Original Article

Traditional Versus Virtual Medical Education for Undergraduates During COVID-19

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Abstract

Objective: To assess the preferences of undergraduate medical students for online medical education as well as its barriers.

Material and Methods: This was a cross-sectional study conducted online on undergraduate students of various medical institutes across Punjab, Pakistan. In the questionnaire,302 students participated and gave their point of view on online learning and the its possible barriers. The answers of the students were evaluated on a Likert scale of 1 to 5, where 1 showed "least effective" and 5 denoted "most effective"

Results: The mean age of the students was 21.40 ± 1.564 . 102 (33.8%) of the respondents were in basic sciences and 200 (66.2%) were in clinical years. There was lower level of satisfaction, in engaging the faculty (BS: 2.24 1.23; CY: 2.17 1.11) and lacked hands-on practice (BS: 1.83 0.92; CY: 1.84 0.97). Home environment non-conducive for studying was found as most important barrier (p< 0.05). The preference for virtual medical education versus traditional in-campus learning was low (25.8%), and the barriers to online education showed low variance (6.7%), and hence there was preference for virtual learning as compared to traditional in-campus learning (p<0.05).

Conclusion: We concluded that there was low preference and perceived effectiveness of virtual medical education by the undergraduates.

Keywords: Medical Education, virtual learning, COVID-19, Pandemic

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Introduction

COVID-19 was known first time as a disease ranging from the common cold to more serious lung and adjacent organs injury caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2). Patients may experience pneumonia and stomach distress in addition to other organ failures. It

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started at the end of 2019 from the Wuhan city of China. After that, the disease spread to every country, pushing World Health Organization to declare it as a pandemic.¹ To date, the virus has infected more than 704 million individuals all over the world and taken the lives of more than 7 million population; with Pakistan contributing over 1.5 million confirmed infections and over 30,000 deaths to the overall count.²

Pakistan registered its first two cases on the 26th of February 2020, which remained stable.³ However, to flatten the curve, the Government of Pakistan imposed a nationwide lockdown, including educational institutes on the 15th of March 2020. Virtual medical education has gained importance over the past few years because of it being cheaper

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and flexible compared to the traditional in-campus education. Virtual medical education is an online method of rapid learning by using information technology and internet. It can balance studies and family time. However, traditional education can't be discredited. Virtual Education is based on classical in-campus lectures and involves the transfer of knowledge from mentor to student. In-campus learning not only allows students to have face to face experience with the teacher but also gives them opportunity to do practical skills. All these learning options definitely have their challenges. It all depends on students and teachers which option suits them best.⁴

Many educational institutes took to online modes of delivering medical education, using various platforms such as Zoom meetings, Microsoft Teams, and Google Classrooms. Even though the idea of delivering education curriculum online has its perks in terms of preventing the decay in knowledge, but it's imperative to delineate its effectiveness for different subgroups, e.g. students in clinical years and those with an inadequate access to the internet. Hence, in this paper we tried to find out Pakistani undergraduate medical students' preferences towards virtual online learning overcoming the techno-academic barriers adopting online learning for future medical learning in both basic and clinical sciences.

Material and Methods

This cross-sectional study was conducted for 3 months from 1st August to 31st October 2020 which recruited every consenting undergraduate medical student across randomly-selected medical colleges and universities in Punjab. An estimated sample size of 302 was calculated using OpenEpi, ensuring a confidence interval of 95%, anticipated frequency at 50%, absolute precision of 5%, and a design effect of 1.0, all the whilst accounting for a 10% attrition rate. Following an ethical approval of the study, an online questionnaire developed on Google Form was distributed via official channels of selected universities to each class of the respective medical school. After taking consent, all students who had online learning during COVID-19 with previous traditional learning were included. Undergraduates of the medical college, who didn't give consent and had online learning without traditional learning, were not included in this study. The independent variables

recorded include student's demographics (age, gender, level of medical education and year of study). The dependent variables included the student's perceptions on online learning effectiveness, in terms of knowledge delivery, engaging with faculty, concept clarification, modular objectives achievement, prior hands on concepts delivery, and appearing in examinations. To better enable the research team to understand the respondents' selected choice of traditional vs online learning, we evaluated the barriers to online medical education, in terms of number of online classes students have to attend, availability of technology, hardware and an adequate internet connection.

Data was analyzed using IBM SPSS Version 21. Mode and frequencies with percentages was primarily used to analyze sex, programme of study and years of study. Basic univariate analysis, i.e. mode, mean and standard deviations were used to report student-gauged effectives of online education. These individual markers were evaluated on a likert scale of 1 to 5, where 1 showed "least effective" and 5 denoted "most effective" in any particular arrear of interest. Descriptive cross tab analysis was then made to evaluate the correlation between the selected preference for online education and the barriers to online learning. To better analyze the "true" effect of the barriers identified in delineating the preference towards learning, a regression analysis was carried out using the barriers as predictors for the selected choice.

