ORIGINAL ARTICLE

E-learning in medical education: students' experience, challenges and perspectives: a cross-sectional study in India

Kabita Barua[1], Sanjeev Kumar Rasania[2], Anita Shankar Acharya[3], Ankita Singh[4]

[1]Senior Resident, Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India; [2]Director Professor & Head, Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India; [3]Director Professor, Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India; [4]Senior Resident, Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India

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Corresponding Author

Dr Kabita Barua, Senior Resident, Department of Community Medicine, Lady Hardinge Medical College, Connaught Place, New Delhi, Delhi 110001, India
E Mail ID: barua.kabita.28@gmail.com

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Abstract

Background: Due to COVID-19 pandemic, online classes were initiated in medical colleges for continuation of learning. **Methods**: A cross-sectional study was conducted among 537 undergraduate medical students in an Indian medical college using Google forms. The questionnaire contained sections on students' online or e-learning experience and role of instructor in enhancing it; challenges and further scope of improved implementation of e-learning. Statistical analysis included descriptive statistics. SPSS 23 was used for data analysis. RESULTS: Among study participants, (46.7%) regularly joined e-classes on time. Prior scheduling of classes (88.6%) and sharing of study material in e-learning application (84%) by teachers/instructors; interactive discussion with teachers (71.1%) and their response to students' queries through e-learning application (77%) facilitated learning among participants. For (42.6%) e-learning represented considerable challenge in acquiring clinical medical skills. Theory lectures were found suitable for learning by e-learning mode while clinical case discussions were not preferred. **Conclusion**: E-classes had some definite advantages; however, undergraduate medical students preferred blended approach as e-learning represented a challenge for learning clinical medical skills. Instructors were found to have definite role in enhancing e-learning experience. Providing solutions to barriers like poor internet connectivity and resolution of technical glitches are essential for improved implementation of e-learning.

Keywords

COVID-19 pandemic; E-learning; Online learning; Education; Students

Introduction

The World Health Organization declared COVID-19 a pandemic on March 11th, 2020. (1) Different countries worldwide imposed lockdowns to restrict transmission of SARS CoV-2 virus. The government of India announced closure of all educational institutions on March 16th, 2020 following which medical colleges were also pushed to stop their offline teaching and start e-learning to cater to students in the pandemic and that they do not miss atleast the theoretical knowledge in the curriculum.

E-learning is defined as using computer technologies to deliver instructions to learners who are at a remote location from a central site. It is also called as online learning, web-based learning, distributed learning, computer-assisted instruction, or internet-based learning. (2) There were significant transformations in medical education in the pandemic as various e-learning tools were introduced in medical colleges. As the shifting of offline medical lectures to online learning platforms has become an absolute necessity in the COVID-19 pandemic, it has provided us with an opportunity to study the challenges and scope of e-learning in medical education even beyond the pandemic.

Aims & Objectives

1. To find out e-learning experience among medical undergraduates to help improve its format.
2. To assess students' perspectives regarding challenges and future scope of implementation of e-learning in medical education.

Material & Methods

Study design: A cross sectional study was conducted for a period of 3 months among all undergraduate medical students in a government medical college in Delhi, India.

Study setting: The participating college enrolls female students in the undergraduate medical course. Following nationwide lockdown on 24th March, 2020, Microsoft teams for the college students' online classes were set up in April, 2020 and regular e-classes for undergraduate students were conducted since mid- April 2020. Live streaming synchronous sessions using Microsoft team's platform were used for conducting classes in the form of online lectures; tutorials, demonstration/ practical sessions and clinical case discussions.

Sample size, sampling design and Study participants: For this study, the estimated sample size was derived from the online Raosoft sample size calculator (3). The sample size was calculated based on a response rate of 50%, a confidence interval of 99%, and a margin of error of 5%, with a total 1st, 2nd, 3rd and 4th year MBBS medical student population around 838 (i.e., First Year (n = 240), Second Year (n = 194), Third Year (n =209) and Fourth Year (n = 220). The minimum recommended sample size was 376. However, the study included a sample of 537 undergraduate medical students who are enrolled in their academic years and gave consent to participate in the study.

