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Assessment of barriers and motivators to online learning among medical undergraduates of Punjab

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Abstract:

BACKGROUND: The current corona virus disease 2019 (COVID-19) pandemic has led to the disruption of academic activities including medical education which has made online learning only available options for continuing education worldwide. Online learning has its own limitations, which are further amplified if not implemented properly. Hence, there is a need to assess various barriers faced in the implementation of effective online learning.

OBJECTIVES: The objective of the study was to identify the barriers and motivators in online learning among medical undergraduates.

SUBJECTS AND METHODS: This internet-based cross-sectional study was conducted among medical undergraduates of Punjab. The data collection tool was a semi-structured self-made questionnaire prepared using "Google Forms," which was then circulated in the WhatsApp groups of the students. Received responses were imported to the Microsoft Excel sheet and statistical analysis was done.

RESULTS: Out of the 592 participants, 533 (90%) faced some kind of problem in online learning. Major among them were lack of personal interaction with teachers (52%), distractions at home (43.6%), technology failure (43.2%), limited access to the Internet (39.2%), visual fatigue (38.5%), and increased workload (25%). Benefits perceived were the comfortable environment of home (41%), easy accessibility of recorded lectures (36.8%), and the opportunity to keep in touch with studies (35%).

CONCLUSIONS: The online learning process is not a replacement for routine classroom teaching and clinical postings in medical education. However, it can supplement routine teaching, especially during current COVID-19 pandemic-like situations. Most of the students (90%) were facing some kind of difficulty in the online learning process due to unplanned and sudden shifts. Therefore, it is necessary to identify and eliminate the various barriers to make online learning effective.

Keywords:

Coronavirus disease 2019, medical education, online learning, undergraduate

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Introduction

Medical education in the current era mainly focuses on three sectors, i.e., undergraduate, postgraduate, and the continuous professional development of established health-care personnel. Medical education is aimed to provide society with a skilled, knowledgeable, and up-to-date cadre of health-care professionals who

put patient care above self-interest and remain diligent in the maintenance and development of their expertise over a lifelong career.^[1]

The medical field is vast and ever evolving, thus demanding the timely modifications in medical education. In the past few decades, changes in health-care delivery and advances in medicine have increased demands on academic faculty. Challenges

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such as large curriculum, need for repetition, continuous advancements, and limited teaching faculty can be largely met by incorporating online learning in medical education. To supplement classroom teaching, online learning through various digital platforms was gradually being introduced in the medical education of India. However, the recent outbreak of coronavirus disease 2019 (COVID-19) has suddenly made online learning only available option for continuing education worldwide.

The current pandemic of COVID-19 was identified in Wuhan, China, in December 2019. The World Health Organization declared the outbreak a Public Health Emergency of International Concern on January 30 and a pandemic on March 11, 2020.^[2,3] The first confirmed case of COVID-19 in India was detected in Kerala on January 30, 2020. At present, the entire country is in the grip of this severe global pandemic. The Indian Prime Minister announced a nationwide lockdown from the midnight of March 24, 2020, thus temporarily suspending face-to-face classroom teaching in all educational institutes including medical colleges.^[4,5]

The pandemic has resulted in disruption of various activities such as the implementation of academic programs, bedside teaching, research activities including PG/PhD thesis work, university examinations, and counseling/admission process. However, the advent of new technologies is providing educators with opportunities to create a variety of effective learning environments and online teaching has been started at many of the institutions to compensate for the losses in education already faced due to the lockdown.^[6]

As universities around the globe are rapidly shifting to online learning, teaching, and assessment in response to the COVID-19 pandemic, many concerns have also been reported. Both teachers and students have felt unprepared, inadequately supported, and deeply fearful due to this forced, unpredicted, and sudden shift.^[7-9]

Various challenges related to online classes are being faced by teachers and learners, especially in the medical field where experiences of presentations, bedside case discussions, and clinical rotations are a very crucial part of learning.^[10] Some of the barriers to online learning can be limited technology experience, lack of motivation, challenging e-learning material, inadequate support, etc.^[11] Although online classes are not a replacement for face-to-face classes, they are need of the hour.

