



Impact of Virtual Medical Education during COVID -19 pandemic among Medical Students in Kerala, India

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ABSTRACT

Background - To ensure the continuity of education during the current Covid -19 pandemic virtual method is the only means to gauge the knowledge of the students. This study focuses on the details of learning of medical students during the pandemic which modify their cognitive, psychomotor, and affective domains including communication skills. The study set out to decide the usefulness of virtual classrooms beyond the pandemic period to justify the cost and effort that will need to be invested.

Materials and Methods- It was a cross-sectional questionnaire-based survey conducted through an online platform using Google forms after institutional ethics committee approval. By convenient sampling method, five hundred and twenty one medical students from various tertiary care teaching hospitals throughout the state were enrolled in the study. A validated and structured questionnaire was the study tool and the impact of virtual medical education in their various domains and other aspects were assessed.

Results- Cognitive domain analysis showed that the online classes satisfied learning needs for 38.5% participants, 60.8% found learning material useful, 83.4% experienced study pattern changes and 25% had knowledge retention. The most obvious finding to emerge from this study was in psychomotor domain that 8.2% satisfied with the practical skills taught along with 12.4% participants confident in communicating to patients. 77.2% participants were not in favour of virtual classes after the pandemic gets over.

Conclusions-The impact of virtual classes on the cognitive domain though equivalent to face-to-face classes, its impact on psychomotor and affective domain including communication skill was less.

Keywords: Cognitive Domain, Communication Skills, COVID-19 Pandemic, Psychomotor Domain, Virtual Medical Education

INTRODUCTION

Corona Virus Disease -19 (COVID-19) originated in Wuhan China is a highly infectious disease in recent history [1]. It has gained worldwide distribution within a short period and is still spreading. The World Health Organization (WHO) has declared the coronavirus outbreak a pandemic on March 11, 2020, affecting people from all walks of life [2]. The Government of India declared a nationwide

lockdown on March 24, 2020. The government adopted preventive strategies like physical distancing and universal masking to curb the virus. They closed all the educational institutions including medical colleges and postponed various examinations.

To ensure the continuity of education, medical institutions replaced traditional lecture hall teaching and clinical posting with virtual platforms. The

pandemic situation has pushed us to accept online teaching platforms like Zoom, Google Meet, Microsoft Teams, and WebEx [3]. This method is the only option available to gauge the knowledge of the students without which the educational process will be incomplete. Students put to use gadgets like mobile phones, laptops, personal computers to attend online classes [4].

The benefits of virtual education include convenience in terms of time, place, and resources. Students have less expenditure on travel. Teaching modalities like e-learning modules, clinical videos, podcasts, simple virtual reality, and computer simulations are being utilised for engaging students in practical sessions [5]. Students have the facility to access the demonstrations of essential clinical skills and communication through online websites and blogs. Their doubts are cleared by asking questions directly by unmuting the audio or using chat boxes.

The main problem is to adapt to the new learning style [6]. In addition to that, students have to face a fair amount of challenges. Reliable network connections, the equipment they can access the Internet, the availability of facilities for teaching in medical schools, and the shortage of teaching staff due to their involvement in treating COVID-19 patients are some of them [7]. The ability to communicate with patients is the most difficult standard to achieve and can affect their professional development. Systematic integration of active learning strategies can overcome many of the challenges [8].

The present study was designed to determine the impact of virtual medical education during the pandemic period. It focuses on the details of learning which modify cognitive, psychomotor, and affective domains including communication skills of the students. This study set out to decide the usefulness of virtual classrooms beyond the pandemic period to justify the cost and effort that will need to be invested.

