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Perspectives of Indian medical students on e-learning as a tool for medical education in the country: a quantitative study

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ABSTRACT

Background: In view of the COVID-19 pandemic, medical colleges resorted to e-learning to continue teaching; giving us a unique opportunity to explore the potential of this tool, understand the student perspective, help improve its structure and assess its scope for future use.

Methods: A quantitative cross-sectional study was conducted across Indian medical colleges using Google forms. The questionnaire consisted of sections on e-learning experience, technological readiness, effects of COVID-19 on education and attitude towards e-learning.

Results: From 32 medical colleges in India, 556 undergraduate medical students participated in the study. The results showed that 93.3% students were exposed to e-learning, from which 99% were introduced to it following the COVID-19 pandemic-imposed lockdown. The study reported the pros and cons of e-learning for medical education. E-learning methods were deemed fit for theory lectures, but wasn't preferred for clinics and demonstrations. Students believed that e-learning- preferably short live online classes, together with efficient portals, provision of offline videos and discussion of clinical cases- had great scope to support the traditional methods of teaching.

Conclusions: According to the students, e-learning has immense potential and is an irreplaceable ally to the traditional method of medical education, even beyond the COVID-19 pandemic.

Keywords: COVID-19, E-learning, India, MBBS, Medical colleges, Online education

INTRODUCTION

The World Health Organisation has termed the COVID-19 pandemic as an unprecedented Global Crisis that has been met with an unprecedented global response. At the time of writing this paper, the SARS CoV-2 virus had affected 8.06 million people in the world, 3,67,000 in India, leading to 12,237 deaths. Different countries over the world have imposed lockdowns to restrict the transmission of this virus and flatten the epidemic curve. In India, the lockdown that was enforced on March 22nd 2020, has led to schools, colleges and universities to suspend the traditional teaching methods and instead start using e-learning tools to continue teaching the

curriculum. The medical colleges too, are pushed to rely on technology-based learning in order to cater to students during the pandemic and enhance their knowledge and performance.³⁻⁶

Negash and Wilcox classified e-learning into six categories (1) e-learning with physical presence and without e-communication (by use of power points, digital versatile discs, etc. in the classroom); (2) e-learning without physical presence and without e-communication (self- learning); (3) e-learning without physical presence and with e-communication (asynchronous learning); (4) e-learning with virtual presence and with e-communication (synchronous learning); (5) e-learning

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with occasional presence and with e-communication (hybrid-asynchronous learning); and (6) e-learning with physical presence and with e-communication (hybrid-synchronous learning).⁷

The COVID-19 pandemic has led to the introduction of various e-learning tools in medical colleges, and has also provided us with a unique opportunity to study the challenges and sustainability of this method and evaluate its role in medical education much beyond the pandemic. Medical education is constantly growing at a rapid speed and knowing the scope of technology-based learning, beyond the pandemic, will be essential to keep the Indian medical graduates at par with the competitive world.⁴⁻⁶

In order to strengthen the medical education system, it is important to learn about the perspectives of medical students towards this e-learning experience. This study was conducted with the aim to understand the perspectives and effectiveness of e-learning among medical undergraduates, in order to help improve its format and to assess its scope for future use, even beyond the pandemic. Moreover, the study would also give us a better insight about the larger effect of COVID-19 pandemic on the students, with and without access to e-learning and the future prospects of technological tools in the medical education system.

METHODS

Participants and data collection

A cross sectional study was conducted in undergraduate medical MBBS students open to all medical colleges in the country. A total of 556 students from 32 medical colleges in India, from 8 states and 1 union territory, participated in the study. 1st year, 2nd year, 3rd year part-1 and 3rd year part-2 undergraduate MBBS students were included in the study, irrespective of whether their college had begun e-learning facilities or not. Interns and post-graduate students were excluded from this study. Most of the postgraduate courses had not resorted to e-learning at the time of the study. We conducted this study in the month of May and June 2020, over a period of one month.

