Effectiveness of online teaching during COVID-19 pandemic

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Abstract

Background: The COVID-19 pandemic had forced a sudden transformation of the teaching in medical colleges to online learning. Such a transition was necessary, but it presented special challenges because of the practical elements of medical education and prior lack of preparation among institutions and students.

Objectives: To assess the students' perception of the effectiveness of online classes conducted during the COVID-19 pandemic.

Methods: A cross-sectional, questionnaire-based study was conducted among MBBS students who attended online classes during the pandemic. The validated questionnaire included Likert-scale, multiple-choice, and open-ended items. Data were collected via Google Forms, and responses were analyzed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were applied, and Chi-square tests were used to assess associations ($p < 0.05$ considered significant).

Results: Out of 575 students, 457 responded. Mobile phones were the preferred device for learning. About 95% had sufficient technical skills; prior training varied significantly across academic years ($p = 0.02$). Most students could focus for 30 minutes (63%), with males showing significantly higher attention spans ($p = 0.03$). Eye strain was reported by 82.3%, more commonly in males ($p = 0.001$). Around 66.7% expressed confidence in performing skills learned online, with significant differences based on gender and academic phase ($p = 0.04$, $p = 0.02$, respectively).

Conclusion: Although students have successfully accustomed themselves to the online mode, having sufficient technical skills and valuing faculty assistance; the lack of attention span, physical workload, and insufficient psychomotor training stood out as a weakness.

Keywords: COVID-19, online learning, students' perception

Introduction

The COVID-19 pandemic has profoundly disrupted traditional educational paradigms worldwide, compelling a rapid transition from in-person instruction to online learning modalities.[1] Medical education, which traditionally relies heavily on hands-on clinical experience and face-to-face interactions, has faced unique challenges in adapting to this new digital landscape. Prior to the pandemic, e-learning was not a primary mode of instruction in Indian medical institutions.[2,3] The sudden necessity for online education has prompted both educators and students to navigate uncharted territories, often without adequate preparation or resources. Studies have indicated that while a significant portion of students (approximately 70%) are willing for the online classes to continue their education during the pandemic, there remains a substantial preference for traditional classroom settings.[4–6]

The transition to online learning has also introduced challenges related to student engagement and the efficacy of virtual instruction. Research has highlighted concerns regarding the lack of informal interactions between students and instructors, which are integral to the learning process.[7,8] Additionally, the absence of immediate feedback and real-time clarification of doubts can impede the learning experience, potentially affecting academic performance and comprehension.

Health-related issues have emerged as another significant concern associated with prolonged online learning. Extended screen time has been linked to physical discomforts such as eye strain, headaches, and mental fatigue.[9] These issues underscore the necessity for implementing ergonomic practices and promoting regular breaks to mitigate the adverse effects of continuous digital engagement.

Despite these challenges, the integration of technology in education has also unveiled potential benefits. The flexibility of online learning allows students to access educational materials at their convenience, facilitating self-paced learning and the opportunity to revisit recorded lectures for better understanding.[10] Furthermore, the current scenario has accelerated the exploration of blended learning models, combining online theoretical instruction with in-person practical sessions to enhance the overall educational experience.[11] The study aimed to assess the students' perception of the effectiveness of online classes conducted during the COVID-19 pandemic.

Materials & Methods

A cross-sectional, questionnaire-based study was conducted among MBBS students who had attended online classes during the COVID-19 pandemic. Institutional Ethics Committee approved the protocol. The questions were prepared and discussed among the faculty, and content validation was done. The questionnaire included different types of items: eleven were of option category, ten were measured on a Likert scale, and two were open-ended questions. This validated questionnaire was sent to 25 students to assess the reliability and Cronbach's alpha of 0.848 was obtained; based on their feedback, suggestions were incorporated. The validated questionnaire was prepared using google forms, and the same was sent to different student groups along with consent form. Three days' time was given for them to respond, repeated reminders were sent to students to complete the survey, and only one response was limited per participant. The data of students who participated in the reliability testing process were excluded from the analysis.

Statistical analysis

Data collected was entered into an excel sheet and analysed using Statistical Package for Social Sciences Version 22.0, (IBM Corporation, Armonk, New York, USA) manufactured by International Business Management Corporation.[12] Descriptive statistics were used for demographic data; results are expressed in frequency and percentage. The Chi-square test (χ^2 test) was used to assess associations between categorical variables and a P value of <0.05 was considered significant.

Results

The response rate of this survey was 79.5%, with 457 out of 575 participants completing the questionnaire. Among the respondents, 51.4% were male and 48.6% were female. Mobile phones emerged as the most preferred device for online learning (Figure 1).