MATERIAL AND METHODS

It was a cross-sectional questionnaire-based study conducted after institutional ethics committee approval. The study was done through an online platform using Google forms for two months. Participants were medical students from various

tertiary care teaching hospitals throughout the state. Through a pilot study on sixteen participants sample size was estimated with a 95% confidence interval. By convenient sampling method, five hundred twenty-one medical students from both private and government sectors were enrolled for the study. The selection of study participants was based on the inclusion criteria that MBBS students should have completed at least six months of their course and attended online classes for a minimum period of three months. The students from medical colleges where online classes were not conducted were excluded from the study. The study investigators developed an online structured and standardised questionnaire using Google Forms. The survey questionnaire contained an introductory paragraph that informed the participants about the aim of the study, the confidentiality of their responses, and the freedom to withdraw from the study at any time. Informed consent to participate in the study was taken from all the participants. In the next section, they had to give their demographic details like age, gender, year of study, and name of the medical college. Subsequently, they had to answer twenty-five dichotomous questions which were in with 'Yes' or 'No' answers. All the questions were made compulsory and given scoring. For 'Yes' response, a score of one and for 'No' response, a score of zero was given. The questionnaire was structured to determine the impact of virtual medical education in the learning of the participants, assessment, and general aspects. The cognitive domain of learning includes variables based on knowledge acquisition, comprehension, analysis, and application. The psychomotor domain includes variables for professional and practical skills while affective domain variables were based on the attitude and perceptions of students. Moreover, variables for communication skills and general aspects were also included. The expert faculty members from the institution did a content validation of the questionnaire. Based on their feed-back modifications were done in the questionnaire. In the next step, we sent the modified questionnaire through the Google FormTM to the participants. They were given fourteen days to complete the questionnaire. Duplicate responses from the same participants were deleted based on the email address provided.

STATISTICAL ANALYSIS

For data analysis, all the quantitative data were recorded on a Microsoft Excel Spread sheet and subsequently was analyzed by Software Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics were used to assess the baseline characteristics of the data. All qualitative variables were presented as frequency and percentages.

RESULTS

Out of the total, 521 responses in the survey 384(73.7%) participants were females and 137(26.3%) were males. The mean age was 21 ± 1.31 . Of these 40.7% were in the First year MBBS, 21.5% were in the second year MBBS, 28.6% in the final MBBS year part one, and 9.2% in the final year MBBS part two (Table 1).

The analysis of variables for cognitive domain, psychomotor domain, attitude and communication skill variables are depicted in Table 2. The distribution of impact of virtual classes for assessment and general aspects in the study population are provided in Table 3.

According to the scoring done, the five questions under the cognitive domain had a maximum score of five and a minimum of zero. 78 participants scored in the range of zero to two, 346 participants scored in the range of two to four, and a score of more than four was obtained by 97 participants. In psychomotor skills, there were three questions with a maximum score of three and a minimum of zero. 475 participants scored less than two while 46 of them scored more than two. For attitude domain, the three questions had a maximum score of three and a minimum of zero. The score obtained for attitude was in the range of zero to two by 152 participants and a score of more than two was obtained from 369 participants. Four questions covered under communication skills had a maximum score of four and a minimum of zero. The score obtained in the range of zero to two was given by 229 respondents and a score of more than two was given by 292 respondents (Table 4). The scoring percentage in various domains depicted in Figure 1.

In addition to the regular online classes, 48.9% of students utilized various other online resources which include YouTube, Wikipedia and online applications

such as marrow, Dr Najeeb's Lecture, DAMS,DFMS etc. for their learning (Figure 2).

DISCUSSION

The widespread panic and uncertainty of COVID -19 have made a transition in the field of medical education; virtual classes became essential to ensure the continuity of medical education. The undergraduate course is envisaged to impart students not only knowledge but skill, attitudes, and values [9]. Online education is as effective as traditional classroom education in imparting knowledge [10]. The educational objective has three domains cognitive, psychomotor, and affective domains [11]. It is needed to establish whether effective learning is occurring in all the domains of the students. Some of the studies showed that online learning is less effective for students in terms of increasing their clinical and practical skills [12].

The purpose of the current study was to determine the impact of virtual medical education in the cognitive domain, psychomotor skills, attitude, and communication of medical students during the COVID-19 pandemic in the state. The cognitive domain involves the acquisition of knowledge, remembering, analysing, and applying [13]. Even though the class material provided to them was helpful and sufficient (62%), many felt that their retention in a virtual medium is not as good as classroom teaching (75%). The majority of participants (83.4%) experienced changes in their study patterns with virtual online classes. Getting adapted to the new experience of online mode of medical education lacking face to face contact with the faculty might be the reason [14]. Further, nearly 50% of our participants sought the support of other online resources for their learning (Figure 2). The most obvious finding to emerge from this study is that neither student were satisfied with the practical skills taught nor they found a balance of practical and theoretical knowledge provided to them. Lack of clinical posting and inadequate hands-on training could be a possible reason [15].

