack of familiarity with online education, no bedside teaching, lack of equipment and affordability of internet bundles, poor internet connectivity and postponed examinations. Ways forward included training faculty on e-learning, providing students with loans and other financial support to purchase equipment and internet bundles, establishing COVID-19 prevention protocols and protective equipment, recording lectures and tutorials to make up for lost time and simulated methods to teach clinical aspects. **Conclusion:** Despite challenges, there was a rapid move to online learning among surveyed universities. Alongside this, courses to address lack of familiarity with e-learning approaches with hybrid teaching approaches here to stay. The next step will be to undertake a wider study and to use the combined findings to provide future guidance.

Keywords: COVID-19, education, healthcare, implications, India, pandemic

INTRODUCTION

COVID-19 has appreciably impacted on morbidity and mortality across countries since it was first identified in Wuhan, China, in December 2019, with 5.76 million deaths recorded by 7th February 2022.^[1,2] India is no exception, with over half a million deaths by the early February 2022.^[2] At

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the start of the pandemic, there were no proven effective treatments despite claims to the contrary for treatments including hydroxychloroquine and anti-viral medicines including remdesivir, with a number of these medicines subsequently failing to demonstrate improvements in patient care in well-controlled large-scale clinical studies.^[3-7] Consequently, activities undertaken by governments and others across countries at the start of the pandemic to limit its spread and impact centred on lockdown and other measures. Measures introduced included quarantining as well as the closure of borders and educational establishments including universities.^[8-11]

However, the lockdown measures introduced early in India,^[3,12] including the closure of schools and universities, coupled with the need to rapidly transform learning, including skills learning, online with associated challenges,^[13-15] appreciably impacted on the education of healthcare professionals (HCPs) across India, with a similar situation in Africa.^[16] Before this, campus-focussed teaching–learning activities encompassing face-to-face interactions with students, case-based learning and work-integrated learning were normal practice for all healthcare students.^[17-19] These forced changes resulted in unparalleled commotion and substantial challenges in HCP education across countries.^[10,20-24]

These forced changes in the education of HCPs are a concern if these adversely impact on their necessary skills on graduation to effectively treat patients. We are already seeing the re-emergence of viral diseases in India coupled with the emergence of new viral diseases in addition to COVID-19.^[3,25] This rise adds further pressure on HCPs regarding the effective management of these existing and emerging diseases, with India already having a considerable infectious disease burden. This burden is reflected by India currently being the largest, or one of the largest, consumers of antibiotics worldwide, with usage rates continuing to grow.^[26-28] This high usage of antibiotics in India is exacerbated by considerable inappropriate prescribing and dispensing of antibiotics in ambulatory care in India. This includes fixed-dose combinations with utilisation of antibiotics enhanced by appreciable sales of antibiotics among community pharmacies without a prescription despite on-going legislation.^[28-32] Such practices are enhanced by currently a limited number of physicians in India, especially in rural areas, the convenience of community pharmacists and high levels of patient co-payments for both physician visits and medicines. Alongside this, pharmacists wishing to retain patients if they request antibiotics based on their previous experiences.^[29]

Out-of-pocket payments have remained relatively stable in India in recent years at between 63% and over 71% of total healthcare expenditure,^[33-35] with the cost of medicines accounting for an appreciable proportion of this.^[34,36] This is a concern as high out-of-pocket payments can have catastrophic consequences for some families when family members become ill.^[34,35] This is beginning to change in India with new reforms providing health insurance cover for a number of families.^[37]

Alongside this, the Indian government has made a commitment to reduce out-of-pocket expenditures to 50% of total healthcare expenditures in the coming years.^[38] This however will take time necessitating trained HCPs to be fully aware of the circumstances of their patients and the cost of care, including medicines, when managing their condition. We are also aware of high levels of inappropriate prescribing of antibiotics for both adults and children in hospitals in India.^[39,40] Such activities are exacerbated by currently considerable prescribing of antibiotics to patients with suspected or actual COVID-19, mimicking other countries, despite limited evidence of concomitant bacterial co-infections.^[3,41-45]