Majority (95%) of the students demonstrated adequate technical knowledge and skills to navigate online learning tools. Prior training in these tools was found to be statistically significant across different academic phases [χ^2 (3, N = 457) = 9.431, p = 0.02], indicating a variation in experience levels. When evaluating attention span during online sessions, 63% of the students reported being able to concentrate for 30 minutes, 30% for 45 minutes, and only 7% could sustain for 60 minutes. Gender-based differences in concentration levels were statistically significant, with male students exhibiting a longer attention span than their female counterparts [χ^2 (1, N = 457) = 6.474, p = 0.03]. Regarding the total number of hours spent on online learning per day, 68% of students were able to focus for 1–3 hours, followed by 18% who managed only 1 hour, and 14% for 3–5 hours.

A substantial proportion (82.3%) of students reported experiencing eye strain due to prolonged screen exposure, with male students being significantly more affected [χ^2 (1, N = 457) = 10.702, p = 0.001]. Additionally, 75% of the respondents indicated that using headphones minimized distractions, thereby enhancing their ability to focus.

Many students perceived that the faculty were competent in delivering online education. 67% agreed that instructors possessed the necessary technical skills, 65% felt that teachers successfully stimulated their interest, 64% acknowledged effective interaction, and 84% agreed that instructors provided clear explanations. Furthermore, 82% of students confirmed that course content was readily available on the Learning Management System (LMS) (Table 1).

To facilitate clinical and practical learning, various instructional approaches were employed. Case-based scenarios were the most frequently used method, accounting for 40% of the strategies implemented (Figure 2). With respect to assessments, the most preferred mode was scanned handwritten submissions, chosen by 38% of students, with other assessment formats distributed across different preferences (Figure 3).

A notable 66.7% of students expressed confidence in their ability to perform skills learned through online training. Among final-year students, performance in psychomotor tasks during online practical and clinical sessions was statistically significant [χ^2 (3, N = 457) = 9.457, p = 0.02]. Furthermore, male students demonstrated better performance in executing practical tasks compared to female students [χ^2 (1, N = 457) = 4.075, p = 0.04].

When comparing different academic phases, no statistically significant differences were observed in technical knowledge, attention span, daily study hours, incidence of eyesight-related problems, or the use of headphones to mitigate distractions.

Discussion:

The sudden shift to virtual learning altered all aspects of medical education during the height of the COVID-19 global crisis. While continuation of learning through online allowed student to pursue education without interruption, it also raised significant challenges, particularly in multitasking, staying focused, and hands-on abilities. The present study gives an outlook on perception of online learning, comparing findings with existing literature to offer insights on its effectiveness.

This study found that students were generally able to adjust to online learning, with most reporting confidence in using digital platforms and navigating online tools. This aligns with the findings of Abdul Razzak et al.[13], who noted that students adapted well despite initial disruptions in transitioning to digital learning. However, while recorded lectures and online resources were readily available, many students expressed concerns about feeling disconnected due to reduced engagement and the absence of face-to-face interaction with teachers and peers. Similar observations were made by Arja et al.[6], who found that while remote learning was effective for delivering theoretical content, it fell short in fostering interpersonal connections and meaningful discussions.

One of the most pressing challenges was maintaining focus during online classes. A significant portion of students (63%) reported difficulty concentrating beyond 30 minutes, with engagement levels declining sharply thereafter. This finding are in line with Lobos et al.[14], who identified screen fatigue and home distractions as major obstacles to sustained focus.

Interestingly, gender differences in concentration levels emerged, with male students reporting longer attention spans compared to their female counterparts. This supports the work of Nomie-Sato et al.[15], who found that female students tend to experience higher stress and anxiety in online learning environments, potentially impacting their ability to concentrate. The combination of psychological strain and environmental distractions underscores the need for structured engagement strategies to help students stay focused.

Health-related issues also surfaced as a key concern, with 82.3% of students reporting eye strain due to prolonged screen exposure. Similar studies, such as those by Nomie-Sato et al.[15], have linked extended digital screen time to headaches, dry eyes, and mental fatigue. Additionally, poor ergonomic setups at home further exacerbated these problems, highlighting the need for strategies like scheduled breaks, blue-light filters, and ergonomic guidance to improve students' well-being.

Another important drawback of online learning was its limitations in practical and clinical training. While 61% of students found online clinical classes useful for understanding theoretical concepts, only 43% felt that their hands-on skills improved. This concern is widely reflected in medical education research, as noted by Eglseder et al.[16], who emphasized that hands-on training is irreplaceable and cannot be fully replicated through virtual learning. To address this gap, various online teaching methodologies were used, including case scenario discussions, simulations, and pre-recorded procedural videos. While these strategies offered partial solutions, they failed to provide the real-world, hands-on experience that traditional in-person training ensures. Research in occupational therapy education by Eglseder et al.[16] highlighted similar shortcomings, concluding that while online teaching is effective for theoretical knowledge, it falls short in practical skill development.