Ethical approval was taken from Institutional Review Board, King Edward Medical University, Lahore. Student names were not collected in order to maintain confidentiality of the respondents. However, Google Forms were filled from all. The collected answers were then used to analyze data.

Results

A total of 302 undergraduate medical students ($3-109, 36.1\%, \text{and } \bigcirc -193, 63.9\%$) filled out the survey, with a mean age of 21.40 ± 1.564 years. Among these respondents, 41(13.6%) of individuals were in year 1, 48(15.9%) in year 2, 71(23.5%) in year 3, 58(19.2%) in year 4 and 84(27.8%) in year 5. With respect to clinical exposure, 102 (33.8%) of the respondents were in basic sciences and 200 (66.2%) were in clinical years.

The effectiveness of online learning was evaluated on a Likert scale of 1 to 5, whereby 1 was denoted as being least effective and 5 was denoted as the most effective measure. The variables assessed were as follows: 1) Knowledge Delivery, 2) Engaging with Faculty, 3) Clarifying Concepts Clarification, 4) Modular Objectives Achievement, 5) Delivering Prior Hands on Concepts delivery and 6) Appearing in Examinations. The results shown in Table 1 below.

Table 1	: Effectiven	ess of On	line Learn	ing
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		1	2	3	4	5	6	
Basic Sciences	Mean	2.5	2.2	2.5	2.4	1.8	1.9	
	S.D	1.2	1.2	1.3	1.2	0.9	1.2	
	Mode	2	1	1	2	1	1	
Clinical Years	Mean	2.5	2.2	2.5	2.5	1.8	2.2	
	S.D	1.1	1.1	1.1	1.2	1	1.1	
	Mode	3	1	3	3	1	1	

The results showed an overall low preference and perceived effectiveness of online learning in delivering medical education, assessed on the abovementioned parameters. Similarly, when asked whether these individuals would prefer online learning over the traditional, face-to-face learning, the responses were, yet again, in the favor of traditional learning. The details of this response are as shown below in Table 2.

Table 2: Preference for Online Learning OverTraditional Learning

	Preference	Frequency (%)
Basic Sciences	Yes	13 (12.7)
	No	61 (59.8)
	Maybe	28 (27.5)
Clinical Sciences	Yes	28 (14)
	No	128 (64)
	Maybe	44 (22)

An important aspect of this paper was to elucidate why online education was significantly disregarded as a modality of medical education. These barriers to online learning can be visualized in Table 3 below.

Fable 3: Assessing Barriers to Online Learning					
Preference of Online Learning with Respect to Number of Classes					
		Yes	No	Maybe	
Number of Classes per Week	>10 classes/week	8 (19.5%)	31 (16.4%)	16 (22.2%)	
(p=0.824)	>5 classes/week	19 (46.3%)	83 (43.9%)	30 (41.7%)	
	<5 classes/week	14 (34.1%)	75 (39.7%)	26 (36.1%)	
Preference of Onlin	e Learning wi	th Respect to	o Availability	of Technology	
Availability of Necessary Technology	Yes	40 (97.5%)	177 (93.6%)	72 (100%)	
(p=0.204)	No	1 (2.5%)	7 (3.7%)	0	
	Maybe	0	5 (2.6%)	0	
Preference of Online Learning with Respect to Availability of Hardware					
Availability of Necessary Hardware	Yes	39 (95.1%)	163 (86.2%)	66 (91.7%)	
(p=0.450)	No	2 (4.9%)	23 (12.2%)	5 (6.9%)	
	Maybe	0	3 (1.6%)	0	
Preference of Online Learning with Respect to Availability of Internet					
Availability of Internet Connection	Yes	37 (90.2%)	155 (82%)	64 (88.9%)	
(p= 0.215)	No	0 (%)	18 (9.5%)	4 (5.6%)	
	Maybe	4 (9.8%)	16 (8.5%)	4 (5.6%)	
Preference of Online Learning with Respect to Ease of Studying at Home					
Ease of Studying at Home	Yes	32 (78%)	97 (51.3%)	53 (73.6%)	
(p=<0.05)	No	7 (17.1%)	54 (28.6%)	7 (9.7%)	
	Maybe	2 (4.9%)	38 (20.1%)	12 (16.7%)	

The table 3 showed how the ease of studying at home was the most significant factor accounting for the difficulty in continuing medical education online. A regression analysis was carried out to assess if the barriers to online education impacted the choice of traditional vs online education. Even though the value of regression is low (25.8%), and the predictors explain low variance (6.7%), the predictors (mentioned above) for the calculation of preference for virtual learning over traditional learning was significant (p<0.05).