We also assessed the impact of virtual learning on the affective domain and communication skills of the participants. The affective domain involves feelings, emotions, and attitudes, and its subdomain receiving, responding, and valuing [16]. Although participants (74.2%) had interactive sessions during or at the end

of the class, half of them did not find online teaching contributing to the effective communication of the subject knowledge. Also their peer interaction regarding the subject matters were not adequate. Their confidence to communicate to a patient with the knowledge gained through virtual classes was not appreciable.

Assessment paves way for learning [17]. The findings of this study suggest that majority of participants had online assessments conducted for these virtual classes but only half of them were satisfied with the online exams and the way in which it was conducted. The scope of e-assessment is vast but there is a lack of familiarity of both teachers and students with online examinations. Meanwhile, other challenges posed could be anxiety regarding technical aspects, the possibility of unethical practices that students might engage in, which needs to be monitored by e-proctoring systems [18].

Regarding the conductance of online classes' majority of the participants found the schedule of online classes convenient, their technical skills were sufficient for attending classes. They were satisfied with the duration of the classes and majority were able to pursue their hobbies and other leisure activities. Other than network connectivity problems, the participants experienced visual fatigue and auditory fatigue [19]. Taken together, these results suggest that to overcome these challenges, recorded lecture classes after the sessions, short breaks to minimize fatigue, improve interactions and level of understanding to be implemented.

In many studies, physical classrooms were superior to virtual classrooms in many dimensions [20]. Overall, this study strengthens the idea that physical classrooms were better when compared to virtual classrooms. The study findings had significant implications for the understanding of the perception of students in various domains of learning using virtual modality. The relevance of the study by Thomas A, et al were clearly supported by the current finding that 77% of the study population were not in favour of virtual classes after the pandemic gets over [21]. Rafi et al. mentioned that recorded classes were preferred by the majority of the students due to their flexibility in timings similar to the findings in this study [22]. The findings of this research provide

insights that online classes were not as effective as compared to conventional classroom teaching.

The results of this research support the fact that various issues experienced by the students during virtual learning should be duly addressed. Proper planning of interactive classes, coordination, ensuring good network connectivity, scheduling of classes in advance, using different methods of teaching, getting feedback can improve the quality of online sessions [23]. The virtual model of education can support some of the learning needs of students, but it cannot serve as an alternative for face to face classroom teaching [24].

The strength of the study is the multifariousness of participants from both the private and government sector in the state giving us an adequate sample size. However, the study was limited by the absence of equal participation from both sectors, and the study was focused on the tertiary care teaching hospitals within the state.

CONCLUSION

Due to the uncertainty of the end of the current pandemic, this research proves to be particularly valuable and will serve as a base for future studies. Assessing the impact of this mode of learning can improvise the system to make it more acceptable to both faculties and students. The virtual platforms should offer more opportunities for students to have a deeper level of learning in the entire three domains: cognitive, psychomotor, and affective domain. Moreover, we have to decide the usefulness of virtual classrooms beyond the pandemic period to justify the cost and effort that will need to be invested.

CONFLICTS OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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Table 1: Demographic details of students participated in the study

Year of Study	Number of students (percentage) Distribution of Students Participated	Percentage distribution (within the year of study) of students based on gender	
		Male	Female
First MBBS	212(40.7)	24.1	75.9
Second MBBS	112 (21.5)	27.7	72.3
Final MBBS-Part I	149(28.6)	24.2	75.8
Final MBBS-Part II	48(9.2)	37.5	62.5

Table 2: Distribution of impact of virtual classes in the learning domains of the study participants