Study instrument and data collection: A semi-structured questionnaire was designed which was made available electronically through Google forms. The questions were about participants' characteristics, availability of technologies and e-class participation (duration of attending, regularity of joining e-classes), perspectives (teacher's role in e-learning, experience of benefits, drawbacks and participants' preference of e-learning for various methods of medical teaching); challenges and future prospects for improving implementation of e-learning in medical education.

E-learning in our study is defined 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 live chat sessions, online discussions, quizzes, e-mail and assignments. (4,5)

Data of 537 students who responded between the data collection period were quantitatively analyzed.

Ethical clearance: The study proposal was approved by the Institutional ethics Committee of Lady Hardinge Medical College in New Delhi, India. Informed Consent was taken electronically from study participants as was permitted by the Indian Council of Medical Research during the pandemic.(6)

Results

A total of 537 undergraduate medical students from the college participated in the study. Response rate among participants was 100 percent. All were females. The mean age of the participants was 21.96 years.

***Students' experience of e-learning*:** Data connectivity for e-classes was good/ average for 436 (81.2%) while poor data connectivity was reported by 101(18.8%). Regarding online class participation, 285 (53.07%) students missed joining some classes due to network or other issues.

Total duration of lecture/tutorial was for 1-2 hours and for practical/clinical case discussions, duration was 2-3 hours. For the majority (82%), preferred duration of an e-class was 1hour-2 hours. Total duration of e-classes per day was 7 hours and 371 (69.1%) reported attending e-classes daily for an average duration of 5 hours or more. ([Table 1](#))

Students' opinion regarding teachers'/instructors' role in enhancing e-learning experience: According to 476 (88.6%), prior scheduling of classes by teachers in the e-learning application helped them to join e-classes timely. Majority (96%) were aware of a system of teachers marking their attendance. In case of network connectivity problems, 310 (57.7%) reported to have shared issues regarding attending their attendance to the facilitators (which was given due consideration). Study material (presentations and pdf format of textbooks) shared by teachers facilitated e-learning as reported by 451 (83.9%), (the majority had left their textbooks in their hostels when they left for their homes due to lockdown). ([Figure 1](#))

*Regarding **benefits of e- classes***, 210 (39.1%) students reported them to be superior to offline classes for clearing doubts as they could ask their queries more confidently and cleared doubts during the class itself. Also, they received answers from teachers in the interactive chat-box in the e-learning application. 154 (28.7%) reported that the convenience of accessing e-classes during pandemic-imposed travel restrictions had a distinct advantage over offline classes.

***Drawbacks of the e-classes observed*:** According to (65.5%), there were increased distractions in e-classes due to network connectivity problems and technical glitches in the e-learning application. Apart from issues like difficulties during application login and audio and visual problems due to internet hanging, increased distraction among some students due to a tendency of scrolling on social media during e-lectures was reported.

***Students' preferences of e-learning for different methods of medical teaching*:** Theory lectures were preferred by 363(67.6%) students for learning via e-learning mode while none preferred clinical case discussions as suitable for e-learning. ([Table 2](#))

Students' perspectives regarding challenges and future scope of e-learning in medical education:

229 (42.6%) students were of the opinion that e-learning represent a considerable challenge in acquiring clinical medical skills.

A strong bandwidth / good internet streaming quality and coverage is an important requirement of e-classes. According to (27.7%) students, poor/ unstable network connectivity in some parts of the country could lead to a lack of uniform commitment to e-learning.

On the future scope of improved implementation of e-learning, (66.3%) suggested a blended approach in medical colleges. (Table 3)

Discussion

E-learning technologies though existed earlier but was not used to its full potential in medical education in the country before the COVID-19 pandemic. The present study sought to find out medical students' experience of e-classes and their perspectives regarding challenges and future scope of e-learning in medical education.