A structured questionnaire was developed and used to collect data from the undergraduate medical students, which was made available electronically through Google forms.

Study questionnaire

A self-administered questionnaire we developed consisting of 5 main sections: 1) Socio-demographic characteristics; 2) E- learning experience; 3) Technological readiness; 4) COVID-9 and its effect on elearning; 5) Attitude toward and future prospects of elearning.

For this study, we define e-learning as a technology-based learning in which a computer network is used to deliver learning material (via audio, video and text medium) electronically to remote learners. This can be done through e-mail, live chat sessions, online discussions, forums, quizzes and assignments.^{8,9}

A separate questionnaire was given to students whose colleges hadn't started online classes, to identify the challenges they felt their colleges were facing, amidst the COVID-19 crisis.

The data obtained from Google forms, was quantitatively analysed.

Ethical approval

Approval granted by the Institutional Ethics Committee of Goa Medical College, Bambolim, Goa, India. Data was kept confidential. Informed Consent was taken electronically form all the participants as was permitted by ICMR during the pandemic. To ensure that the student was answering the questionnaire, their names were checked with their information on the college website. Data was kept confidential and no identifiers were used during the analysis.

RESULTS

Students from 32 medical colleges, from 8 States and 1 Union Territory in India participated in this study. It was conducted in the 2^{nd} and 3^{rd} months of the COVID-19 lockdown in the months of May and June.

Among the 556 medical students that took part in this study, 61.2% (340) were female and 38.8% (216) were male. The age of the participants ranged from 18 years to 24 years, with a mean age being 20 years (SD 0.062). There were 28.2% (157) from first year, 22.7% (126) from second year, 31.7% (176) from third year part one and 17.4% (97) from third year part two.

The e-learning experience

Among the 556 students, 93.3% (519) informed that their college had started using e-learning for medical education. Of these, 14.1% (73) of the students had e-learning without physical presence and without e-communication (self-learning), e.g. lecture slides; 4.4% (23) had e-learning without physical presence and with e-communication, e.g. pre-recorded classes; 89.8% (466) had e-learning with virtual presence and with e-communication, e.g. online virtual classroom and 0.6% (3) followed other means of e-learning.

Out of the students, 94.8% (492) attended most of the online classes. Those who did not, stated reasons like lack of concentration, network issues and lack of interest. With regards to the timing, 41.8% (217) had classes in the morning, 17% (88) in the afternoon, while 41.2% (214)

had classes both in the morning and afternoon. While 73.2% (380) preferred classes in the morning, 17% (88) preferred afternoon classes and 18% (52) did not have any preference for the timing of the e-class.

Where 74.6% (388) students had classes for an average of 30 minutes-1 hour, 20.6% (107) had them for 1 hour-2 hours, 3.8% (20) had them for more than 2 hours and 1% (5) had them for less than 30 minutes. The preferred duration was 30 minutes-1 hour for 77.1% (401) of the students, less than 30 minutes for 9.4% (49), 1hour-2hours for 8.5% (44) and 4.6% (24) did not have any preference.

The online classes consisted of 98.5% (511) of theory lectures, 11.8% (61) of demonstrations, 20.6% (107) of practical classes, 18.9% (98) of clinical classes and 31.6% (164) of case discussions.

Table 1 gives the format of the online lectures.

Table 1: Format of online lectures.

Format of online lectures			
Online live classes: 97.3% (505)		Pre-recorded classes: 2.7% (14)	
Teaching with use of PowerPoint presentation	96.8% (488)	Powerpoint presentations with voice recording of teachers' explanations	57.1% (8)
Teaching without use of PowerPoint presentation	12.5% (63)	Video format of lecture without powerpoint presentation	14.28% (2)
Dictation of lecture notes	5.6% (28)	Video format of lecture with powerpoint presentation	21.4% (3)
Discussions (Interactive learning)	21.8% (110)	Voice recording of lecture	7.14% (1)

Out of the participants, 77.8% (404) said that the live classes were recorded and sent to them after class. Of those who did not, 80.3% (339) of the students preferred if these lectures were recorded and sent to them.

