



Comparative analysis of e-learning during covid-19 pandemic: a cross sectional survey among health sciences students in northern India

Shweta Chaudhary¹, Rishi Kumar Bharti², Swati Yadav³, Rinku Garg⁴

¹ Assistant professor Anatomy, Santosh Medical college, Ghaziabad, India

² Assistant Professor, Department of Community Medicine, King Khalid University, Saudi Arabia

³ Assistant Professor, Department of Anatomy, Santosh Medical College, Ghaziabad, India

⁴ Professor, Department of Physiology, Santosh Medical College, Ghaziabad, India.

***Corresponding authors:** Shweta Chaudhary, **Address:** Department of Anatomy, Santosh Medical College, Ghaziabad, India

Email: drshwetarishi@gmail.com, **Tel:** +919654003585

Abstract

Background & Aims: To prepare qualified doctors for today's environment in which the internet provides universal digital information, the teaching methods used for educating and training medical school students should be reconsidered for their effectiveness. The aim of this study was to investigate effectiveness of online teaching in facilitating medical education during the COVID-19 pandemic in northern India.

Materials & Methods: This Cross-sectional, online survey study was conducted on total 334 students of 18-22 years' age by giving questionnaire which consisted of 10 questions. Informed consent was also taken. Questionnaire was given through online Google forms and link shared through social media and responses were collected. Questions were 5-point Likert-type questions, ranging from strongly disagree to strongly agree. Responses were collected in a one-week period. Statistical analysis was done using MS Excel program (ver. 2019, Microsoft, Redmond, WA, USA).

Results: It was shown that 36.5% of the students disagree for "effectiveness of online teaching whereas 69.9% of them agree for "preference for online teaching to offline teaching. The commonly perceived disadvantages as perceived by students to using online teaching platforms were problematic internet connection (42.5%) and lack of two-way interaction. (22.2%). P values calculated for mean of paramedical and medical group was 0.03, which was statistically significant.

Conclusion: Our study results showed that 82.6% of the students agreed that online teaching has not successfully replaced the offline teaching. Whereas 91.5% of the students felt they could not learn practical skills through online teaching. This indicates practical skills remain as potential disadvantage for online teaching.

Keywords: Online Teaching, Medical Education, Learning, Skills

Received 06 April 2022; accepted for publication 17 May 2022

Introduction

To prepare qualified doctors for today's environment in which the internet provides universal digital information, the teaching methods used for educating and training medical school students should be reconsidered for their effectiveness. The effectiveness of online learning is influenced by many factors. Some factors create barriers for online learning, such as administrative issues, social interaction, academic skills, technical skills, learner motivation, time and support for studies, technical problems, cost and access to the internet (1).

Therefore, the choice of teaching method should also be made after comprehensive thought of human economic behaviors in the real world. To some extent, online learning might not compete with some aspects of offline learning, like interactive knowledge building between teacher and students. Such limitations would create opportunities for students to obtain self-learning abilities through information technology, such as information literacy and metacognition controlling (2).

The effectiveness of online learning varied, which is as or more effective than offline learning for some target knowledge and skills and also for the students. To avoid the potential limitations of online learning in undergraduate medical education, it might be worthwhile to combine the advantages of online and offline teaching methods, called blended learning (3).

Materials & Methods

The study was conducted on Total 334 students of 18-22 years' age, 164 medicals, 108 paramedical, and 64 dental students by giving a 10-item questionnaire.

Table 1. Mean and Standard deviation of responses on Likert scale for Medical, paramedical and dental students for each question

Questions	Medical	Paramedical	Dental
	(Mean ± SD)164	(Mean±SD)108	(Mean ± SD)64
1. The teaching is often simulating session	3.52±0.97	2.92±0.86	3.43±0.61
2. I find it easy to engage in the lesson	3.51 ±1.14	2.79±1.01	3.21±1.06
3. I feel able to ask questions	3.48±1.14	3.07±1.16	3.46±0.87
4. I enjoy the online teaching session	3.20±1.29	2.05±1.08	2.96±1.20

Informed consent was taken. Students who were willing to participate and ready to give informed consent were included in the study. Questionnaire was given through online Google forms and link shared through social media and responses were collected. Questionnaire was designed after literature search about current teaching methods and effect of COVID-19 on medical education in India. Questions were 5-point Likert-type questions, ranging from strongly disagree to strongly agree. The remaining items in the questionnaire comprised a mixture of question styles. Certain questions were conditional. Open-ended text responses were also collected and underwent thematic analysis, whereby responses were categorized.

Final questions were based on following criteria

1. The use and experience of online teaching during the COVID-19 pandemic

2. Perceived advantages of online teaching

The survey was accessible via an anonymous link and open for a 1-week period (4 to 11 Dec 2021).