Traditional i.e., (face to face) teaching is considered an essential long-standing approach in medical education. (7) It required that teaching and learning should take place at the same time and place. E- learning contrastingly doesn't have the time and space limitations of offline learning and offers flexibility to students to access course material and information. (8,9) (28.7%) study participants reported that easy accessibility of the classes during the pandemic-imposed travel restrictions was an important advantage of e-classes. Al-Balas M reported that travel time saved and flexibility of accessing classes are advantages of e-classes. (10)

Present study found instructors to have a definite role in enhancing e-learning experience among students. Prior scheduling of the classes and pre-sharing of learning material in the e-learning application facilitated participants for e-learning. Similarly, Moravec M found that preparing for a lecture beforehand puts the student in a better place to understand information taught in class, which promotes in-depth learning. (11)

Participants were mostly aware of a system of their attendance being marked. A good attendance policy can have a strong impact on student performance. (12,13)

Present study found that teachers' prompt response to students' queries during e-class helped them in clearing their doubts. A unique feature of the e-classes was the resolution of students' queries/doubts in chat messages in the learning application. Lawande N reported a similar finding. (14)

Among participants, (8.7%) cited a lack of interaction with teachers and classmates in e-classes. It was suggested that a pre- or post-class test or quiz could improve interaction. Muilenburg had stated lack of social interaction to be an important barrier to students learning online.(15) Classic lectures can be improved by increasing student teacher interaction via quizzes, tests and other interactive sessions.(16,17) Majority (80%) in the study were in the favour of group work for practical postings in e-classes. Previous studies have revealed that system functionality, social interactions and collaborative learning among online learners are positively correlated with enhanced e-learning experience.(18,19)

Increased distractions in e-classes were reported (65.5%) due to frequent technical issues in the e- learning application like: 'Removal automatically from e-class for which students had to re-join, but partially missed discussions'. Valdez G had stated that students can't access technology in the absence of support and maintenance of the software.(19) Institutional strategies must be designed to use a safe, effective and updated software.

Among study participants, (5.9%) reported a lack of self-motivation to attend e-classes. El-Seoud S stated that in order to motivate students, teachers should consider use of animation, clear organization of materials, quizzes and explanation about importance of the course.(20) Training sessions should be organized to improve technological skills among students and instructors.

In the present study, (13.2%) reported a lack of understanding of the e-classes mainly practical/ demonstration classes. Headache, eyestrain and fatigue due to increased screen time in e-classes were reported in a few (2%). Providing timely break in between e-classes, avoiding too much text and instead using flow charts in PowerPoint presentations, circulating recorded videos of practical sessions and making small groups of students for practical classes can provide effective solutions to these issues.

Implementation of e-learning is particularly challenging, in low-middle income countries. Lack of technology, internet access, poor quality of internet services and infrastructure are examples of barriers that impact both learners and faculty members.(21,22) Regarding challenges of implementation of e-learning, participants reported issues like non-availability of functional high-speed internet uniformly which was a key requirement of e-classes. Also, there was difficulty to acquire clinical examination skills without exposure to bedside patients. Data connectivity for classes was poor as per (18.8%) leading to failure to log in to Microsoft teams' application; inability to download study material; failure in uploading or submitting class assignments and taking online tests at the given time slot. Participants also cited limitation in their internet data packages. In a study by Uma V, 40% of the concerns about online education were related to unreliable connectivity, 30%, to data costs and 10%, to uncertainty in electrical supply.(23) There should be institutional collaboration with telecommunication companies to provide students and instructors with high quality internet coverage at affordable costs.(10)

In the study, theory lectures were found to be the most preferred method of medical teaching by e-learning mode. Participants were largely of the opinion that e-classes were the only viable option due to pandemic related closure of medical institutions and not a substitute for clinical skills gained by touching and feeling a real patient at bedside. For increasing understanding of clinical case discussion, video clips demonstrating clinical procedures and physical examination methods can be uploaded prior to scheduled e-classes. Majority (66.3%) had the opinion that a blended approach (online for delivering theoretical knowledge and offline for teaching medical skills) will be the most suitable for future medical teaching. According to participants, institutional support for enhanced solution of technical glitches and imparting training for skill build-up of instructors and students in e-learning technology could improve e-learning experience.