Question No:	Cognitive domain	Number of students (Percentage)	
		Yes	No
1	Satisfied with the learning needs	201 (38.5)	320 (61.5)
2	Learning materials helpful/sufficient	317 (60.8)	204 (39.2)
3	Changed the study pattern	435 (83.4)	86 (16.6)
4	Retention of knowledge similar to classroom teaching	127 (24.3)	394 (75.7)
5	Need the support of other online learning resources	255 (48.9)	266 (51.1)
Psychomotor domain			
6	Helped in building up of professional skills	82 (15.7)	439 (84.3)
7	Balance of practical and theoretical knowledge	63 (12)	458 (88)

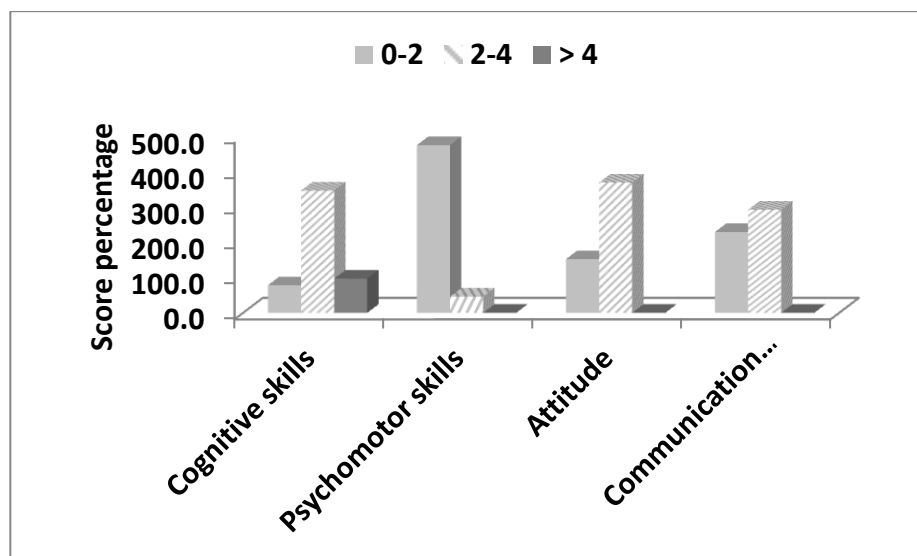
8	Satisfied with the practical skills taught	43(8.2)	478(91.8)
Communication skills			
9	Effective communication of the subject knowledge	242(46.4)	279(53.6)
10	Interactive sessions during or at the end of the class	387(74.2)	134(25.8)
11	Adequate interaction among the peers regarding the subject matters	203(39)	318(61)
12	Confidence in communicating to a patient with the knowledge gained	65(12.4)	456(87.6)
Attitude			
13	Get easily distracted during the online class	383 (73.5)	138 (26.5)
14	Preferred recorded lecture along with the online class	416 (80)	105 (20)
15	Favoured the virtual classes even after the pandemic is over	119 (22.8)	402 (77.2)

Table 3: Distribution of impact of virtual classes in Assessments and general aspects of the study participants

Question No:	Assessments	Number of students (Percentage)	
		Yes	No
16	Whether assessments are conducted	420 (80.6)	101 (19.4)
17	If yes, whether satisfied with the way of assessment	247 (58.8)	173 (41.2)
General Aspects			
18	Technical skills are sufficient for online learning	309 (59.3)	212 (40.7)
19	Convenient time schedule	410 (78.6)	111 (21.4)
20	Satisfied with the duration of the online class	401 (76.9)	120 (23.1)
21	Need break time during the online class	317 (60.8)	204 (39.2)
22	Able to pursue hobbies and other leisure activities	435 (83.4)	86 (16.6)
23	Experienced visual fatigue during the online classes	360 (69)	161 (31)
24	Experienced auditory fatigue during the online classes	278 (53.3)	243 (46.7)
25	Experienced network connectivity problems during the online classes	416 (79.8)	105 (20.2)

Table 4: Response frequency for scores in various domains

Score	Frequency			
	Cognitive skills	Psychomotor skills	Attitude	Communication skills
0-2	78	475	152	229
2-4	346	46	369	292
>4	97	Not Applicable		

Fig 1 : Bar diagram showing score percentage in various domains

Fig 2. Pie chart depicting other online resources preferred by students