High rates of inappropriate prescribing of antimicrobials are a concern as this increases antimicrobial resistance (AMR) rates, with a corresponding impact on morbidity, mortality and costs.^[46-48] Concerns have grown regarding rising AMR rates during the current COVID-19 pandemic with, as mentioned, high levels of inappropriate antimicrobial prescribing, which need to be urgently addressed.^[49,50] We have seen that the instigation of antimicrobial stewardship programmes (ASPs) in hospitals in low- and middle-income countries (LMICs) improves appropriate antimicrobial prescribing despite resource issues and should be taken forward across India to improve future use.^[48,51-53] However, we are aware that there can be concerns with knowledge regarding ASPs among physicians and other key stakeholders in hospitals in LMICs, which also needs to be addressed starting with undergraduate education.^[48,54] The instigation of appropriate educational activities among healthcare students can address knowledge concerns.^[55-57]

We have also seen that trained pharmacists can reduce inappropriate dispensing of antibiotics without a prescription as well as direct patients to more appropriate treatments, especially for viral and other self-limiting infections.^[48,58-60] Fully trained community pharmacists can also help address the considerable misinformation that has existed surrounding potential treatments for COVID-19, including hydroxychloroquine, and provide appropriate advice.^[11,61-63] High inappropriate use of hydroxychloroquine has been an issue across countries as this increases morbidity, mortality and costs.^[64-66] Trained physicians and pharmacists can also address important issues surrounding vaccine hesitancy, including COVID-19 vaccines, starting in university and following graduation.^[67]

Of equal importance in India are concerns with rising rates of non-communicable diseases (NCDs), with NCDs now being the principal cause of death in the country.^[68-70] Expenditures are exacerbated by the complications arising from NCDs, which can be addressed through improved prevention and adherence to prescribed medicines including through telemedicine approaches.^[71,72] Patient education via community pharmacists can also enhance adherence to medicines, with community pharmacists also helping to ensure medicine availability, which has been a concern during the current pandemic.^[3,63,73,74] The public health issues arising from increasing rates of infectious

diseases, AMR and NCDs, coupled with increasing rates of patients with combined comorbidities, must be reflected in university courses, including hybrid courses, to improve future patient care.^[75]

However, the initial challenges to HCP education across countries, including India, following closure of the universities included limited knowledge and experience with e-learning among both faculty members and students, a lack of infrastructure and equipment, concerns with academic integrity, including conducting examinations online, regular access to quiet rooms as well as the availability, reliability and costs of the internet including internet bundles coupled with the routine availability of electricity.^[14,16,76-79] These challenges resulted in some universities postponing learning and teaching until key issues, including a lack of information technology, could be addressed.^[79] Alongside this, there have been concerns with conducting practicals and clinical rotations via e-learning due to social distancing and other important aspects potentially reducing necessary skills on graduation unless proactively addressed.^[16,20,77,80-84] The challenges with lockdown, coupled with concerns with e-learning and future employment, has also resulted in increased mental health issues among both faculty members and students across countries.^[85-88] This includes medical students in India.^[89]

The situation seen among a number of LMICs can be very different from higher-income countries with their greater resources and typically greater use of e-learning approaches before the start of the pandemic.^[90-93] This is reflected in the study of Abbasi *et al.*, who found greater satisfaction with e-learning experiences among students from developed versus developing countries.^[94] However, this is not universal, with Besche *et al.* reporting that an appreciable number of students at Harvard Medical School were also struggling with basic remote learning exacerbated by issues with Internet connectivity and quiet spaces to take part in remote classes and study.^[95] Conversely, students in Latvia, Nepal, the Republic of Srpska (Bosnia and Herzegovina) and Slovenia were generally satisfied with e-learning approaches, although there can still be technical issues, including connectivity issues.^[22,24,93]

We are aware that there have been studies conducted in India to assess the impact of lockdown and other measures, including the closure of universities, on the education of HCPs. These include concerns with a small number of healthcare students (23%) unable to attend online classes,^[13] issues with the household environment and internet connectivity, especially in rural areas,^[14,96] and a greater preference for face-to-face teaching, especially among faculty members. Key issues include internet connectivity, poor audio and visual quality and reduced student engagement during online classes.^[97] Ray *et al.* also documented concerns with technical issues and concentration during online classes as well as issues with simulated technology and simulated patients for surgical training.^[80] Saurabh *et al.* also documented concerns with internet connectivity in over a third of medical students

surveyed, with a higher number concerned with their ability to ask questions during online teaching sessions.^[98] However, Kaur *et al.* ascertained that among medical students in India, there were positive comments toward e-learning, including offering a better understanding of the subject matter through recorded classes. However, there were concerns including learning the necessary skills for a professional career postgraduation as well as balancing theoretical and practical knowledge with full-time e-learning.^[23]

