Original Article

Medical Student's Preference of Educational Resource Usage during COVID-19 Pandemic from Northern India

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Abstract

Introduction: Coronavirus disease (COVID-19) posed an extraordinary situation in front of humankind with the onset of the year 2020. The Government of India, on March 16, 2020, announced closure of all the educational institutions. The aim of this study was to investigate the accessible and preferable educational resources among medical students during this pandemic phase. **Materials and Methods:** This web-based cross-sectional study was conducted among 392 undergraduate medical students after obtaining informed consent using a structured questionnaire with close-ended responses. Existence of clustering within the student's preferred educational resources was investigated. **Results:** The mean age of the study participants was 20.71 ± 1.65, with 51.3% males and 48.7% females. The major responses regarding educational resources were online lectures, online teaching videos, reading textbooks, and written notes. Wilcoxon signed-rank test revealed preference for online lectures, online teaching videos, interactive online materials, and medical apps. **Conclusion:** As the count of users for educational resources available over the Internet is uprising, now, it is vital to generate evidence-based systems which support teaching merits and provide guidance for efficient teaching material available for online learning.

Keywords: Knowledge, learning, online, revision, textbooks

Introduction

The coronavirus disease (COVID-19) wreaked havoc across the globe with the onset of the year 2020, which posed an extraordinary situation in front of humankind, causing illnesses ranging from the usual flu to serious respiratory problems even leading to mortality.[1] The origin of COVID-19 is zoonosis, yet the transmission from animals to humans or humans to humans is observed either through droplets or direct contacts, and period of incubation ranges from 2 to 14 days.[2,3] The history has recorded occurrence of plenty of pandemics including severe acute respiratory syndrome 2002 resulted in eight hundred mortality, and Middle East respiratory syndrome–related coronavirus (MERS-CoV) (2012) resulted in 860 mortality and just after 8 years of MERS-CoV, COVID-19 gave its worldwide representation.[3,4] The index case was reported from Wuhan (China) during the month of December 2019, and after that, its dissemination speeded in a very rapid manner and reached several countries in a short duration of time, causing a lot of fatalities.

After such disastrous situation, the World Health Organization (WHO) came into action, realized its impact, and decided to declare COVID-19 as a public health emergency of international concern on January 30, 2020.[5] Startling there was global reporting of catastrophic counts of newer cases during the start of March, so subsequently on of March 11, 2020, the WHO has declared the COVID-19 to be a pandemic. On March 24, 2020, the Government of India (GoI) took a strong initiative to contain the spread of this virus, and from March 25, 2020, onward, the closure of nearly all offices, industries, hotels, commercial and private establishments, shops, malls,

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and others was ordered.[6] The closure of educational, research, and coaching institutions was also initiated with no exception to teaching institutes such as medical colleges. The closure of medical colleges during pandemic has put the students in dilemma as they will not get that extent of support, guidance, and supervision from their teachers as they were getting on the campus. In addition, there will be no face-to-face interaction between student and teacher, the traditional way of teaching methods will be hampered. Reporting of COVID-19 cases as of April 22, 2020, was more than 2,475,699 among 213 countries and territories, and it resulted in around 169,134 deaths, whereas in India, the active case counted 15,859, 3960 cured, and 652 deaths.[2,7] But in the last decade, the availability of education materials or resources to medical students has expanded rapidly.

There is an increased access to online learning tools and apps with the rapid expansion of mobile technology apart from traditional methods textbooks, tutorials, and lectures.[8,9] In developed countries, the concept of blended learning is well established and accepted, as it includes both e-learning and traditional learning methods.[10,11] Moving on a similar path GoI has suggested teaching schools and institutes to teach the students through various available and accessible online portals.[12] The current need of the hour is to find out how medical students learn during this pandemic while institutes are closed; this study was done with the aim to investigate the accessible and preferable educational resources among medical students during COVID-19 pandemic for acquiring new skills/knowledge and for revising skills/knowledge. The expected benefits of the present study are that the institute will be aware of student's education priorities and needs, the quality and reliability of educational resources can be further evaluated, and the most commonly used tools by students can be developed at the level of institution itself.

Materials And Methods

Study design

The present study was web based and cross-sectional in design.