Discussion

Several learning methods are used in medical education to teach students, including in-person classroom learning that follow a teacher-centered model. This particular approach to educational activities may affect teaching culture and prevents new and emerging techniques and technology from being adopted. The medical education has changed over the past few decades, moving to online model rather than traditional teaching methods.⁵

Our study showed that there was low preference and perceived effectiveness of online learning in delivering medical education, assessed on the abovementioned parameters. The barriers to online education impacted the choice of traditional versus online education were also evaluated and the predictors were low variance (6.7%), the predictors for the estimation of preference for online learning was significant (p<0.05).

Multiple letters and personal anecdotes, such as those by Farooq et al.,⁶ and Haroon et al.,⁷ similarly highlighted the significant challenges faced by both the students and the faculty in delivering medical and dental education online. Perhaps what's of more interest is to see the trends in other parts of the globe and diversify the challenges faced outside the geographic borders of Pakistan.

Ahmed Alsoufi and colleagues⁸ in their crosssectional study on medical students from more than 13 medical schools in Libya administered an online questionnaire to assess the availability of adequate software and hardware, status of virtual medical education delivery, mental health assessment and a knowledge, assessment and practice test of e-learning in the field of medicine. Most of the respondents, 64.7% agreed that it is extremely challenging to implement e-medical education in Libya, with only 21.1% agreeing that e-learning could be used to teach key clinical content and curriculum. Libya being a third-world country such as Pakistan helps in identifying challenges to delivery of education, whilst fairly eliminating the socioeconomic factors. Their results were like ours whereby most students, both in basic (59.8%) and clinical sciences (64%) disapproved of the online medical education. Even though our study did not evaluate the mental health effect of COVID-19 on undergraduates, but the study of Alsoufi et al. demonstrated that 31.3% exhibited possible depressive symptoms, and 10.5% may have anxiety features. These higher numbers are attributed to two major factors: COVID-19 related lockdown, and the internal civil war, displacing families and loved ones.

In Saudi Arabia, Rajab and colleagues carried out a study to evaluate the response to online medical

education at the largest university in the country-Alfaisal University. An online questionnaire was emailed to the 1200 individuals, garnering 200 responses. Among these respondents, 54.8% were females, and among these 66.8% were undergraduates; 14.9% were master's students, and 18.3% were faculty. Approximately 41.8% of the individuals had low to none experience of online education prior to the COVID-19, however 62.5% individuals preferred the merger of the two modes of teaching in the future. The barriers identified included problems with communication (59%), conduction of tests and examinations (57.5%), use of technology (56.5%), experience of e-learning (55%), anxiety/stress induced by COVID-19 (48%), managing time (35%), and discomfort with the use of technology (17%).

Considering all the mentioned barriers to virtual medical education, it is worthy to note the efforts have been put in to deliver e-learning to medical students in both, the high-income countries (e.g., United States of America), and the low-middle income countries (e.g., Iran). In Iran, a learning management system was introduced by the Iran's Virtual University of Medical Sciences (VUMS). This centralized system of medical education provided key online modules and courses for all years of medical learning, provided a discussion platform for students to engage with professors, and served as the dock for conducting examination. However, a significant challenge was unequitable distribution of resources amongst the students- in terms of digital connection. Secondly, even though the basic sciences students continued to adapt well to the online modules, the clinical year students suffered the most because of a suspension of clerkships. Perhaps, the only way forward in the latter circumstance is the inculcation of Virtual reality simulation (VRS) in medical education- which has been in regular usage in England's health institutions since 2019. This VRS system can help deliver key clinical concepts and knowledge considering stimulating clinical scenarios and conducting objective structured clinical examinations.^{10,11}

Similarly in the USA, more than three-quarters of American medical schools had suspended clinical clerkships. This meant that students in clinical years had an underdeveloped infrastructure to develop critical clinical skills online. Most of the schools preponed their fourth-year elective slot to buy time till they could resume in-campus third year clinical rotations. However, many institutes retorted to the use of online platforms such as Zoom and WebEx to impart clinical learning in a "non-clinical" format. The biggest challenge was the inability to impart a full clinical clerkship experience, since only a portion of learning could be imparted online. Secondly, with the rapidly evolving global scenario, professors found it extremely tough to manage their professional clinical duties, and their personal lives with academic teaching.¹²

Conclusion

We concluded that there was low preference and perceived effectiveness of virtual medical education by the undergraduate medical students. The ease of studying at home was the most significant factor accounting for the difficulty in continuing medical education online. As humanity takes leaps towards online learning, a degree of innovation in education is critical in ensuring that there are no fallbacks in delivering curriculum-both basic and clinical, if any unforeseen circumstances were to develop again.

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Authors Contribution

MIS, SUM: Conceptualization of Project

MIS, TK, SM, SSB: Data Collection

SI, SM: Literature Search

SI, SM, SSB: Statistical Analysis

- IH, SA, SA: Drafting, Revision
- MIS, TK, SM: Writing of Manuscript