A majority of students 64.2% (334) had their doubts cleared during class itself, 12.7% (66) could do so by contacting the teacher via email, 3.8% (20) did it through a separate session, 7.9% (41) could not get their doubts cleared and 11.3% (59) were unsure.

Out of the participants, 31.2% (162) of the students found these classes to be at a fast pace, 3.9% (20) found them slow, while 64.9% (337) found it to be at an adequate pace.

Among the students, 42% (218) said that assignments/projects/homework were given. Out of these, 21.9% (80) preferred if homework/projects/assignments were given, 51.1% (187) did not, while 27% (99) were indecisive.

Clinical skills were considered as an important part of their study in the medical curriculum by 98.1% (509) of the students. Among the students, 94.4% (490) found it difficult to study the subject without direct patient exposure. Of the participants, 52.4% (272) had a clinical case discussion for their lectures.

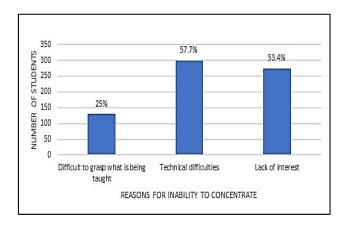


Figure 1: Reasons for inability to concentrate in eclasses

Concentrating in the e-classroom was reported as a major problem by most of the students. Only 15.8% (82) reported that they could concentrate for the whole class. 60.1% (311) reported that they could pay attention only halfway through the class, 16.3% (85) could only for a few minutes, and 7.9% (41) reported that they could not concentrate at all. The reasons for difficulty in concentrating are provided in Figure 1, while the solutions to address this is provided in Figure 2.

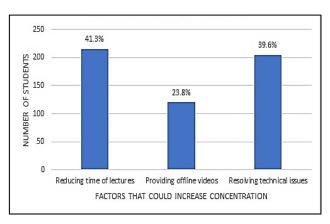


Figure 2: Factors that could increase concentration in e-classes.

While 71.5% (371) preferred traditional learning to improve their concentration, 28.5% (148) preferred online

learning. Among the participants, 43.9% (228) faced distractions during online classes, 18.5% (96) did not and 37.6% (195) were not sure. While 48.3% (212) of the distractions were avoidable, 17.3% (76) were not and 34.4% (151) of the students were unsure. Among the students 47.5% (223) felt that scrolling through social media/ talking to people during online lectures was a cause of their decreased concentration.

In this sample, 70.5% (366) of students had attendance for online classes. Out of those who did not, 39.1% (128) said that this reduced their motivation to attend online lectures.

Technological readiness

Out of the students who participated in this study, 70.1% (364) used mobile phones to attend online classes, 20.2% (105) used laptops, 2.7% (14) computers and 6.9% (36) used tabs and other devices. While 83.8% (435) of the students did not face any difficulty while using these devices, 9.2% (48) did and 6.9% (36) were indecisive.

Where 49.9% (259) students used Cisco WebEx, 15.8% (82) used GoToMeeting, 12.9% (67) Zoom and 21.4% (111) used other software like Microsoft teams, Adobe Connect, Medwhizz and MOOC Armed Forces Medical portal.

Out of the students, 22% (114) faced difficulty while using the software on their device. Difficulties in software login, network disturbances and audio and visual problems were some of the issues that the students faced while using their device.

Wi-Fi was used by 40.1% (208) of the students and mobile network was used by 59.9% (311). Where 22.7% (118) of the students claimed that they faced network issues during most of the classes, 21% (109) did not and 56.3% (292) of the students faced network issues for less than one out of three online classes.

COVID-19 and its effect on medical education

Out of all the students, 99% (514) reported that the COVID-19 lockdown was the reason for initiation of elearning in their colleges. These methods were not used earlier for medical undergraduate teaching. Of the participants, 56.8% (295) felt that online classes boosted their productivity during the lockdown. Among the students, 60.5% (314) felt that there was scope for elearning even after the lockdown.

