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Effect of webinars in teaching–learning process in medical and allied health science students during COVID-19 pandemic: A cross-sectional study

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Abstract:

BACKGROUND: COVID-19 pandemic lockdown has brought all sectors to be dwindled with no exception of the academic system. Even professional courses like medical and allied health academic courses were also not spared. The academic requirements were not met as required to do so. Webinar has become a good source of virtual platform acting as a bridge for attaining the gaps in accomplishing the curriculum to the students during these curfew times. Our study aimed to know the value of webinars on teaching–learning processes among the medical and allied health science students in India.

MATERIALS AND METHODS: The study design is a cross-sectional study with 2084 students who attended at least one webinar. An online survey questionnaire was sent, and the data were collected on participant's perspective on the effectiveness of webinar, post webinar assessment by their satisfactory level of gain of information through webinars and their plan to apply in future.

RESULTS: Participant's perspective on effectiveness of webinar showed 66.7% of agreement with the webinar use. In post webinar assessment, the use of webinar was in agreement with 69.9% of the participants. Furthermore, we observed a significant association with the gain of information in post webinar assessment ($P < 0.05$) and a significant association with their plan to apply in future ($P < 0.05$).

CONCLUSION: Our results showed that the students were satisfied with the webinar teaching and acknowledged it to be an effective tool in the teaching–learning process to gain new knowledge and wish to attend webinars in future as a part of their curriculum. Thus, webinars have a constructive effect in the teaching and learning process in professional courses during pandemic lockdown.

Keywords:

COVID-19, E-learning, pandemic, specific learning objectives, webinar

Introduction

With the evolution of the novel coronavirus disease (COVID-19), the pandemic situation arose in March 2020. In surge to this pandemic, priority is given to the investigation of the pathogenesis, diagnosis, and treatment of COVID-19 disease due to its devastating effect on

human life. The impact of pandemic on routine medical education has taken a backseat. Faculty and students tussled with the changes brought about by this pandemic. To overcome the challenges faced by the students, an online learning system was adopted by the educational institutions which created a paradigm shift

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from offline to virtual learning activities. This online medical education has been a challenge in a number of countries. For instance, in Libya, the civil war and financial crisis have affected the country's infrastructure. Consequently, blackouts and poor internet connections posed challenges for online learning platforms. In Indian scenario, medical and allied health science education came to a standstill during pandemic lockdown and urged the need to find alternatives. Then, webinar served to be a great mode of education communication on transferring knowledge. Adopting more and more technology-enhanced learning elements, distance learning has turned into e-learning, providing de-localization and flexibility, allowing a departure from the "classroom paradigm," the virtual space which serves as a mediator of knowledge and information.^[1] Online modes of teaching methods aided the institutions to effectively overcome the educational crisis during the time of public health emergencies.^[2]

Most of the online learning modules were based on the competency-based educational framework, which emphasizes blending of professional practice with classroom education by health-care professionals who are also entrusted with governing patient's health needs.^[3,4] Among these learning activities, webinars are frequently integrated into the curricula of distance education and blended with learning programs.^[5] Several unexpected challenges are confronted by the underprepared teachers for adapting to this transition from conventional curriculum to online-based curriculum during COVID-19 pandemic. Still, the educational institutions are imposed to migrate to digital technology for empowering the teachers and the medical education to be continued during the pandemic. For the effective teaching and learning process to be continued, even the teachers throughout the world were trained through webinars.^[6] Through the application of a series of webinars, theoretical knowledge and practical skills of the teachers and students can be improved. The impact of webinars on the quality of pedagogical instruction is to be unraveled to a greater extent. Promising results have been obtained in the field of education by the innovative ways of e-learning through webinars. Webinars were also conducted among the teachers for improved understanding of e-learning and creating constructive e-portfolios to enhance students' learning.^[7]

Webinars have been widely accepted by several trainers and teachers as it promotes different methods of learning, engagement as well as social and technological update.^[8] In medical education, webinar teaching facilitates exploring and broadcasting the scientific knowledge and various aspects of medicine. It is used by the medical instructors to impart their clinical ideas concerning the medical competency to the residents. Furthermore, webinar

teaching enables participants to actively participate in seminars, give feedback, establish better interaction, and acquire information efficiently.^[9,10] Another positive aspect in using webinars as an effective tool in training is the flexibility in acquiring knowledge anywhere and easy access to training materials.^[11,12] Webinars act as an enriched virtual medium by providing face-to-face interaction for students to relate with their instructor and peers, through which it allows a real-time participation of students and instructors simultaneously. Webinars also provide just-in-time learning opportunities.^[13] The students are allowed to progress at their own pace by enhancing flipped classrooms through recorded sessions, which is both cost-effective and time-saving for the educators who are far away.^[14] Webinars do support the social presence for all the participants and reduce their anxiety levels enabling them to attend sessions in their personalized environment.^[15] Thus, online learning system with amalgamation of traditional and innovative methods, together with a pedagogically well-adapted strategy, will be a novel and ideal method for an effective students' learning.^[12]

With this new teaching as regular practice of medical education, we aimed to study the value of webinars on teaching-learning process by determining the effectiveness and satisfactory level of webinars during the COVID-19 pandemic among the medical and allied health science students in India.