Conclusion

In the study, e-learning had some definite advantages. However, it represented a challenge for acquiring clinical medical skills by medical undergraduates and they preferred a blended approach. Students can watch recorded demonstration of clinical procedures /examination to augment their learning. Instructors have a definite role in enhancing e-learning experience in students, hence, it is an onus on the part of institutions to improve instructors' skills in using technology in e-learning. Resource limitations like high-speed internet availability, high internet costs and technical issues are reported as barriers for successful participation in e-learning. Designing of institutional strategies and support system for better resolution of technical glitches can help further improvement of e-learning in medical education.

Recommendation

(I)Design of institutional strategies and support system for better resolution of technical glitches during e-classes (II) Institutional training to improve instructors' and student's skills in using e-learning technology (III) Studies could be conducted in different medical colleges to understand the individual issues and optimize e-learning experience among students. There is a need for measuring the educational outcomes linked to the online learning and compare them to the traditional offline learning.

Limitation of the study

It was done at a single medical college due to difficulty in reaching out to medical students across India amidst the COVID -19 lockdown.

Relevance of the study

Majority of the participants in the present study reported use of e-learning methods for the first time as a means to adapt to the unresolved situation. Students' opinion regarding role of the instructor/facilitator in enhancing the e-learning experience and their perspectives regarding their current experience of benefits and drawbacks of e-learning; challenges and suggestions for improved implementation even beyond the pandemic is highlighted in this study and adds to the existing literature about e-learning in medical education.

Authors Contribution

Acknowledgement

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Tables

TABLE 1 PARTICIPANTS' CHARACTERISTICS (N=537)

Variable	Category		Number (%)
Age	Mean 21.96 years (Range:19-26 years)		
Academic year	First year (MBBS)		194 (36.13)
	Second year (MBBS)		114(21.23)
	Third year (MBBS)		152(28.31)
	Fourth year (MBBS)		77 (14.34)
Gadget used for classes	Computer		251(46.74)
	Smartphone		274(51.03)
	Tablet		12(2.23)
Data connectivity for class	Good/Average		436(81.19)
	Poor		101(18.81)
Online class participation	Regularly joined e-classes		252(46.93)
	Missed some classes		285(53.07)
Duration attended (hours/day)	5 hours or more		371(69.09)
	Less than 5 hours		166(30.91)
Preferred duration of e-class	1 hour-2 hours		440(82)
	2-3 hours		37(7)
	No preference		60 (11)