Study setting

This study was conducted at a tertiary care teaching hospital of southern Haryana during the 3rd week of April 2020. The college was started in 2013 with getting its first batch of MBBS students, and since then, there has been joining of 100 MBBS students each year, so currently, there are 627 MBBS students (regular batch and additional batch), including interns.

Study population and sample size

The study participants included MBBS students from 1st year to prefinal year with currently having access to the Internet and it counted to around 392 eligible students. The participants provided their written consent after understanding the study objectives, and possible attempts were made to keep the information pertaining to participants as anonymous and confidential.

Study tool

A 24-item structured questionnaire with close-ended responses was developed which covered the domains of participant's characteristics, educational resources used for gaining/learning new knowledge/skill and for revising old knowledge/skills, and level of satisfaction toward learning and revision of educational resources during COVID-19 pandemic. A pilot study was done on 20 graduation pursuing medical students and it took on an average 10 min for completing the questionnaire. The questionnaire was made precise, relevant, valid, and acceptable by presenting it among 15 randomly selected faculty members. Prior to distributing the questionnaire to the study participants, further refining and organizing of the same was done to make it more comprehensive. The questionnaire had 4 divisions and consisted of total of 24 elements. Division one consisted of four elements and gathered information regarding participants characteristics such as current age in years, sex, studying prof and access to smartphone. Division two comprised nine elements and aimed to gather student's educational resources for acquiring new skills and knowledge. Similarly, section three comprised nine elements and aimed to gather student's educational resources for revising old skills and knowledge. The nine elements included "attending lectures online; reading textbooks; consulting medical literature like journals; watching online teaching videos; online or downloaded question banks; interactive online materials; using medical apps such as Human Anatomy Atlas; making written notes; and attending small group discussions/tutorials," and participants were suggested to respond to each item based on a 7-point Likert scale pattern (1 = never, 2 = rarely, 3 = occasionally, 4 = sometimes, 5 = often, 6 = mostly, and 7 = always). Division four comprised two elements and aimed to obtain the level of satisfaction among participants toward learning and revision educational resources during COVID-19 pandemic and participants were suggested to respond to each item based on a 5-point Likert scale pattern (1 = extremely unsatisfactory, 2 = unsatisfactory, 3 = neutral, 4 = satisfactory, and 5 = extremely satisfactory). Google Forms was used as a platform to develop and distribute the questionnaire.

Data collection

Being elective and not requite were the properties for participating in the study. The contacting and recruiting with undergraduate students were made via social media channels such as Instagram, Twitter, Whatsapp, Facebook, and Mails; and the password to fill the Google Forms was shared on the same channels. The directions for filling and completing the questionnaire were explained in a session given to each year's participants over the "Zoom Meeting" Online portal, especially mentioning that all questions were mandatory and the participants could not change the answers after submitting the questionnaire.[13] The participants were provided with adequate duration (1 week) to peruse, apprehend, and provide response to all elements, and those do not respond back to the questionnaire within defined time and reminders were declared as dropouts and were not included in the data analysis. While conducting the study, enough consideration was given to

adhere to the guidelines of checklist for reporting results of Internet e-surveys.

Data analysis

The collected data were tabulated and analyzed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp. Armonk, NY, USA). All the tests were performed at significance level of 5%. Categorical variables were presented as percentage (%). The difference in preferred education resources and level of satisfaction between learning and revising was assessed by Wilcoxon signed-anked test, and existence of clustering within the student's preferred educational resources was investigated using principal components analysis (PCA).

Ethical approval

The study was initiated only after obtaining necessary clearance from the Institutional Ethics Committee of the medical college vide letter number SHKM/Acad./IEC/2020/34.

Results

Data of 374 students were analyzed and presented here. Eighteen participants did not respond back to the questionnaire after suggested reminders. The mean age of the study participants was 20.71 ± 1.65, with 51.3% males and 48.7% females. There was near equal representation of participants from each academic year (1st year – 26.2%, 2nd year – 24.6%, 2nd year – 24.3%, and 3rd – 24.9%) and almost each participant had access to the smartphone (97.9%).