Many factors influence the online learning process ranging from student-led factors to faculty-led factors and the factors related to digital resources and infrastructure. There is a need to explore these factors

in the current scenario to make necessary changes to the system of online teaching and learning so that it is more effective and serves the desired purpose. Hence, this study has been taken up to access the various problems faced by the students of the medical field undergoing this online learning process. This study aims to identify the barriers and benefits perceived in online learning by the medical undergraduates and to suggest necessary recommendations for effective implementation of online teaching.

Materials and Methods

Study type

This was a descriptive cross-sectional study.

Study setting

This study was conducted in medical and associated colleges of Punjab.

Study population

The study population consisted of medical undergraduates including MBBS, BDS, BPT, and B.Sc nursing students studying in various colleges of Punjab (India).

Study duration

Due to the COVID-19 pandemic, face-to-face classes were suspended in the whole country including medical colleges on March 24, 2020. Online classes were started in most of the colleges by the 1st week of April. This study was conducted in mid-May 2020, approximately after 1 month of exposure to the online learning process. A period of 2 weeks was provided to the participants to submit their responses.

Study tool

Preformed self-made pretested questionnaire was used as a study tool.

The questionnaire includes the following components:

1. Sociodemographic data of the participants
2. Questions about general concepts of online learning
3. Questions assessing barriers in online learning
4. Questions about the benefits of online learning and suggestions for improvement
5. Questions about training and suggestions for improvement.

The questionnaire was self-made keeping in view the aims and objectives of this study and pretested by conducting a pilot study on 10% of the required sample size, and the changes were incorporated in the questionnaire afterward. The questions were aimed at inquiring about the details of online learning like the software used, the number of hours devoted to online learning per day, attentiveness in the lectures;

obstacles faced by the students; benefits perceived, and suggestions for improvement.

Strategy for data collection

A semi-structured questionnaire was prepared via “Google Forms.”. This consisted of 21 open-and close-ended questions. Google Forms link of the questionnaire was shared in the WhatsApp groups of the students of various medical, dental, physiotherapy, and nursing colleges of Punjab. Instructions regarding filling the questionnaire were mentioned in the description of the Google Form.

Sample size

To calculate the sample size, the following formula (Daniel, 1999) was used:

$$N = Z^2P(1 - P)/d^2$$

Where n = sample size,

Z = Z statistic for a level of confidence,

P = expected prevalence or proportion (in proportion of one; if 50%, $P = 0.5$)

d = precision (in proportion of one; if 5%, $d = 0.05$).

Z statistic (Z): For the level of confidence of 95%, which is conventional, the Z -value is 1.96.

Taking the prevalence of barriers perceived by students as 57% as reported by previous studies,^[12] with an allowable error of 5%, the calculated sample size comes out to be 377. However, 605 responses were received and 592 responses fulfilling inclusion criteria were analyzed.

Data processing and analysis

Data collected were imported in the Microsoft Excel sheet and statistical analysis was done using Epi Info statistical package for windows (freely available online). Normally distributed numerical data were presented as mean (standard deviation [SD]). Categorical data were presented as frequencies and percentages. The Chi-square test was used to test the level of significance between variables.

Ethical considerations

This study was registered at the Government Medical College Ethics Committee under the research project number IEC/GMC/2048. Consent was obtained in the first section of the form stating that they were volunteering to participate in the study. Participants were also assured of the data confidentiality, and all the questionnaires were kept anonymous. The study was conducted per the ethical standards of the Institutional Ethics Committee.

Results

This study included responses from 592 students in the analysis. The mean age of participants is 20.7, with an SD of 1.56. The basic profile of students reveals most of the responses came from females. This was obvious as most of the courses have more strength of females than males. Moreover, a majority of responses were received from nursing students which usually have a female-to-male ratio of >90%, thus females were more in this study also. We received most responses from private colleges rather than government colleges. Details are enlisted in Table 1.