A number of steps have been taken to address identified challenges in India. These include rapidly conducting online teaching sessions using a free version of Zoom[®] and subsequently buying an advanced version to enhance interaction with students at Pt. B. D. Sharma Postgraduate Institute of Medical Sciences in Haryana.^[99] Alongside this, Parul University rapidly implemented video-conference platforms resulting in 54.8% of medical students surveyed being extremely or quite satisfied with the online teaching modalities.^[100] Nimavat *et al.* also believed that the challenges with e-learning can be addressed, thereby improving the flexibility of learning, and consequently, the authors believed that such approaches are here to stay.^[77,76] However, key issues remain including considerable concerns with postgraduate training after the pandemic, which also needs to be addressed going forward in India and wider.^[101-105]

We wanted to build on these documented challenges and activities in India by undertaking a survey among faculty members attending both private and public healthcare universities. Potential participants should also include faculty personnel from universities training medical, dental and pharmacy students. This is because most published studies concentrate on different healthcare student populations rather than combining them. This started with a pilot study. The findings from this pilot study, coupled with those from subsequent studies, can be used to help improve the education of HCPs in India during a pandemic. This is especially important in India given, as mentioned, rising rates of both infectious diseases, NCDs and those with multiple comorbidities. In addition, an environment that is still heavily dependent on patient co-pays for financing recommended treatments.

MATERIALS AND METHODS

This pilot study used a realistic exploratory approach based on a representational model among medical, dental and pharmacy faculty members across India. The objective was to understand the impact of COVID-19 on teaching and learning practices among HCPs, and potential ways forward, during these unprecedented times in India based on the experiences of faculty members. This method was built on the recently conducted studies among healthcare faculty members in Africa and Bangladesh involving a number of the authors.^[16,106]

India currently has 595 medical colleges, which are either public, private, government-society or public or private trusts in line with the National Medical Commission (NMC)

of India.^[107] However, while the country has several types of medical school, a unique curriculum operates among all medical schools in India.^[108,109] Similarly, India currently has over 300 dental colleges,^[110-112] with a similar course programme throughout India designed by the Dental Council of India.^[112] India also currently has more than 3000 pharmacy colleges registered with the Pharmacy Council of India (PCI),^[113] with pharmacy education regulated by the PCI with unique coursework across India.^[114,115] Both private and public healthcare universities were included in this pilot study as resources and equipment are likely to be greater among private universities and their students.^[116]

As mentioned, the questionnaire was developed based on the recent study undertaken across Africa regarding the impact of COVID-19 on medical and pharmacy education,^[16] combined with a similar study conducted in Bangladesh among senior medical, dental and health-professional educators.^[106]

The study questionnaire contained four open-ended questions to address the aims and objectives of the study. Participants were given an option to submit up to five responses. In addition, five more questions were included to elicit their response to support the first four questions.

The questions were:

1. What challenges has COVID-19 presented to health sciences education in India?
2. How did health sciences institutions respond immediately to the challenges presented by the COVID-19 pandemic in India?
3. What support was harnessed to mitigate the challenges faced by higher learning institutions in India?
4. What lessons can be learnt 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, to undertake e-learning at the start of the pandemic, 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 e-learning at the start of the pandemic? If not, what was being done about this?
7. Were any courses/tutorials instigated early by the health science schools at the start of the pandemic for the teachers to become familiar with the new platforms such as Zoom[®]?
8. Were there any challenges with students undertaking e-learning at home, including access to a quiet room and reliable internet facilities?
9. Have any support services been introduced for students and lecturers due to the pandemic? If so, please describe.

The questionnaire was subsequently distributed to 10 senior-level educators among seven Indian states (Bihar, Telangana, Uttar Pradesh, Gujarat, Karnataka, Madhya Pradesh and Maharashtra) in both public and private colleges who volunteered to be part of the pilot study using a purposeful

sampling approach. If needed, one co-author consolidated the responses from their institution to help with the analysis. The answers to the open-ended questions were analysed into themes to aid the interpretation of the findings. The findings can help determine whether the pilot questionnaire needed any adaptation before undertaking the full study across India. No students were approached since we wanted to understand the challenges from faculty members first.