Figure 1 shows the distribution of study participants responses based on 7-point Likert Scale regarding educational resources utilization to learn or gain new knowledge and skill during college closure due to COVID-19 pandemic and it was observed that online lectures ("always" as 42.8%), reading textbooks, online teaching videos, and written notes ("mostly" as 35.0%, 31.3%, and 27.3%, respectively) were the new learning priorities among participants. The "rarely" and "never" used educational resources for new learning were small group discussion (25.9% and 29.7%), medical apps (21.9% and 15.5%), interactive online materials (26.2% and 11.5%), and consulting medical literature (32.1% and 31.3%) among participants.

Figure 2 shows the distribution of study participants responses based on 7-point Likert Scale regarding educational resources utilization for revising old skills and knowledge during college closure due to COVID-19 pandemic, and it was observed that during revision, resource preference of online lectures was "always" in 21.7% of participants, but the revision preference resources were reading textbook, online teaching videos, and written notes ("mostly" as 35.6%, 27.8%, and 31.6%, respectively) among the study participants. The "rarely" and "never" used educational resources for revision were small group discussion (23.8% and 30.7%), medical apps (27.0% and 13.4.%), interactive online materials (28.3% and 13.4%), and consulting medical literature (34.0% and 27.5%) among participants.

Frequency for the usage of every education resources to new learn and revision of knowledge and skill among study participants during college closure due to COVID-19 pandemic was compared using Wilcoxon signed-rank test [Table 1], and it was found that preference for online lectures, online teaching videos, interactive online materials, and medical apps was found to be statistically significant for learning when compared to revision ($P < 0.05$). Similarly, the difference in satisfaction levels for learning and revision was found to be statistically significant ($P < 0.05$) and revision was found to be more satisfactory when compared to new learning during college closure in COVID-19 pandemic [Figure 3].

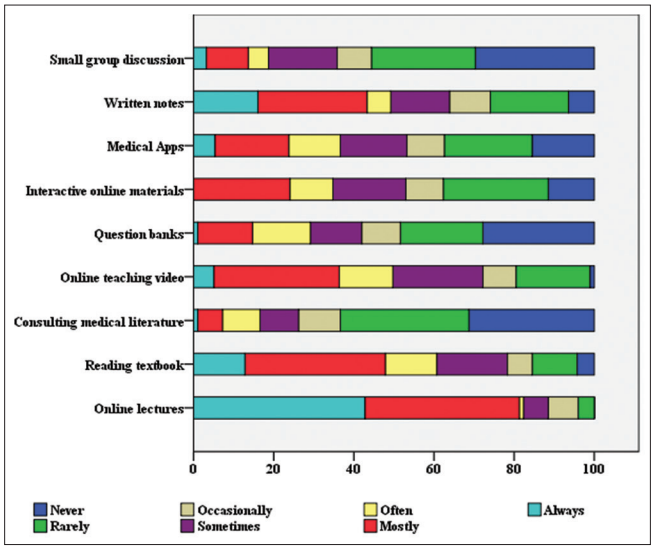

Figure 1: Distribution of study participants responses based on 7-point Likert Scale regarding educational resources utilization for learning new skills and knowledge ($n = 374$)

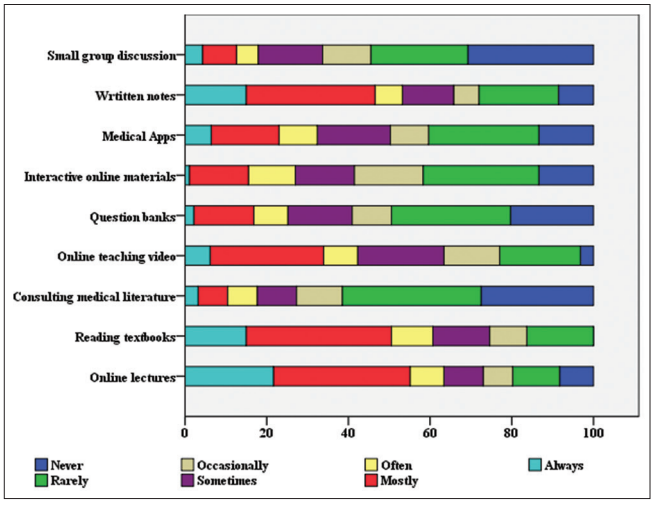

Figure 2: Distribution of study participants responses based on 7-point Likert Scale regarding educational resources utilization for revising old skills and knowledge ($n = 374$)

Table 1: Comparison of frequency of each educational resource usage for new learning or revision of skills and knowledge among study participants using Wilcoxon signed-rank test (*n*=374)

