

Impact of Online Learning during COVID-19 Pandemic and its Comparison with Conventional Teaching: A Cross-sectional Study

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ABSTRACT

Introduction: Coronavirus Disease-2019 (COVID-19) pandemic has made a huge impact on medical education resulting in adoption of online methods of teaching in order to continue with the process of teaching and learning so as to complete the syllabus. In addition, online education methods also helped to provide psychological support to the students in this time of crisis.

Aim: To evaluate the perception of students for online learning and to compare it with conventional classroom teaching.

Materials and Methods: This cross-sectional study was conducted in the Department of Pharmacology at Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan, India, on fifth semester 148 medical undergraduates, in April, 2021. All the participants were randomly divided into two groups, with each group consisting of 74 students. Group I was taught antitubercular drugs through online method while, group II was taught the same topic in classroom and then a cross-over was done among the two groups for antimalarial drugs on the second day. The perception of students towards online learning and the preferred method of teaching were evaluated

using a predesigned standardised questionnaire. The collected data was analysed using Z-test and p-value <0.05 was considered significant.

Results: Out of 148 students, 62.84% were females. Mobile phones (86.48%) were the most commonly used gadgets for online learning. Majority of students preferred conventional classroom teaching with regard to convenience (75.67%), acquisition of knowledge (83.78%), practical skills (89.86%), interactive (84.45%), doubt clearance and the preferred method of teaching (81.08%). However, most of the students agreed that online learning saves time (62.83%) and was better suited for submission of assignments (68.9%). A statistically significant difference (p-value <0.05) was observed when online learning was compared with classroom teaching.

Conclusion: The study concluded that online learning is not a substitute for classroom teaching but might supplement conventional classroom teaching. However, it helps in completion of syllabus and boosts the morale of the students during this pandemic.

Keywords: Coronavirus disease-2019, Classroom teaching, Online learning, Perception, Questionnaire, Undergraduates

INTRODUCTION

COVID-19 also known as Coronavirus Disease-2019, caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) was initially reported in Wuhan, China in December, 2019 and was subsequently declared as a pandemic on March 11, 2020 [1,2]. It is referred as a pandemic due to its aggressiveness and severity and is regarded as the greatest health crisis across the globe after centuries [3]. People of all age groups living in diverse geographical areas, ethnic background and belonging to different economic strata are affected by this deadly virus.

Coronavirus disease-2019 pandemic has also impacted all aspects of human life like social, economic, entertainment, tourism, sports and the most affected is education. Education is the backbone of any country and COVID-19 has made a terrible impact on medical education. This is owing to the fact that all the health care providers were engaged in managing COVID patients and routine training of students was temporarily discontinued. Educational institutions were forced to suspend classroom teaching as per government guidelines in order to limit the spread of disease among students. Since the duration of course in medical education is fixed, the medical colleges had to explore various methods of online teaching. There has been a paradigm shift in the medical education preferring online learning during the pandemic [4]. Keeping in mind the prevailing conditions, it has been observed that postgraduate and undergraduate classes, conferences as well as workshops are being conducted online.

Online learning or e-learning is internet-enabled learning. It incorporates a pedagogical approach which is engaging, flexible

and student-centered [5]. Online learning is different from classroom teaching not only in the medium by which it is delivered but also in teaching, learning and assessment approach used [6]. It may be further divided into synchronous, asynchronous and hybrid learning [7]. Synchronous learning occurs when the teacher is present at the same time as the student thus ensuring face to face interaction. While asynchronous learning is independent of time. It is flexible, such that the teacher can provide the study material in the form of recorded audio or video lectures, handouts or power point presentation which is accessible to the student at any time anywhere through a number of Learning Management Systems (LMS). On the other hand, hybrid learning, as the name suggests, is a combination of synchronous and asynchronous learning.

The teachers engaged in medical education were at cross roads during the COVID-19 pandemic-management of COVID-19 patients on one side while ensuring that online classes are conducted regularly and effectively on the other side. Thus, it was a challenging task for both the teachers as well as the students and required considerable efforts and co-operation from all the stakeholders including administrators, teachers and students so that optimum utilisation of information technology can be made in the process of ongoing teaching.

The medical colleges adopted various learning platforms like Webex, Moodle, Cisco, Google meet, Microsoft teams and Zoom in order to make online learning feasible for the students. This was employed to ensure that the syllabus was covered in time and the students could be in touch with the faculty thus boosting their confidence and morale during the pandemic [8].

Medical education is a challenging profession and requires dedication, perseverance, acquisition of skills and constant motivation to ensure self-directed learning from the students [5]. However, it becomes imperative to assess the effectiveness of this newly adopted method of learning by analysing the perception of students so that necessary and timely interventions could be made. A number of studies have been conducted recently to assess the effectiveness of online learning in medical undergraduates. Majority of these studies involve conduction of online surveys to assess the perception of students for online learning during the period of lockdown [4-6]. However, there is paucity of data which attempt to conduct and compare online and classroom teaching simultaneously. The present study was planned when the medical colleges were reopened with the decline in COVID-19 related cases so that students can assess and appreciate the difference between classroom and online teaching in various parameters.