There was no need for ethical approval; this study was not dealing with patients. This is similar to the situation among other similar studies conducted by the co-authors across different areas.^[9,11,16,117,118]

RESULTS

Ten educators took part, five from public universities and five from private universities. The educators covered a range of disciplines including applied therapeutics and pharmacology, paediatrics, pathology, and radiodiagnosis as well as conservative dentistry and endodontics, periodontics and prosthodontics, and pharmacy.

Table 1 summarises the top six challenges faced by faculty members at the start of the pandemic broken down by professional type.

Table 2 discusses key challenges faced by the students at the start of the pandemic from the perspective of faculty members.

The challenges faced by both faculty members and students, again from the perspective of faculty members, included:

- a. Extending duty hours for final-year students to provide additional care due to the COVID-19 pandemic
- b. Rapid increase in health issues among both faculty members and students due to lack of physical activity
- c. Lack of finances to purchase the necessary ICT products
- d. Lack of skills initially to conduct teaching sessions and presentations online.

Table 3 includes the top six responses from faculty members among the various universities regarding the activities they undertook in response to the pandemic, with Table 4 discussing other support measures. Typically, a range of support measures were introduced to assist with e-learning and the challenges.

Additional measures mentioned by faculty members to address the challenges posed by the shift to e-learning approaches for both faculty members and students included:

- a. Recording of lectures/tutorials to make up for loss of study times and where there are challenges in the home environment with, for instance, quiet rooms to study
- b. Regular screening of both faculty members and students attending teaching and clinical/practical sessions in person by regularly measuring temperatures or via rt-PCR
- c. Institutions providing ICT support to pertinent students, especially those struggling with available finances.

Examples of simulated methods of teaching among those surveyed included dummy objects and patients being used to

Table 1: Summary of the top six challenges faced by university personnel at the start of the pandemic in India

Professional	Institution	Top six responses					
		No clinical/ practical/ bedside teaching	Depletion of innovative thinking and physical interaction	Poor internet connection	Both teachers and students not familiar with online education	Postponed examinations	Delayed sessions
Allied health professionals	Public	√		√	√	√	
	Private		√			√	
Physicians	Public	√	√	√	√		
	Private	√				√	√
Dentists	Private	√	√	√			

Table 2: Challenges faced by students at the start of the pandemic

Questions	Allied health professionals		Physicians (%)		Dentists (%)
	Public	Private	Public	Private	Private
Did all students have access to the necessary equipment for e-learning, e.g., computers?	No	Yes	Yes: 2 (50%) responders No: 2 (50%) responders	Yes	Yes: 3 (100)
Could all students afford the various internet bundles to undertake e-learning?	No	Yes	Yes: 3 (75%) responders No: 1 (25%) responder	No	Yes: 3 (100)
Were there any challenges with students undertaking e-learning at home?	Yes	Yes	Yes: 3 (75%) responders No: 1 (25%) responder	No	Yes: 3 (100) responders

Table 3: Summary of immediate responses among the health educational institutes at the start of the pandemic

Professional	Institutions	Top six responses					
		Shifted to online education using e-learning platform, e.g., conducting lectures and examinations online	Simulated methods to teach clinical aspects	Teachers trained for online education	New protocols designed to cope with the pandemic	COVID-19 prevention programmes instigated	Active management of COVID-19-infected faculty members
Allied health professionals	Public	√	√				
	Private					√	
Physicians	Public	√	√	√	√		
	Private						√
Dentists	Private	√	√	√	√		

COVID-19: Coronavirus disease-2019

explain many clinical procedures, online demonstrations to impart clinical skills and the availability of videos relating to pertinent clinical procedures. The surveyed universities also typically instigated courses/tutorials early in the pandemic for faculty members to become familiar with new platforms such as Zoom® [Box 1].

DISCUSSION

This pilot study showed that there were considerable challenges with the introduction of e-learning among healthcare students in India at the start of the pandemic, especially those attending public universities [Table 1]. This included a lack of practicals and bedside teaching, certainly initially, compromising the ability of students when faced with patients in a real-life situation postgraduation. This mirrors the situation in other studies conducted in India and other LMICs.^[13,14,16,93,96,100, 103,119] For instance, in Egypt, the greatest barriers to e-learning approaches were inadequate/wobbly

internet connections, scarcity of appropriate ICT, especially among students, and a number of technical issues.^[120] However, once addressed, there was high acceptability for e-learning approaches enhanced by the ease of use and flexibility compared with traditional approaches.^[120] Kaur *et al.* also found support for e-learning among medical students at SGT Medical College.^[23] One study conducted in Malaysia also reported that 21.9% and 11.2% respectively of medical students attending a public university did not have Wi-Fi access or mobile broadband coverage at home.^[121] These are key areas to address going forward given the need for fully trained HCPs on graduation in India, and following graduation, with the rise in both infectious and non-infectious diseases across the country as well as patients with joint comorbidities.^[122,123]