Table 2 states that most of the students (72.6%) are learning via video lectures, while only 3.9% are studying via written material and 23.5% are receiving both. Most students (34.1%) are attending 3–5 lectures per day followed in frequency by 1–2 lectures per day (34%), 3–4 per week (17.4%) and 1–2 per week (14.5%). Most of the institutions are using Zoom App for teaching (50.8%), followed by other applications such as WhatsApp (15.2%), YouTube (9.1%), Google Meet (9.3%), Free Conference Call (8.3%), Telegram (8.1%), Skype Meet Now, and GoToMeeting. Online assignments are being given in most of the cases (79.2%) via WhatsApp (35.8%), Google Forms (23%), E-mail (13%), Google Classroom (6.3%), ClassMarker (3.2%), and others (1.4%) such as Telegram, SurveyMonkey, etc.

Table 3 represents the feedback of students regarding online teaching. Almost half of the students (56.8%) attend/read all the lectures scheduled for them per day. About 24.5% of the students said that they were able to be always attentive during the class, 36.3% were able to be attentive during most of the lecture, 26.2% sometimes, and 13.5% were rarely attentive during the class. Regarding the usefulness of online assignments, 26.5% were of the view that they are highly useful, while 37.5% thought them to be somewhat helpful and other 15.2% as not helpful at all. About 69% have not received any previous training regarding the use of digital platforms

Table 1: Basic profile of the students

Particulars	Frequency (%)
Gender	
Female	449 (75.8)
Male	143 (24.2)
Course	
BSc nursing	219 (37.0)
MBBS	184 (31.1)
BPT	107 (18.0)
BDS	82 (13.9)
Type of institute	
Private college	380 (64.2)
Government college	212 (35.8)
Total	592 (100.0)

Table 2: Details of online teaching

Aspect	Frequency(%)
Mode of online teaching	
Video lectures	430 (72.6)
Written material	23 (3.9)
Both	139 (23.5)
Frequency of online teaching (classes/videos/written notes)	
3-5/day	202 (34.1)
1-2/day	201 (34.0)
3-4/week	103 (17.4)
1-2/week	86 (14.5)
Software/s used for online teaching (multiple responses allowed)	
Zoom Meetings	301 (50.8)
WhatsApp	90 (15.2)
YouTube	54 (9.1)
Google Meet	55 (9.3)
Free Conference Call	49 (8.3)
Telegram	48 (8.1)
Others	15 (2.5)
Online assignments given	
Yes	469 (79.2)
No	123 (20.8)
Software/s used for online assignments (multiple responses allowed)	
WhatsApp	212 (35.8)
Google Forms	136 (23.0)
Email	77 (13.0)
Google Classroom	37 (6.3)
ClassMarker	19 (3.2)
Others	8 (1.4)
Total	592 (100.0)

for this purpose, while 20.3% of all have no previous expertise by themselves regarding the use of digital media. About 34.8% of the participants are of the view that online teaching can be included in the curriculum as an aid to the routine teaching.

Table 4 states that the major problems faced by students in online learning were lack of personal interaction with the teachers (52%), followed by distractions at home (43.6%), frequent technological failures (43.2%), limited access to the internet (40%), visual fatigue (38.5%), increased workload (25%), lack of adequate devices (17.7%), personal anxiety/fear of online learning (15.2%), and others like the poor audio quality of lectures, headache after prolonged use of e-devices, inadequate learning environment at home, lack of interaction among fellow students, lack of uninterrupted power supply, and security issues with some applications used for online learning.

Table 5 compiles the benefits of online learning. Most students feel that it is the comfortable environment of the home which lures them toward online