Attitude towards e-learning

Out of all the students who had started online classes, 43.4% (225) were in favour of e-learning. Those who were not, gave reasons such as lack of clinical exposure and case discussions, and difficulty in covering practical classes.

Students felt that improvement in audio-visual software, inclusion of clinical discussions, adding more student-teacher interactive sessions, and solving existing network issues would better the quality of e-learning in the future. The subjective preference of the students for the use of e-learning methods for various types of medical classes is given in Figure 3.

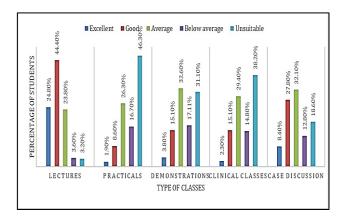


Figure 3: The preference of e-learning for various types of medical classes.

DISCUSSION

Technology always had the potential to boost medical education, but it was not used to its full potential in medical education in the country. The unprecedented measures and strict enforcement of lockdown and the closure of all colleges, forced the medical colleges to use e-learning as a tool for medical education. In this study, e-learning methods were reported to be introduced for the first time by 99% of the participants in view of the COVID-19 pandemic. The growing popularity of this technology-based learning and its probable value in the future of medical education was clearly reported in this study.

The students felt that the COVID-19 pandemic paved the path for a new form of medical education and in turn boosted the productivity of students across India during this crisis, who were otherwise confined indoors due to the lockdown.

A lot of stress is put upon attendance in the India medical education system. The Medical Council of India makes it mandatory to achieve at least 75% attendance in each subject to be allowed to answer the exams. Majority (94.8%) of the students attended online classes and the few (5.2%) who didn't, cited reasons, such as difficulty in understanding and lack of interest due to attendance not being compulsory. Studies on class attendance have shown that, on an average, students with high attendance achieve higher academic performance in both coursework and examinations than students with poor attendance. To decrease absenteeism, a good attendance policy can have a strong impact on student performance. ¹¹⁻¹⁴ At the same

time students complained of missing out on attendance due to the poor network.

Classic lectures can be improved by increasing student-teacher interaction. ^{15,16} In an online set up, this could be done via polls, quizzes, tests and other interactive sessions. Use of e-learning modules (flash multimedia and digitized images), patient surrogates such as virtual patients (to teach clinical examination, procedural, diagnostic skills and communication skills) and virtual-reality simulators (to teach palpation, surgical and resuscitation skills) is needed.³

Live online classes were chosen over pre-recorded classes, perhaps due to it being more engaging and interactive.¹⁷ Many (80.1%) were in favour of classes being recorded and sent, post a live session. A good approach to see that the classes missed can be referred back, and that important topics can be reviewed when required, would be to ensure that a system is in place for recorded live classes to be sent in a timely manner daily or weekly.

The students had their doubts cleared by the teacher during class, or in a separate doubt-resolving session, or by direct contact with the teacher through email, which should be encouraged as it is a good way to assure better understanding in class. Though many students did not receive any homework assignments, a study conducted by Ahsan et al stated that introducing a simple pre-lecture assignment (PLA) before the lecture will help make classes more student-centred and focused more toward active learning. ¹⁸ Preparing for a lecture beforehand, puts a student in a better place to understand and gather information taught in class, which promotes in-depth learning. ¹⁹

Although the pace of the lectures was found to be adequate, only 15.8% reported that they could concentrate through the whole class, while 60% of the respondents in this study could not concentrate beyond 30 minutes and felt it would be more effective if the duration of the classes was reduced. A study on concentration of medical students by Stuart and Rutherford showed similar results where student concentration rose sharply to reach a maximum in 10-15 minutes, and fell steadily thereafter.²⁰ The study also stated that the optimum length of a lecture may be 30 minutes instead of 60 minutes. Technical issues and lack of interaction were an important hurdle in the flow of the lecture, causing preference of offline classes with respect to better concentration. Decreasing the length of the lecture or providing breaks between the sessions; making offline videos of the live lecture available to all students and trying to make the sessions more interactive, as mentioned above, are solutions, in order to ensure better concentration of the students.