This study was conducted with the aim to assess the perception of students towards online learning and to compare it with conventional classroom teaching among second year medical undergraduate students in Pharmacology.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Pharmacology at Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan, India, on fifth semester 148 MBBS students in April 2021. Institutional Ethical Committee approved the study (letter no. MGMCH/IEC/JPR/2021/279 dated 12th March, 2021). The participants were explained about the entire procedure and an informed consent was obtained. The study was conducted by a team of skilled teachers.

Inclusion criteria: All the students of second professional MBBS who were willing to participate were included in the study.

Exclusion criteria: Students not willing to give informed consent, incompletely filled questionnaire were excluded from the study.

Study Procedure

The data was collected using a validated semi-structured questionnaire. It was validated by a group of faculty members and necessary modifications were done. A pilot test was done on a small group of students before starting the study for standardisation and to assess the feasibility of the study. The students included in the pilot test were excluded from the study. All the participants were randomly divided into two groups with each group consisting of 74 students.

- Group I was taught antitubercular drugs through online method using google meet. The assignment pertaining to antitubercular drugs was provided to group I through Moodle at the end of online teaching session.
- Group II was taught the same topic in classroom and assignment, in the form of multiple choice questions, was provided in the form of handouts.

Then a cross-over was done among the two groups for another topic which was antimalarial drugs on the second day. Group I was taught the second topic in classroom followed by handouts of assignment in the form of multiple choice questions. Group II was taught antimalarial drugs using Google meet and assignment was provided on Moodle.

Thus, all the students included in the study were exposed to both the methods of teaching, viz., conventional classroom teaching and online teaching. At the end of the session, all the students were asked to fill a questionnaire related to their perception towards online learning (agree, can't say, disagree) and the preferred mode of teaching between online and conventional teaching.

Questionnaire

A prevalidated questionnaire was prepared comprising of:

Part A: which included demographic details of study participants and open-ended questions related to electronic gadgets and educational platform most commonly used for online learning.

Part B: comprised of a set of 14 closed ended questions pertaining to perception of students towards online learning (agree=2, can't say=1, disagree=0).

The preferred method of teaching between classroom and online teaching was assessed using a set of eight closed ended questions (online teaching=0, conventional teaching=1). The students were given clear instructions to mark any one option out of all the options provided for each question in part B of questionnaire.

STATISTICAL ANALYSIS

The data was entered in Microsoft excel 2010 worksheet. Descriptive statistics was applied to analyse the collected data. The data was expressed in n (%). The perception of students towards online and classroom learning was compared using Z-test and p-value (p-value <0.05 was considered significant) was calculated using IBM Statistical Package for the Social Sciences software version 23.0.

RESULTS

Out of 148 students, there were 93 (62.84%) females and 55 (37.16%) males. The students responded to two open ended questions before going to the main questionnaire. This included gadget most commonly used and educational platform which was most frequently used for online teaching. Most of the students accessed online classes through smart phones (86.48%) followed by laptops (18.9%) and iPads (4.05%) as depicted in [Table/Fig-1].

Mode	Male N (%)	Female N (%)	Total
Mobile	47 (36.71%)	81 (63.28%)	128
Laptop	11 (39.28%)	17 (60.71%)	28
iPad	1 (16.66%)	5 (83.33%)	6

[Table/Fig-1]: Gadgets used by students for online learning (multiple responses obtained from the study participants for open ended question).

A number of educational platforms were made available to the students for online learning by the administrators of the institution during the pandemic. The most commonly used platform for online teaching were Google meet (102) followed by Moodle (56) as depicted in [Table/Fig-2].

Platform	Male N (%)	Female N (%)	Total
Google meet	42 (41.17%)	60 (58.82%)	102
Moodle	18 (32.14%)	38 (67.85%)	56
Youtube	0 (0)	5 (100%)	5
Prepladder	4 (100%)	0 (0)	4
Marrow	6 (85.71%)	1 (14.28%)	7
Offline	2 (33.33%)	4 (66.66%)	6
Zoom	1 (50%)	1 (50%)	2

[Table/Fig-2]: Educational platform utilised by students for online learning (Multiple responses obtained from the study participants for open ended question).

The students were given a set of 14 questions pertaining to their perception towards online learning varying from 'agree', 'can't say' to 'disagree'. A vast majority of students disagreed that online teaching was helpful in learning and understanding {105 (70.94%)}. Most of the students disagreed with the fact that punctuality was an important issue with online classes {99 (66.89%)}. Majority of students submitted that they did not miss online classes due to network issues {101 (68.24%)}. The responses were analysed to compare the two proportions using Z-test and p-value was calculated as summarised in [Table/Fig-3].