Table 3: Feedback of the students

Aspect	Frequency (%)
Attend/read all the lectures scheduled for the day	
Always	336 (56.8)
Mostly	145 (24.5)
Sometimes	58 (9.8)
Rarely	53 (9.0)
Able to attend/read online lectures attentively?	
Always	142 (24.0)
Mostly	215 (36.3)
Sometimes	155 (26.2)
Rarely	80 (13.5)
Are the online assignments helpful?	
Very helpful	157 (26.5)
Somewhat helpful	222 (37.5)
Not helpful	90 (15.2)
Assignments not given	123 (20.8)
Previous training on the use of digital platforms for online learning?	
Yes	184 (31.1)
No	408 (68.9)
Previous expertise in the use of digital platforms such as Microsoft Office and e-mail.	
Yes	322 (54.4)
Somewhat	150 (25.3)
No	120 (20.3)
Can online teaching be incorporated as a supplement to the regular teaching?	
Yes	183 (30.9)
No	206 (34.8)
Can't say	203 (34.3)
Total	592 (100.0)

learning (41%). The other motivating factors were the ability to access recorded lectures/written material anytime (36.8%), be able to keep in touch with studies even during the lockdown (35%), a vast variety of content available online (25.7%), and development of digital expertise (24.5%).

We also recorded responses of students on suggestions to improve the current ongoing online teaching. The majority of the students were of the view that the burden of classes per day should be reduced so that they can grasp better. Other suggestions were organizing some kind of training for teachers regarding how to use digital platforms for this purpose, availability of better Internet connection, and concerns regarding the security of some online apps used for this purpose. Attentiveness during online learning was found to be significantly associated ($P = 0.036$) with the number of classes/lectures per day [Table 6].

Discussion

The present study was conducted among the medical undergraduates of various colleges of Punjab. These

Table 4: Problems/difficulties faced during the online learning process (multiple responses were allowed) (n=592)

Problems/difficulties	Frequency (%)
Lack of personal interaction with the teachers	307 (51.9)
Distractions at home	258 (43.6)
Frequent technology failures	256 (43.2)
Limited access to the Internet	232 (39.2)
Visual fatigue	228 (38.5)
Increased workload	148 (25.0)
Lack of adequate devices/hardware	105 (17.7)
Personal anxiety/fear of online learning	90 (15.2)
Others	13 (2.1)
None	59 (10.0)

Table 5: Benefits of online learning (multiple responses were allowed) (n=592)

Benefits	Frequency (%)
Comfortable environment of the home	243 (41.0)
Can attend recorded classes anytime	218 (36.8)
Can continue learning during the lockdown	207 (35.0)
More content can be provided through online platforms	152 (25.7)
Helps developing digital expertise	145 (24.5)
None	95 (16.0)

Table 6: Ability to attend/read lectures attentively with respect to the number of lectures per day

Frequency of lectures	Attentive		Total
	Always/mostly	Sometimes/rarely	
<3/day	247	143	390
≥ 3/day	110	92	202
Total	357	235	592

Pearson Chi-square: 4.3815, P=0.036

students underwent e-learning through various digital platforms arranged by their institutes.

In this study, 533 participants (90%) faced some kind of difficulties in online learning. Major among them were lack of personal interaction with teachers (52%), distractions at home (43.6%), technology failures (43.2%), limited access to the Internet (39.2%), visual fatigue (38.5%), increased workload (25%), lack of adequate devices (17.7%), personal anxiety/fear of online learning (15.2%), and others like the poor audio quality of lectures, headache after prolonged use of e-devices, inadequate learning environment at home, and security issues with some applications used for online learning. Similar results have been reported by other studies also.

Mokaripour *et al.* state that most of the respondents were only partially experts in working with the computer system and had problems regarding the system hardware and protecting against viruses and hackers. Participants also reported limited interaction in online

learning as one of the problems faced by them while learning online.^[13]

Kaup *et al.* have enumerated the challenges faced by the learners while using online apps for learning during COVID-19 lockdown. Some of them are lack of clinical and surgical skill training; technology-related challenges; less student engagement and attention; resource overload; lack of physical support from the peer group; lack of books and other resources; isolation, fear, and anxiety associated with the pandemic and new pedagogy technique; and issues faced in conducting a secure and valid online assessment.^[14]

Shahmoradi *et al.* report in their study that about half of the participants (40%) had a problem accessing the technology and 38% of them faced problems regarding the use of tools required for online learning.^[15] Singh *et al.* also report that nearly half of the students believed that physical classroom was better than e-classroom.^[16]