MBBS: Bachelor of Medicine and Bachelor of Surgery

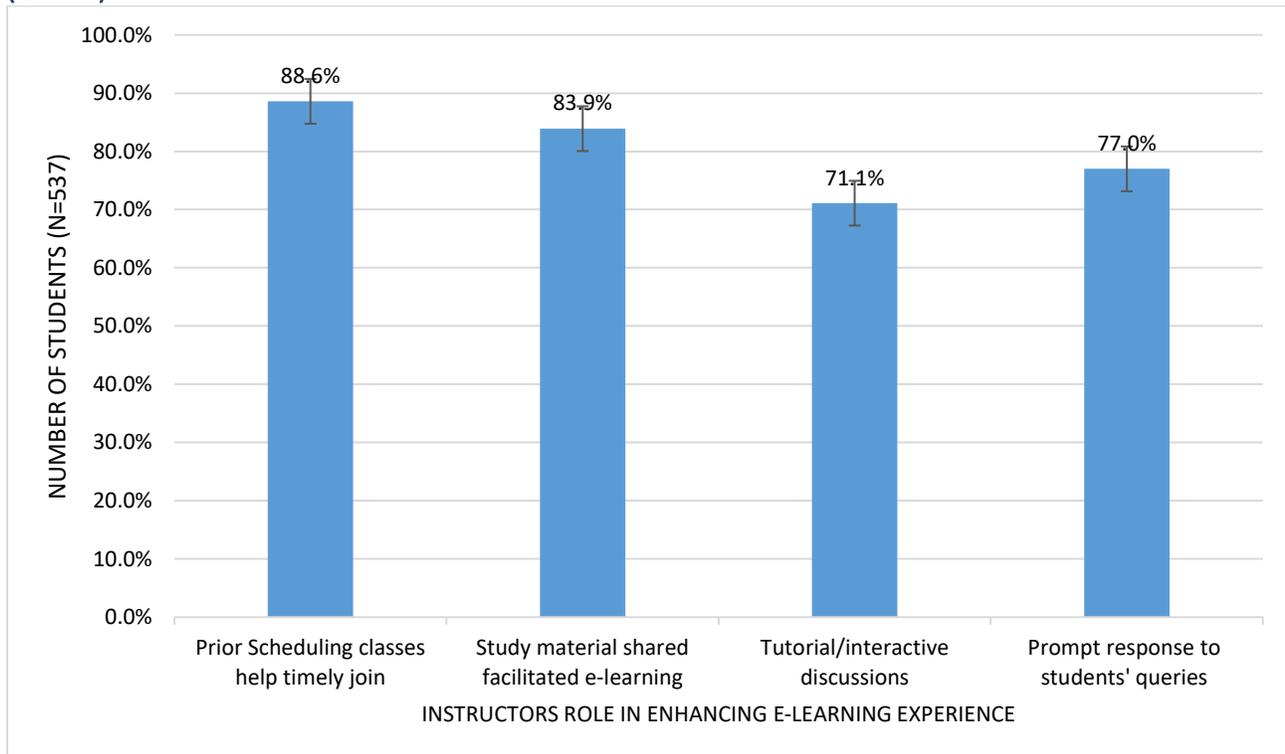### TABLE 2 BENEFITS, DRAWBACKS AND PREFERENCE OF E-LEARNING FOR DIFFERENT METHODS OF MEDICAL TEACHING (N=537)

Variable	Participants' Response		Number (%)
Benefits	Better clearance of doubts		210 (39.1)
	Convenient for accessing classes		154(28.7)
	Learning material and presentations shared		120 (22.3)
Drawbacks	Saves travel time, expenses		53(9.9)
	Increased distractions		352(65.5)
	Difficulty in understanding demonstration/practical		71(13.2)
	Lack of social interaction		47(8.7)
	Lack of self-motivation		40(7.5)
	Loss of time in technical glitches		16(3.0)
	Increased screen time causing eyestrain, headache		11(2.0)
Preference of e-learning for different medical teaching methods	Theory lectures		363(67.6)
	Tutorials		162(30.2)
	Demonstration/ practical classes		12(2.2)

TABLE 3 PERSPECTIVES OF STUDENTS REGARDING CHALLENGES AND FUTURE SCOPE TO IMPROVE E-LEARNING IN MEDICAL EDUCATION (N=537)

Variable	Participants' Response	Number (%)
Challenges	Difficulty to acquire clinical medical skills	229(42.7)
	Poor network connectivity	149 (27.7)
	Internet costs and limitation of internet data package	85(15.8)
	Preference of traditional offline approach by some faculty members and lack of skills	74(13.8)
Future scope to Improve e-learning	Blended approach can be used in medical colleges	356(66.3)
	Institutional training to improve instructors' and students' skills	112(20.9)
	Institutional support for enhanced resolution of technical glitches	69 (12.8)

Figures

FIGURE 1 PARTICIPANTS' OPINION REGARDING TEACHERS' ROLE IN ENHANCING E-LEARNING EXPERIENCE (N=537)

N.B. (multiple responses)