Sl. No.	Questions	Agree (A) N (%)	Can't say (B) N (%)	Disagree (C) N (%)	p-value (Between A and C)	p-value (between A and B)	p-value (between A and B)
1.	Were online teaching methods helpful during COVID-19 pandemic?	54 (36.48%)	29 (19.59%)	65 (43.91%)	0.065	<0.05	<0.05
2.	Was it helpful in learning and understanding?	15 (10.13%)	28 (18.91%)	105 (70.94%)	<0.05	<0.05	<0.05
3.	Was it helpful in acquiring practical skills?	32 (21.62%)	34 (22.97%)	82 (55.4%)	<0.05	<0.05	0.125
4.	Were you satisfied with e-resources provided to you?	49 (33.1%)	57 (38.51%)	42 (28.37%)	0.071	0.102	0.22
5.	Was adequate time dedicated for online classes?	38 (25.67%)	28 (18.91%)	82 (55.4%)	<0.05	<0.05	0.23
6.	Was online teaching convenient to you?	23 (15.54%)	39 (26.35%)	86 (58.1%)	<0.05	<0.05	<0.05
7.	Was punctuality an issue with online teaching?	26 (17.56%)	23 (15.54%)	99 (66.89%)	<0.05	<0.05	0.092
8.	Was individual attention given during online classes?	34 (22.97%)	38 (25.67%)	76 (51.35%)	<0.05	<0.05	0.084
9.	Was online teaching helpful in clearing your doubts?	30 (20.27%)	27 (18.24%)	91 (61.48%)	<0.05	<0.05	0.072
10.	Were the online assignments helpful in improving academic performance?	56 (37.83%)	24 (16.21%)	68 (45.94%)	0.215	<0.05	<0.05
11.	Did you miss online classes due to network issues?	27 (18.24%)	20 (13.51%)	101 (68.24%)	<0.05	<0.05	0.236
12.	Did you face any health problems due to online learning?	28 (18.91%)	54 (36.48%)	66 (44.59%)	<0.05	0.306	<0.05
13.	Were you able to communicate easily with teachers and peers through online learning?	29 (19.59%)	29 (19.59%)	90 (60.81%)	<0.05	<0.05	0.086
14.	Did you face clash of class timings during online learning?	56 (37.83%)	27 (18.24%)	65 (43.92%)	0.623	<0.05	<0.05

[Table/Fig-3]: Perception of students for online learning (n=148).
p-value <0.05 was considered as statistically significant

The last part of the questionnaire comprised of eight questions to evaluate the effectiveness of online learning as compared to conventional classroom teaching. Majority of students {124 (83.78%)} favoured conventional classroom teaching for better learning and understanding. Most of the students preferred conventional mode of teaching for acquisition of practical skills {133 (89.86%)} and considered classroom teaching to be more interactive as compared to online learning {125 (84.45%)}. A statistically significant difference (p-value <0.05) was observed in the perception of students when online learning was compared with conventional learning [Table/Fig-4].

Sl. No.	Questions	Online learning N (%)	Conventional learning N (%)	Z-score	p-value
1.	Which mode of teaching is convenient?	36 (24.32%)	112 (75.68%)	-8.8348	<0.00001
2.	Which mode of teaching helps in better learning and understanding?	24 (16.21%)	124 (83.78%)	-11.6248	<0.00001
3.	Which mode of teaching helps in acquiring practical skills?	15 (10.13%)	133 (89.86%)	-13.7172	<0.00001
4.	Which mode of teaching saves time?	93 (62.83%)	55 (37.16%)	4.4174	<0.00001
5.	Which mode of teaching is more interactive with teachers and peers?	23 (15.54%)	125 (84.45%)	-11.8573	<0.00001
6.	Which mode of teaching clears doubts?	28 (18.91%)	120 (81.08%)	-10.6948	<0.00001
7.	Which mode of teaching is better for assignment submission?	102 (68.91%)	46 (31.08%)	6.5099	<0.00001
8.	Which mode of teaching will you prefer in future?	28 (18.91%)	120 (81.08%)	-10.6948	<0.00001

[Table/Fig-4]: Comparative effectiveness of online learning vs conventional learning (n=148).
p-value <0.05 was considered as statistically significant

DISCUSSION

The outbreak of COVID-19 pandemic forced most of the countries to impose lockdown [9]. The Government laid strict guidelines for lockdown to contain the spread of COVID-19 owing to the vast population and limited resources in a developing country such as India. Social distancing and restricted movement were adopted to flatten the rising curve of this pandemic [10]. The onset of this pandemic ruined mankind in numerous ways but the hardest blow was on medical education. This created a stir in medical education. The most important stakeholders in medical education viz., administrators, teachers and students made herculean efforts so as to ensure smooth conduction of online teaching in COVID-19 times. As per the World Economic Forum, there was a sudden shift in teaching methodology from classroom teaching to online learning in all educational fields globally following COVID-19 pandemic [11].