Roberts *et al.* observed the challenges faced in delivering online lectures from both learners as well as tutors' perspectives. Some of them are loss of nonverbal cues, inability to see the reactions of their peers, students feeling more isolated and lose confidence, students not being active in the tutorials, and some students switching off their cameras and microphones during the sessions.^[17]

The barriers in the online teaching process reported by Soni VD during COVID-19 are deficiency of proper learning attitude, lack of suitable materials for learning, more involvement in classroom learning, incapability of self-discipline, and the inadequate learning environment at some of their homes during self-isolation.^[18]

A report by Education Week states that being in-person with teachers and other students creates social pressures and benefits that can help motivate students to engage.^[9]

According to a study conducted by O'Doherty *et al.*, lack of technical skills, poor infrastructure and technology, inadequate time for the development of online teaching tools, and poor communication were seen as some of the barriers to online learning.^[19]

Other studies reported increased levels of anxiety when using computers, lack of skills associated with information and communication technology, unreliable university computer systems, the lack of technical support, technology failures, and time wastage as some difficulties faced in the online learning process.^[20-31]

The present study reports comfortable environment of home (41%), easy accessibility of recorded lectures (36.8%), opportunity to keep in touch with

studies (35%), availability of more content online (25.7%), and opportunity to gain digital expertise (24.5%) as some of the motivational factors perceived by students.

A study conducted by Soni VD states that the benefits of online learning are the flexibility of time, location, learners' convenience, vast content available online in different formats, and free access to certain e-manuals for study purposes.^[18]

Mokaripour *et al.* stated that e-learning provides better learning opportunities, disregarding the time and space of learners.^[13] The benefits of online learning reported by other studies were developmental of basic information technology skills,^[23] flexibility afforded by the online learning environment, the ability to be self-paced,^[22,32] and choices about place and time of learning.^[33]

In the present study, suggestions given by students to improve online learning were the proper gap between two classes, two-way interaction among teachers and students, reducing the burden of assignments and classes to ensure better grasping, and training of the teachers regarding the use of online applications.

Similarly, a study conducted by Abramenska V has also reported suggestions like determining the combination of tools to help students collaborate effectively, discuss the projects with the students, and be able to communicate with the instructor as an important tool for a successful online learning experience.^[12]

Kaup *et al.* also report similar suggestions to improve the online learning process and to cope with the challenges faced in this process. Some of them are using online apps for simulation-based training, ensuring the basic technical training for students and teachers in optimum utilization of the platform being used, designing shorter and more interactive classes to increase the attentiveness of students, being supportive, sensitive, and flexible to each other's needs, regular mentoring of students, one-on-one online meetings with the students, and use of program evaluation tools for assessing the effectiveness of the online education program.^[14]

Roberts *et al.* have suggested that all the sessions should be recorded so that all students, regardless of whether they had attended the live online sessions or not, can review the sessions in their own time.^[17]

Soni VD has reported similar suggestions such as consultation of online teaching assistants by the faculty for lesson plan preparation, providing creative and skillful assignments to the students to increase their participation, dividing teaching material into small modules, dropping the speed of speech by the teachers,

and engaging students in a discussion to encourage their perspectives and provide feedback on their assignments.^[18]

Other studies report suggestions like providing training on the use of software, enforcement of basic computer literacy policy,^[19] and knowing the abilities and necessities of the instructors to understand the lecture better.^[33]

In the present study, 34% of students were of the view that online teaching should be incorporated into the routine teaching schedule.

Kaup *et al.* also suggest that hybrid learning using both can be much more effective and is easier to use.^[14] Ruiz *et al.* report in their study that the students do not see e-learning as replacing traditional instructor-led training but as a complement to it, forming part of a blended-learning strategy.^[34] Button *et al.* also report similar recommendations and suggestions by the students in favor of blended teaching including both online and face-to-face teaching.^[35]

Limitations of the study are that the study was conducted shortly after the commencement of online classes, so there may be a change in opinion after the prolonged experience. Second, a face-to-face interview of the students lacked in the study due to the lockdown imposed by the government.