When it came to assessments, students had mixed experiences. Multiple-choice exams and scanned handwritten responses were the most commonly used formats, but concerns over fairness and transparency persisted. Bharath et al.[5] also reported that students questioned the credibility of online assessments due to issues like potential cheating, unreliable internet connectivity, and the lack of real-time supervision.

Another challenge was the delay in feedback. Unlike traditional classrooms, where students receive immediate clarification from instructors, online assessments often lacked timely responses. This highlights the need for better

assessment strategies, such as AI-assisted proctoring, real-time evaluations, and open-book assessments that emphasize critical thinking rather than rote memorization.

Despite these challenges, students acknowledged several benefits of online learning. Many valued its flexibility and accessibility, which allowed them to manage their study schedules more effectively. Similar sentiments were echoed in studies by Lobos et al.[14], where students appreciated the ability to revisit recorded lectures, access learning materials at their convenience, and study from home.

Additionally, online learning encouraged self-directed learning. As noted by Selvaraj et al.[17], reduced instructor-led interventions, required students to take greater responsibility for their learning, a skill that is increasingly important in medical training. However, this benefit was more pronounced among students with high levels of self-discipline and motivation, whereas those lacking these traits struggled with time management and procrastination.

One of the biggest takeaways from this study is the need for a blended learning model. A hybrid approach—combining online and in-person instruction—could offer the flexibility of digital education while preserving the essential hands-on experience required for skill-based training. DeCoito et al.[18] suggested that such models, where theoretical content is delivered online and practical training occurs in person, provide the best outcomes for student engagement and learning retention.

Further enhancements, such as integrating virtual simulations, augmented reality (AR) demonstrations, and AI-powered assessment tools, could make online learning more interactive and effective. Additionally, universities must invest in faculty training programs to equip educators with the skills needed to create engaging digital classrooms and optimize student learning experiences.

Future Recommendations

To optimize online learning, institutions should consider:

- **Enhanced Interactivity:** Incorporating live discussions, real-time polling, and breakout sessions to maintain engagement.
- **Improved Practical Training:** Developing hybrid models that combine virtual case-based learning with in-person clinical rotations.
- **Health Considerations:** Implementing guidelines for screen time, ergonomic workspaces, and digital well-being programs.
- **Robust Assessment Methods:** Utilizing AI-driven proctoring, open-ended critical thinking assessments, and structured feedback mechanisms.
- **Faculty Development:** Providing educators with training on digital pedagogy and effective online teaching strategies.

Conclusion:

Most students had technical skills, but poor connectivity and data got over fast. They could concentrate for a short duration only. Teachers interacted well and clarified doubts, but were able to acquire partial psychomotor skills.

Conflict of interest: No conflict

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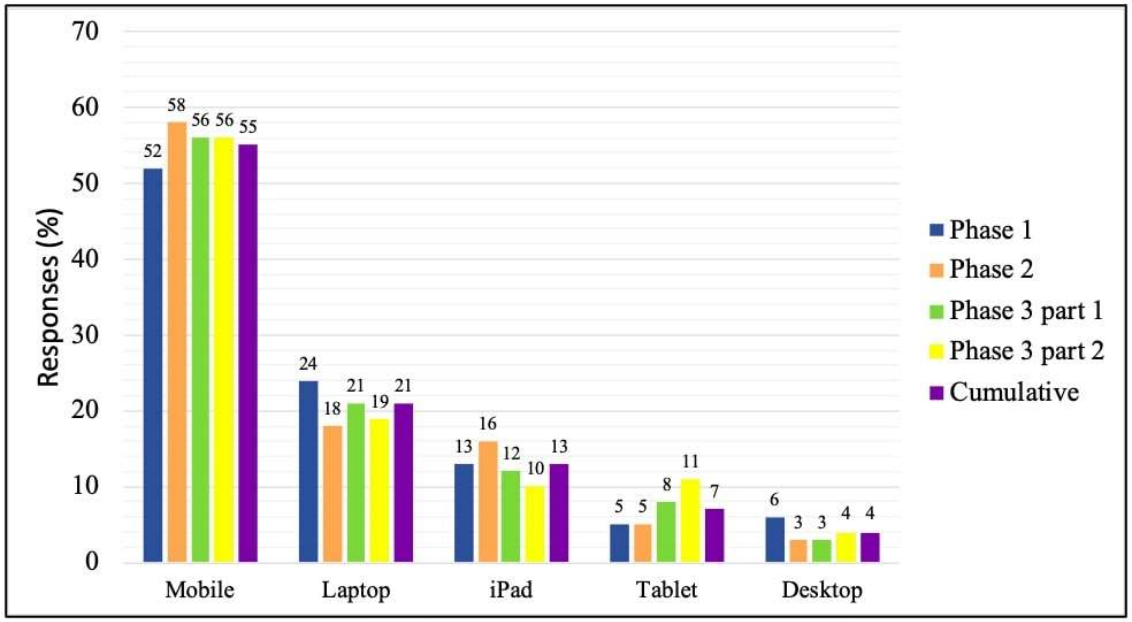