Results were analyzed using MS Excel program (ver. 2019, Microsoft, Redmond, WA, USA). Bar charts and diagrams were made using excel. P values were calculated by applying student t-test.

Multiple responses were accounted for by identifying unique IP (Internet Protocol) addresses.

Results

The Mean and SD of scores on Likert scale for all ten questions for medical paramedical and dental students were shown in [table 1](#).

5. I would like online teaching should be more interactive and two way	3.58±1.08	2.61±1.15	3.34±1.00
6. I feel that online teaching is as effective as offline teaching	2.59±1.30	1.98±1.10	2.25±0.87
7. I prefer online teaching to offline teaching	2.52±1.28	2.62±1.54	2.46±1.21
8. The teachers are well prepared for teaching sessions	3.86±1.01	3.37±0.89	3.46±0.76
9. I feel I am being well prepared for my profession	2.31±1.14	2.90±1.21	2.03±0.96
10. My internet connection can be problematic	3.51±1.09	3.77±0.98	3.75±1.04

It can be inferred from table 1 that low score of 2.05 for paramedical students to “easy to engage in session” indicates less interest in students for online teaching. Low score of 2.05 for paramedical students as compared with a score of 3.20 for medical students indicates that students did not “enjoy online teaching session”. Low scores of 2.59 of medical and 1.98 for paramedical students and 2.25 for dental students for “effectiveness of online teaching” shows students prefer face-to-face teaching. Score of 2.31 for medical, 2.90 for paramedical and 2.03 for dental students for

“well prepared for the profession” indicate less confidence of students. High score of 3.51 among medical students for “problematic internet connection” may reflect it as a potential barrier for online teaching. High score of 3.58 for medical students and 3.34 for dental students for “online teaching to be more interactive” indicates need of two-way teachings. P value calculated for mean of paramedical and medical groups was 0.03, which was statistically significant, although that between mean of medical and dental group was not statistically significant (0.40).

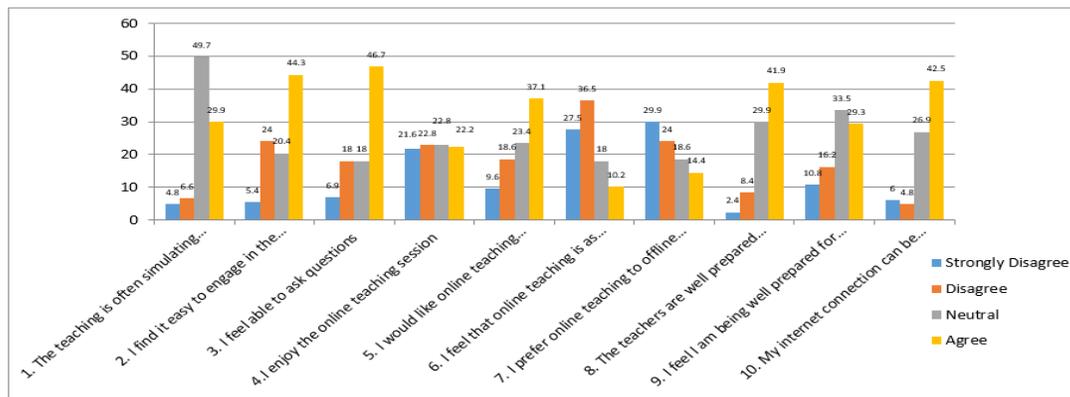


Fig 1. Percentages values for responses on likert scale for all questions

It is evident from figure 1 that highest percentage of students who like to for agree for “easy to engage in online Sessions” is 44.3%, followed by 37.1% agree for students who like “online teaching to be more

interactive and two ways”. 41.9% of the students agreed “teachers are well prepared for classes”, and “problematic internet connection” was felt by 42.5% students.

Table 2. Maximum percentage of responses on likert scale for each question.

1. The teaching is often simulating session	49.7%Neutral
2. I find it easy to engage in the lesson	44.3%Agree
3. I feel able to ask questions	46.7% Agree
4. I enjoy the online teaching session	22.8% Neutral
5. I would like online teaching should be more interactive and two way	37.1% agree

6. I feel that online teaching is as effective as offline teaching	36.5% disagree
7. I prefer online teaching to offline teaching	. 29.9% strongly disagree
8. The teachers are well prepared for teaching sessions	41.9% agree
9. I feel I am being well prepared for my profession	33.5% Neutral
10. My internet connection can be problematic	42.5% agree

It could be assessed from [table 2](#) that 36.5% of the students disagree for “effectiveness of online teaching”. 29.9% of them strongly disagree for “preference for online teaching to offline teaching”. 49.7% of the students were neutral about “teaching is simulating”. 33.5% of the students were neutral about their “preparedness for the profession”.