The relevance of the study is that it brings to light the lacunae of the currently employed system of online education and learning in the lockdown period and also provides the necessary suggestions and recommendations for various levels so that the only available education modality with us can be utilized to its full potential in current times.

Conclusions

Hence, this study states that most of the students (90%) are facing some kind of difficulty in the online learning process and most common of which is lack of personal interaction with the students, so it can be concluded that online teaching cannot be a substitute to the routine classroom teaching; however, it can be used as a supplement along with the routine teaching like to share more content with the students, to give assignments, to receive feedback, etc. Some measures suggested by this study to improve the online learning process are better training of teachers on the use of the digital applications for online teaching, reducing the number of lectures per day to increase the grasping power of students, to ensure two-way communication between teachers and students, and sharing concise information in the form of short

notes. These measures can be incorporated to improve the current system of the online teaching process.

Recommendation

Circumstances have made online learning the need of the hour which is now an indispensable part of medical education. Hence, to enhance the effectiveness of this method of learning, a two-way interaction process should be ensured with the help of different modalities available with us. Furthermore, strong and reliable Internet connectivity is imperative in the current scenario. There is a need to invest in creating standardized online education platforms and to train both students and teachers.

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Conflicts of interest

There are no conflicts of interest.

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Study Tool:

Part-I

1. Age (in years): _____
2. Gender: _____
3. Student of:
 - a. Medical college
 - b. Dental college
 - c. Nursing college
 - d. Physiotherapy
4. Type of institute
 - a. Government College
 - b. Private College
5. State/UT where institute located _____
6. Course:
 - a. MBBS
 - b. BDS
 - c. Nursing
 - d. BPT
7. Do your online teaching are being held?
 - a. Yes
 - b. No
8. If Yes, Mode of online teaching?
 - a. Video lectures
 - b. Written Material
 - c. Both

Part II

1. What is the frequency of classes that you attend online?
 - a. 1-2 per week
 - b. 3-4 per week
 - c. 1-2 per day
 - d. 3-4 per day
 - e. None
 - f. Other
2. Software used for online classes by your institute:
 - a. Zoom Meetings
 - b. Cisco Webex
 - c. Skype Meet Now
 - d. Google Meet
 - e. WhatsApp
 - f. YouTube
 - g. Other _____
3. Are you able to attend/read online lectures attentively?
 - a. Always
 - b. Mostly
 - c. Sometimes
 - d. Rarely

4. Do you attend all the lectures scheduled for the day?
 - a. Always
 - b. Mostly
 - c. Sometimes
 - d. Rarely

5. Online assignments given by your institute?
 - a. Yes
 - b. No

6. If Yes, which platform is used for assignments and assessments?
 - a. Google Forms/Google Classroom
 - b. Class Marker
 - c. WhatsApp group
 - d. E-mail
 - e. Other _____

7. Are the online assignments helpful?
 - a. Yes
 - b. No

8. Have you received previous training on how to use the digital platform for online learning ?
 - a. Yes
 - b. No

9. Do you have the previous expertise and skill on how to use digital platforms like Microsoft Office, E-mail, etc?
 - a. Yes
 - b. No
 - c. Somewhat

10. What problems/difficulties you are facing with online learning? (can tick multiple options)
 - a. Increased workload
 - b. Lack of personal interaction with the teachers
 - c. Frequent technology failures
 - d. Personal anxiety/fear of online learning
 - e. Limited access to the internet
 - f. Lack of adequate devices/hardware.
 - g. Distractions at home
 - h. Visual fatigue
 - i. None
 - j. Other _____

11. What in your view are the benefits of online learning?
 - a. Comfortable environment of the home
 - b. Can attend recorded classes anytime
 - c. More content can be shared by the teachers through online platform
 - d. Develops digital expertise
 - e. Can continue learning during lockdown
 - f. Others _____

12. Can online teaching be incorporated as a supplement to the regular teaching? (after lockdown is over)
 - a. Yes
 - b. No
 - c. Can't say

13. Suggestions for improvement _____