Educational resource	Preference	Level of significance	*Z*-score value	Effect size
Attending lectures online	New learning	0.000	−11.052	−0.40
Reading textbooks	Revision	0.593	−0.534	−0.02
Consulting medical literature like journals	Revision	0.083	−1.733	−0.06
Watching online teaching videos	New learning	0.000	−3.773	−0.14
Online or downloaded question banks	Revision	0.376	−0.885	−0.03
Interactive online materials	New learning	0.000	−4.826	−0.18
Using medical apps such as Human Anatomy Atlas	New learning	0.030	−2.168	−0.08
Making written notes	Revision	0.413	−0.818	−0.03
Attending small group discussions/tutorials	New learning	0.063	−1.862	−0.07

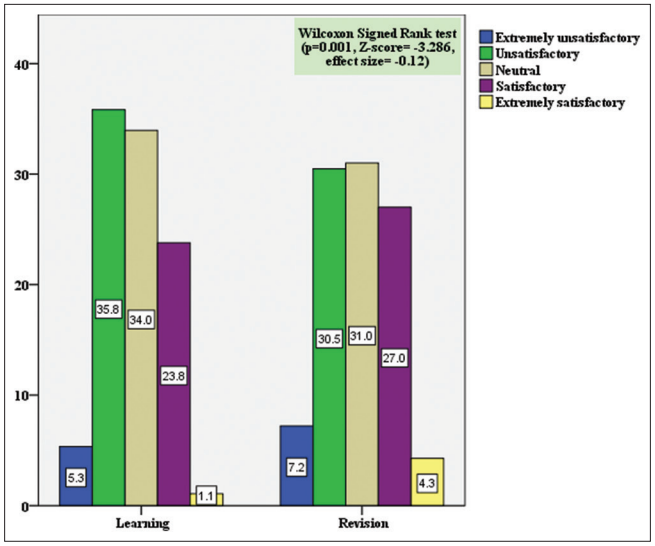

Figure 3: Comparative distribution of study participants satisfaction based on 5-point Likert Scale regarding educational resources utilization for new learning and revising old skills and knowledge (n = 374)

Table 2 shows the PCA of each education resource usage to learn new or revision of knowledge and skill among study participants, and it was observed that most items were loaded to one of the components and component correlation obtained as "r = 0.333." The clustered components specify that studying year, sex, and age had no relation for the educational resources preference during learning and revising. The clustering was also observed along the online and offline differentiation of resources for component 1 (online) and component 2 (offline).

Discussion

The present study is completely novel study as even after exhaustive literature search, no study was found which used the PCA method to explore the use of educational resources among medical students during closure of colleges due to COVID-19 pandemic, and it was found that participants were using plenty of education resources whether online or offline for routine learning or revision. The major responses regarding educational resources were online lectures, medical apps, interactive online materials, consulting medical literature, online teaching videos, and as well as traditional learning resources such as reading textbook, written notes, and small group discussions. Preference for online lectures, online teaching videos, interactive online materials, and medical apps was found to be statistically significant for learning when compared to revision. Findings reflect that reading textbook is among the well-liked resources, but conventional or online education format, such as lecture online, online teaching videos, and written notes, remained the trendy and famous resources when it came to newly learned knowledge.

Without any doubt, lectures by teachers are indeed essential for deep understanding of the subject, but the experience shared by Biavardi and López-Ruiz during college closure in COVID-19 pandemic has shown that PowerPoint presentations with audio records or explanatory notes being posted by teachers sometimes have a significant delay, so this unavoidable change of in-class lectures to online ones has caused some unease and discomfort for the students. To overcome this, institutions shall have constant emphasis to deliver polished and excellent lectures meant to cause ease to learn and revise for individual students.[14,15]

In general, there is a fundamental change in the manner of learning and consolidating the new knowledge among medical students due to latest or trending social media and evolving Hi-tech mobiles. The reason for such change was cited by Moran *et al*., Masters *et al*., and Augustin that interacting websites and mobile apps are pleasing, captivating, easy to approach, suitable while traveling or outside, adaptive to learn, and with amusing allure of span for punt cohorts compared to conventional educational methods.[16-18]