It was encouraging to see that there was typically a rapid move to online learning among the surveyed public universities in India with online courses for faculty members to improve their skills [Table 3 and Box 1]. This builds on the situation

Table 4: Examples of support and other measures harnessed by health educational institutions in India in response to pandemic

	Institution	Examples of support
Allied health professionals	Public	Special lectures and counselling sessions by psychologists were arranged for teachers and students Students were provided with education loans to buy laptops/desktops to continue their studies Institutional was more student and staff-friendly to assist them as per their requirements
	Private	Conducting offline classes batch-wise to increase communication skills A loan was offered to students facing financial crises in paying their academic fees Guiding the students on how to manage their mental health.
Physicians	Public	Establishing COVID-19 wards and training medical students on the management of COVID-19 patients Provision of PPE to all doctors Training of students and establishing COVID-19 prevention protocols
	Private	Provision of online teaching and assessment software to create an e-learning platform Access to the digital library
Dentists	Private	Establishing COVID-19 prevention protocols, e.g., weekly screening of doctors, new waste management guidelines, complete disinfection of facilities daily Provision of PPE to all dentists, including trainee dentists Establishing COVID-19 wards and training new dentists on the management of COVID-19 patients

PPE: Personal protective equipment, COVID-19: Coronavirus disease-2019

Box 1: Activities among participating universities for faculty members to become familiar with e-learning approaches

Allied health professionals

Public universities - Yes

Private universities - Yes

Physicians

Public universities - Yes: 50%; no 50% (4 responders)

Private universities - No

Dentists

Yes: 66.7%; no 33.3% (3 responders)

seen among the surveyed private universities, with on-going activities mirroring those proposed by others in India to address current challenges.^[23,123] As seen, limited familiarity with online learning approaches at the start of the pandemic was more of an issue among public universities [Table 1], although this is now being addressed [Table 3]. It was also

encouraging to see that while there were concerns with the necessary equipment and affordable internet bundles among students [Table 2], this was less of an issue in India than seen across Africa as well as in Bangladesh and some Central and Eastern European countries.^[16,93,106] However, this still needs to be addressed building on current initiatives [Table 4] as hybrid learning approaches are almost certainly here to stay in the post-digital era as well as for future pandemics.^[16,124-127] However, new digital approaches need to be fully evaluated to meet the desired purpose given on-going concerns versus conventional learning approaches.^[23,128] Other areas to address in India and wider for future pandemics include addressing concerns with interpersonal interactions among healthcare students during a pandemic as well as mental health issues among both faculty members and students arising from lockdown and other measures.^[86,88,89,129]

The introduction of a variety of measures to address identified concerns including practical teaching sessions is also encouraging for the future [Table 4], and we will be exploring this further in the full study. We have also seen final-year medical students and pre-PG doctors in India being used to manage patients with COVID-19 during the current pandemic,^[130,131] and COVID-19 response field placements in other countries.^[132] Such activities should help address concerns with skills shortages on graduation.

The next stage of the research will be conducting a larger study among a variety of healthcare professionals across India to provide future guidance building on the findings of this pilot study. We will be using the same questionnaire given the depth of responses already ascertained.

We were aware of a number of limitations with this study. These included the fact that this is only a pilot study. Second, the faculty members were purposely approached to meet the aims and objectives of the study. Third, we did not approach any students for the reasons discussed. Despite these limitations, we believe that the findings are robust given the range of contributors included in the study and their responses, which are already providing direction for the future.

CONCLUSIONS

There were a number of concerns among both faculty members and healthcare students at the start of the pandemic when universities were closed. These included concerns with a lack of familiarity with e-learning approaches, especially among public universities. There were also concerns with lack of ICT equipment and affordability of internet bundles, especially among students at public universities. However, this is beginning to change providing direction for the future. The next steps will be a more complete study among HCPs to provide a more complete picture for future guidance with e-learning approaches here to stay in this post-digital era, and patients are likely to become more complex.

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Conflicts of interest

There are no conflicts of interest.

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