Difficulty in operating the software through which online classes were held was a complaint reported by 22.1% of the students. In the absence of proper support and

maintenance of even the most current and sophisticated software, the ability of teachers and students to access and use technology is highly compromised. Organising training workshops for students as well as teachers regularly, to improve their technological skills and be at par with updates in software is a solution. Also, usage of a single, safe and effective software by all medical institutions in India, would standardise the training programs which need to be given to students and teachers.

A common drawback identified by a majority of the participants (79%) was loss of connection during classes due to poor or unstable network availability and disruption in the flow of the lecture. This obstacle can be overcome by recording the lectures and providing them to the students through various social platforms. Another solution to this would be provision of alternate means of attending these lectures, for example through a 'call in' means for joining and attending classes in audio only mode. An innovative and effective solution would be development of e-learning software that function smoothly even at low bandwidths.²²

A recent survey by Uma V stated that 40% of the concerns about online education were related to unreliable connectivity, 30% cited the cost of data and 10% reported uncertainty in electrical supply.²³ Only 28% of the students belonging to rural households had access to the internet at home.²⁴ Such issues need to be worked on, to extend the reach of e-learning to rural population as well.

The medical field calls for students to have a great deal of social soft skills in order to win the trust of patients and ace the art of medicine. The lack of patient exposure and clinical cases creates a great void in medical learning, which seemed to be one major setback for e-learning, causing students to prefer the traditional method of classes. While e-learning was considered unsuitable for practical classes and demonstrations, it was considered a great method to teach theory classes and case discussions.

This gap in the clinical sphere of e-learning can be met by introducing innovative ideas like purely holding clinical case discussions in a separate interactive class, or integrating these discussions while teaching certain topics could help increase clinical interest and diagnostic skills. In addition, separate video clips demonstrating basic clinical skills, such as clinical procedures and physical examination skills could be streamed live or sent prerecorded. This could be used as a supplementary learning resource to help students master clinical skills. ²⁵ The online lecture sessions allowed students to attend classes in their own comfort zones, make better notes with the audio-visual aids, address their queries more freely and also avoid the travel hassles.

A study conducted by Rose S established that reduced student-student discussions, dependence on emails and

internet facilities and a difficulty in delineating boundaries between home and work were some of the pitfalls of online education that needed to be worked on.²⁶

Though most of the institutes of the participants in the study, had rapidly converted their entire preclinical curriculum to online formats, some of them were still unable to initiate this transition due to lack of infrastructure and technological awareness, especially when a large part of the medical fraternity had been redirected to fight the COVID-19 pandemic.³

Most of these students looked forward to e-learning and believed it to be useful. There is a need for training the students as well as the medical faculty in conducting e classes and the use of technology to its full potential. Overcoming the technical problems, by providing a portal that is more convenient for both, the teachers as well as all students; and using this platform to provide more videos, offline recorded lectures, and clinical cases to the students, will allow institutions to adapt to this new form of education, and to accept it as an important ally to the traditional face to face mode of education.

Limitations of this study include an inability to achieve a larger sample size and a wider representation of the medical colleges in India, due to difficulty in reaching out to medical students across India amidst this COVID-19 lockdown.

CONCLUSION

In conclusion, this study showed that e-learning is an effective tool that can augment the medical student learning experience in India. Students can watch the recorded online classes- that could range from theory lectures to clinical skills demonstrations and utilize them for further reference. By overcoming the setbacks that challenge its implementation, it can be used as a means to supplement traditional teaching methods even beyond the COVID-19 pandemic.

Scope for further research

Further research could be conducted to gather the opinions of the teaching faculty and conducting research on development of more efficient software for e-learning by getting inputs from IT engineers will further help us get better insight and explore e-learning to its full potential. A qualitative study would also be helpful to understand the issues of individual colleges and would give a better insight on the pros and cons of this method and the means to overcome the barriers to use this method effectively.

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