During COVID-19 pandemic, universities and colleges though have responded by providing e-learning platforms for their students, a lot still needs to be done, especially for the medical students, who are next in line for this fight. Understanding learning and revision educational resource penchant of undergraduates is of great worth in designing educational programs as it decides the student's success or lack of success in particular for each educational resource. Studies by O'Doherty *et al*. and Creswell have revealed that when there is a mismatch in the preferential educational resources of students

Table 2: Principal components analysis of each educational resource usage for new learning or revision of skills and knowledge among study participants ($n=374$)

Items	Component 1	Component 2
Revision - Interactive online materials	0.813	
Revision - Medical apps	0.793	
Learning - Medical apps	0.764	
Learning - Interactive online materials	0.706	
Revision - Online teaching video	0.677	
Revision - Consulting medical literature	0.675	
Learning - Online teaching video	0.641	
Learning - Question banks	0.593	
Learning - Consulting medical literature	0.584	
Revision - Online lectures	0.550	
Revision - Question banks	0.526	0.395
Learning - Online lectures	0.435	
Revision - Written notes		0.771
Learning - Written notes		0.741
Revision - Reading textbooks		0.684
Learning - Reading textbook		0.628
Learning - Small group discussion		0.415
Revision - Small group discussion	0.330	0.349
Gender	−0.404	

Kaiser-Meyer-Olkin measure of sampling adequacy=0.761, Bartlett's test of sphericity (P=0.000), Component correlation (r=0.333), Rotation method: Oblimin with Kaiser normalization

and the teaching strategies, the direct effect is observed where students tend to not do well, experience discomfited, get stupefy or distracted, execute abysmally in exams, get demoralized, and finally left with options of dropping the topic or session.[19,20] Walsh and Park *et al*. have reiterated that student-centered approach needs to be implemented including doubt clearing sessions via online portals, virtual bedside stimulation software, creative conceptualization, and student engagement while keeping in mind the four key pillars as expertise, assets, institutions plan of action; and final one as handholding and perspective.[21,22]

As teachers are keen to uptake novel methods to teach undergraduates via website platform, there is the simultaneous occurrence of facts scarcity regarding the effectiveness of this novel web-based educating methods at the graduation horizon, as revealed in studies done by Robinson *et al*. and Jebraeily *et al*.[23,24] In addition, Gavali *et al*. and Varshney expressed that as there is an increase in the count of students for online educational resources, so now, it is vital to generate evidence-based systems which support teaching merits and provide guidance for efficient teaching material available for online learning.[25,26]

Lim *et al*. came up few challenges for online education resources and one of them is that it will require both capital resource and manpower as there is very studies revealing the effectiveness of education resources, so the capital resource of setting up a virtual learning environment or simulation laboratory may prove a deterrent to their utilization.[27]

Arandjelovic *et al*. and Elcin *et al*. commented that enhanced utilization of "inverted/flipped classrooms" in medicine educational system has raised the dialogue regarding the promising role of online educational resources amalgamation with medical teaching.[28,29] The empirical transference of class-established lectures into web-based education utilization and freely available resource put an educating confrontation while maintaining conventional methods repeatedly acts as a hurdle in accommodating with online educational techniques by teachers during this COVID-19 pandemic. Brooks *et al*.'s study outcomes have provided the ways to deal psychological distress being faced by the students due to college closure and staying at home during COVID-19 pandemic.[30]

Perhaps it is the best opportunity for universities and colleges to consider utilizing and enhancing other modes of learning and revision, such as Online lectures, Online teaching videos, or medical app platforms whereby students will be engaged in an interactive manner during COVID-19 or future pandemics. Ultimately, the inclusion of pandemic management training in the medical curriculum will instill the upcoming medical graduates with readiness to respond to future global infectious disease outbreaks or pandemics including COVID-19.

This novel study has made an attempt to find out the common educational resources used during COVID-19 pandemic and also analysis using PCA was done to find the clustering of educational resources for new learning or revision of skills and knowledge. The study reflected that online lectures, reading textbooks, online teaching videos, and written notes were the new learning and revision priorities among participants. The medical apps and other online interactive lectures were often used as educational resources. As the count of users for educational resources available over the Internet is uprising, now, it is vital to generate evidence-based systems which support teaching merits and provide guidance for efficient teaching material available for online learning.

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Conflicts of interest

There are no conflicts of interest.

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