Figure 1: Type of device preferred

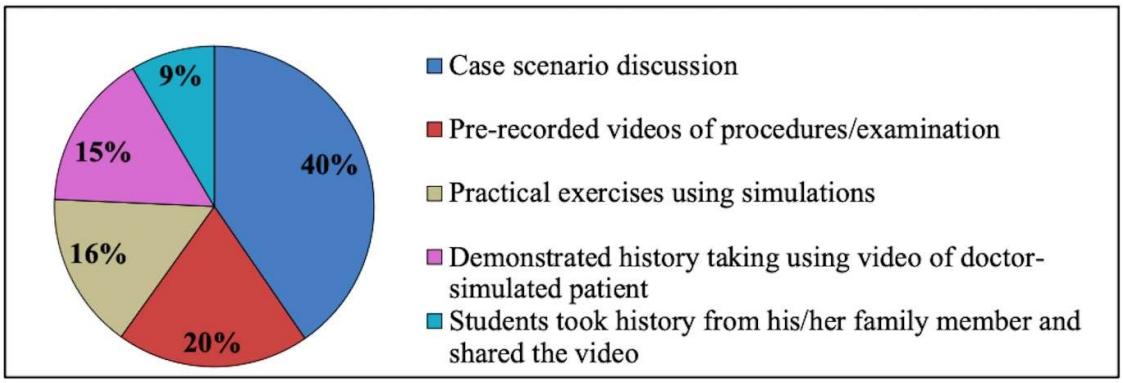

Figure 2: Methods by which practical/clinical was taught

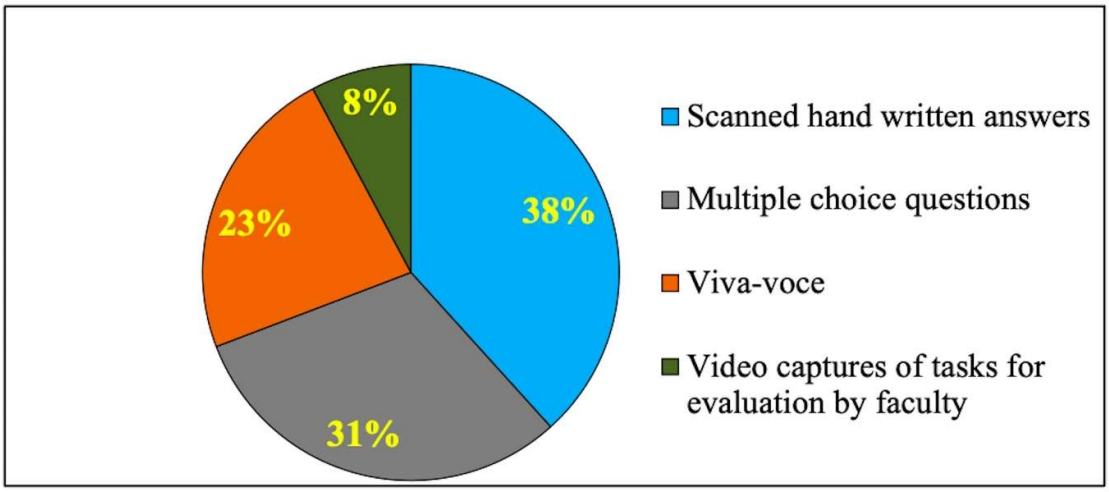

Figure 3: Assessment methods practiced

Table 2: Student's perception of the teaching-learning process

Question	Strongly Agree and Agree (%)	Neutral (%)	Strongly disagree and Disagree (%)
Teacher stimulated interest in you during the class	65	29	6
Teachers had the technical ability to handle online classes	67	24	9
Able to have one to one interaction with staff, like onsite classes	64	24	12
Teacher clarified the doubts during the class	84	15	1
Sufficient time was provided for the completion of assignments after the online classes	75	18	7
Home environment distractions affected online classes	66	22	12
The content of topics taught was available on LMS for further reference	82	15	3
Online Practical/Clinical classes were taught effectively	61	26	13
Your understanding of practical/clinical was better during online classes	43	28	29
Assessments conducted online were fair and transparent	73	21	6