Our study results showed that online teaching had not successfully replaced the offline teaching, which was felt by 82.6% of students. Whereas 91.5% felt that they cannot learn practical skills through online teaching. This indicates practical skills remain as potential disadvantage for online teaching.

Discussion

With the rise of COVID-19, it is not surprising that many medical colleges had started online education platforms. However, online education has been used preceding this pandemic. Here we will focus on the role of online teaching in medical education during this pandemic as well as its role in future medical education. Over recent years, online teaching has played a key role in medical education (4-6).

Bringing any newer methodology of teaching requires three most important aspects both with the learner or the teacher: motivation, awareness, and availability of appropriate resources and tools. In the current pandemic situation with abruptness and uncertainty of the lockdown, students failed to carry the study material and the motivation was at the lowest (7). Significant percentage of students also had other problems related to insufficient or lack of study materials, network, and connectivity issues, as well as lack of study environment at home and affecting their learning capacity of the subject as found in the study done by Doherty et al. (8).

Indeed, a recent national twitter discussion, involving representatives from the General Medical Council, NHS (National Health Service) England and WHO, found that a key concern among students was that remote learning impacted their ability to develop clinical competence (9). This also highlighted the potential role of the professional use of social media in facilitating medical education, as shown in surgical training (10).

Therefore, it is likely that e-learning and telemedicine will continue to form vital sources of medical education. Many authors have suggested that digital health platforms for both patients and students will remain an integral part of care even after the COVID-19 pandemic (11).

The main barriers to online teaching appear to be family distractions, Internet connection, and the timing of classes. There may be disadvantage to students with large families or with limited Internet access. Moreover, the mental health of students, affected by the pandemic COVID-19 has been shown recently (12). Affecting mental health may be, in part, attributed to the lack of interaction with colleagues and friends. As exams being open book and with an unrestricted setting, students may be less prone to exam anxiety (13). Although, this does not address the family and noise disturbances which may still affect exam performance.

Students scored their experiences of online compared with face-to-face teaching to be lower, with an average of 2.52 scored for preference for online teaching, and 2.55 for engagement in lessons (table 1), suggesting most students prefer face-to-face teaching (14). Low scores of student experiences may be due to the unexpected, sudden introduction of online teaching. Despite, it had been shown a relatively high score

among medical students of 3.86 for teacher preparation (15-21).

The low score of 2.31 for being 'well prepared for my profession' (table 1), compared with previous studies reporting up to 3.18 (15, 20, 21) is striking, mirroring concerns that remote or online teaching may compromise the clinical competence and confidence of students (22).

Highest percentage of agree on likert scale for "easy to engage in online sessions" was 44.3% shows low interest for online teaching.

36.5% disagree for online teaching represented as "effective as offline teaching" whereas in one of the previous studies, 77% of students had negative perceptions towards e-learning (23).

In one of the papers presented in a conference on mobile learning at Singapore, it was reported that there is no significant difference between the performance of students taught by e-learning and face to face learning, whereas in our study it was found that e-learning is perceived to have little impact compared to face-to-face learning as indicated by 37.1% of the participants (24).

Post Covid-19 outbreak, students were required to move to online learning; however, they have found it less appealing due to its limitations with respect to practical aspects of learning in the lab/clinical environment. This is consistent with the students' behavior in many other countries like China, Malaysia, Singapore etc. (25-27). In a study done by baczek et al., e-learning was considered less effective than face-to-face learning in terms of increasing skills ($P < 0.001$) and social competences ($P < 0.001$) (28). Our study conformed to this study and showed significant p value (0.03) in medical and paramedical group, indicating difference in socioeconomic background and IQ level in these groups.

Conclusions

Having discussed benefits of both online and offline teaching as well as the future of healthcare online, we suggest that in order to enhance the benefits of these learning methods, and due to lack of practical skills

during online teaching, a mixture of online and in-person teaching should be used moving forward. This can be incorporated into an effective learning method by using platforms such as problem-based learning or team-based learning, which has been shown to improve learning outcomes. These could be combined with traditional teaching for maximum output.

Limitations

One of the limitations of the study is that sample population, which has been taken from a single, private medical and dental college. Therefore, results of the study cannot be generalized.

Conflict of interest

The authors have no conflict of interest in this study.