The present study was planned to evaluate and compare online learning with conventional classroom learning from student's perspectives in pharmacology using a predesigned and validated questionnaire.

This study was conducted on 148 second professional MBBS students in the month of April 2021 when medical colleges resumed to normalcy with classroom teaching. This was planned so that students can evaluate and compare between online and classroom teaching in different parameters simultaneously unlike most of the other studies in which student's perception was taken through an online survey using google forms. The present study established online learning as the only ray of hope amid the COVID-19 pandemic. However, it is not able to substitute the conventional method of learning which is perceived as the preferred mode of teaching by majority of the students.

Majority of the students accessed online classes by mobile phones (86.48%) as observed in similar other study [4,6,12]. Though use of mobile phones for online classes is convenient, such that learning can occur at any place, regular use of mobile phones can cause health issues and is a source of distraction and inattentiveness for the students during the class [4]. The present cross-sectional survey has helped to obtain clear understanding of the perception of students for online teaching. The results of the survey revealed a statistically significant difference in various parameters like

acquisition of knowledge and practical skills, flexibility of time and duration, personal attention, and doubt clearance during online learning. A study conducted previously has demonstrated that social interaction between teachers and students is an integral component of classroom teaching [13]. Another similar study conducted recently has concluded that students were not satisfied with the level of student-teacher interaction which is seen in virtual classes [12,14]. This is consistent with the results of this study in which majority of students perceived that online teaching is less interactive with teachers and colleagues. Student-teacher interaction aids in the social development of the student by means of discussions, debate and conversation among students as well as with the teachers. It also helps in building the doctor-patient relationship which is a prerequisite for the medical profession [15].

Students regarded online learning to be suitable for assignment submission and that it saves time. Nevertheless, majority of students believed that online learning is not as effective as conventional classroom teaching and a statistically significant difference was seen between these methods of teaching with respect to convenience, attainment of knowledge and practical skills, interaction and clearing their doubts. The results are coherent with similar other studies conducted recently [5,15]. However, these findings are in contrast to another study in which most of the students across different phases of MBBS were satisfied with the study material provided and knowledge gained through online teaching [6]. This might be due to the difference in the perception of study participants towards online learning across various phases of MBBS. The difference in the learning pattern and personal preferences of the students can also act as contributing factors.

Studies have concluded that the undergraduates differ from postgraduates in the approach for online learning [16-18]. Due to the outbreak of COVID-19 pandemic, there is a change in priorities of the healthcare professionals. The teaching and training program for postgraduate students has been superseded by the management of patients infected by the deadly virus. As a result, postgraduate students may not be able to fulfil the required number of clinical and surgical cases and provide adequate patient care which is expected during the residency program. In this regard, virtual classrooms, webinars and conferences have been able to mitigate this issue to some extent [19].

Besides this, it has been observed in various studies that students do not prefer online learning due to lack of discipline, adequate learning resources and favourable learning environment [4,5,12]. In addition, the students residing in remote areas also faced technical difficulties while attending online lectures [20]. There is evidence which suggests that students prefer blended learning over online learning which is regarded as the best method to ensure optimum learning [21]. In spite of all these hiccups, online learning has gained momentum owing to its advantages and the constant pressure by the stakeholders to sustain teaching and learning during the pandemic [22].

The strength of this study is the design in which it was conducted. Both the groups of students had access to online as well as classroom teaching. The study was planned with the reopening of medical institutions so that the students were able to give accurate, reliable and valid responses which can be seldom missed when the responses are collected through online surveys.

Limitation(s)

This study was conducted to assess the perception of second professional undergraduate students in Pharmacology. Similar such studies must be conducted on students in different subjects, across different phases of medical education as well as teachers working in

different institutions across the globe to assess and compare their perception for online learning.

CONCLUSION(S)

Advances in information technology and availability of various LMS had made online learning amiable. This is especially true for medical education where the health care providers perform the dual responsibility of treating patients as well as educating their students. With the inception of the second wave of this deadly pandemic and resumption of online teaching, it becomes imperative that a collaborative teamwork ensues among teachers as well as students so that the academics do not stagnate. The educational institutions must constitute a dedicated team of students, faculty members, technical experts and administrators to provide requisite infrastructure and assistance thus avoiding pitfalls of online teaching. Thus, online teaching might be able to supplement conventional teaching once the pandemic comes to an end and life resumes towards normalcy. Consequently, blended learning may become a part of the curriculum which will lead to better performance of the future doctors in the community holistically.

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