References

1. Muilenburg LY, Berge ZL. Student barriers to online learning: a factor analytic study. *Distance Educ* 2005; 1;26(1):29-48.
2. Friedman CP, Donaldson KM, Vantsevich AV. Educating medical students in the era of ubiquitous information. *Med Teach* 2016; 3;38(5):504-9.
3. Garrison DR, Vaughan ND. *Blended Learning in Higher Education: Framework, Principles, and Guidelines*. New York (NY): John Wiley & Sons; 2007;9-11.
4. O'Doherty D, Dromey M, Lougheed J, Hannigan A, Last J, McGrath D. Barriers and solutions to online learning in medical education - an integrative review. *BMC Med Edu* 2018;18(1):1-1.
5. Harden RM. Trends and the future of postgraduate medical education. *Emerg Med J* 2006; 23(10):798-802.
6. Moran J, Briscoe G, Peglow S. Current technology in advancing medical education: perspectives for learning and providing care. *Acad Psychiatry* 2018; 42(6):796-9.
7. Kelsey AHCM, McCulloch V, Gillingwater TH, Findlater GS, Paxton JZ. *Anatomical sciences at the University of Edinburgh: Initial experiences of teaching anatomy online*. *Transl Res Anat* 2020; 19:100065
8. Doherty OD, Dromey M, Lougheed J, Hannigan A, Last J, Mc Grath D. Barrier & solution to online teaching in medical education- An integrative review. *BMC Med Edu* 2018; 18(1):1-1.
9. Huddart D, Hirniak J, Sethi R, et

- al. Med Student Covid: How social media is supporting students during COVID-19. *Med Educ* Oct;54(10):951-2
10. Gallo G, Sturiale A, De Simone V, Mayol J. Epistemic networks on Twitter: new way to learn. *J Invest Surg* 2021 May 28;34(5):536-44.
 11. Reinholz M, French LE. Medical education and care in dermatology during the SARS-CoV2 pandemia: challenges and chances. *J Eur Acad Dermatol Venereol* 2020;34(5):e214-6.
 12. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res* 2020; 287:112934.
 13. Stowell JR, Bennett D. Effects of online testing on student exam performance and test anxiety. *J Educ Comput Res* 2010;42(2):161-71.
 14. Prashanth GP, Ismail SK. The Dundee ready education environment measure: a prospective comparative study of undergraduate medical students' and interns' perceptions in Oman. *Sultan Qaboos Univ Med J* 2018; 18(2):e173.
 15. Miles S, Leinster SJ. Medical students' perceptions of their educational environment: expected versus actual perceptions. *Med Educ* 2007;41(3):265-72.
 16. Patil AA, Chaudhari VL. Students' perception of the educational environment in medical college: a study based on DREEM questionnaire. *Korean J Med Educ* 2016;28(3):281-8.
 17. Dunne F, McAleer S, Roff S. Assessment of the undergraduate medical education environment in a large UK medical school. *Health Educ J* 2006;65(2):149-58.
 18. Pales J, Gual A, Escanero J. Educational climate perception by preclinical and clinical medical students in five Spanish medical schools. *Int J Med Educ* 2015;6:65-75.
 19. Demiroren M, Palaoglu O, Kemahli S, et al. Perceptions of students in different phases of medical education of educational environment: Ankara university faculty of medicine. *Med Educ Online* 2008;13(1):4477.
 20. Dreyer A, Gibbs A, Smalley S, et al. Clinical Associate students' perception of the educational environment at the University of the Witwatersrand, Johannesburg. *Afr J Prim Health Care Fam Med* 2015;7(1):1-8.
 21. Riquelme A, Oporto M, Oporto J. Measuring students' perceptions of the educational climate of the new curriculum at the Pontificia Universidad Catolica de Chile: Performance of the Spanish translation of the Dundee Ready Education Environment Measure (DREEM). *Edu Health* 2009 May 1;22(1):112.
 22. Huddart D, Hirniak J, Sethi R. Med Student Covid: How social media is supporting students during COVID-19. *Med Educ* 2020;54(10):951.
 23. Abbasi S, Ayoob T, Malik A, Memon SI. Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pak J Med Sci* 2020 36(COVID19-S4):S57.
 24. Kwary D. A. The comparison between the result of E-learning and traditional learning: a case study on reading IV subject at D-III in English language study program. Airlangga: Airlangga University 2006.
 25. Ali NA. Students disappointed with online teaching system amid COVID19. 2 April 20. Available online: <https://dailytimes.com.pk/587446/students-disappointed-with-online-teaching-system-amid-covid-19/>. Cited on April 20.
 26. Bao, W. COVID-19 and Online Teaching in Higher Education: A Case Study of Peking University. *Hum Behav Emerg Tech* 2020 Apr;2(2):113-5.
 27. Hiiij BE, Ting SQ, Heng WT, Kong YK, Pathy NB, Zaki RA. How medical students can respond to the Covid-19 pandemic 21 April 2020. Available online: <https://www.thestar.com.my/opinion/letters/2020/04/21/how-medical-students-can-respond-to-the-covid-19-pandemic> . Cited on April 2020
 28. Ba_czek M, Zaga_nczyk-Ba_czek M, Szpringer M, Jaroszy_nski A, Wo_zakowska-Kap_\on B. Students' perception of onlinelearning during the COVID-19 pandemic: a survey study of Polish medical students *Medicine* 2021;100(7).