Materials and Methods

Study design and setting

This was a cross-sectional study conducted among the medical and allied health science students in India. Two thousand and eighty-four students from all over the country who had attended at least one webinar since March 2020 were included in the study. The survey was conducted through Google Forms between July and September 2020. The questionnaire for the study was approved by the expert committee, which included participant's basic demographic data, information about the webinars attended, effectiveness and satisfactory levels of the webinars in imparting education to the students.

Statistical analysis

Snowball sampling technique was followed for the survey. Descriptive data were expressed using mean, standard deviation, frequencies, and percentages. The frequencies of the specific learning objective (SLO) in the beginning and end of the webinars were compared using a Chi-square test, odds ratio (OR), and confidence intervals. The Chi-square test was implied for association of post webinar assessments. Testing was done at 5% level of significance, and a two-tailed $P < 0.05$ was

measured as significant. Statistical analyses were done using Statistical Package for the Social Sciences, (SPSS) software (IBM SPSS Statistics for Windows, Version 20.0. IBM Corp, Armonk, NY) and graphs were made by Microsoft Excel. Participant's level of agreement in webinar usefulness was assessed by using Likert scale with scoring between 1 and 5.^[16,17] The total agreement percentage was calculated by sum of agreement with respect to effectiveness of webinars and post webinar assessment.

Ethical approval

The ethical committee approval was obtained from the Institutional Human Ethics Committee before the commencement of the data collection. An online consent was obtained prior to participation in the study.

Results

Participant's characteristics

A total of 2084 study participants from different institutes all over the country were enrolled for the study. The study participants consisted of all genders with the female predominance [Figure 1a]. The mean age of the participants was 21.08 ± 3.80 in years. The participants were students from various courses like medical, dental, nursing, and allied health science [Figure 1b]. Participants represented a mixture of various states and union territories of India, with different ethnicities.

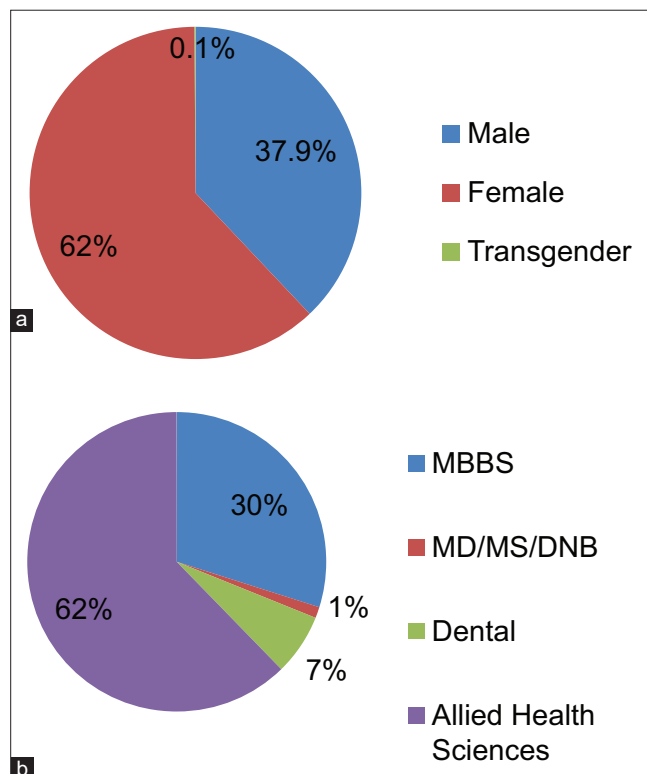


Figure 1: (a) Gender characteristics of the participants. (b) Education characteristics of the participants

Of them, the majority of the participants were from the different states of India.

Purpose of the attending webinars

Among the 2084 participants, 69.9% were found to attend the webinar with the purpose of gaining knowledge [Figure 2a]. Course-wise distribution also revealed that the majority of the medical, dental, and allied health science students were intended to gain knowledge through the webinars [Figure 2b]. Furthermore, gender-wise distribution showed that 74.4% of the females and 62.5% of the males intended to gain knowledge through webinar [Figure 2c].

Webinars attended and source of information

The number of webinars attended by the participants,

Table 1: Number of webinars attended and source of information

Variables	Total, n (%)
Number of course-related webinars attended	
<5	1251 (60)
5-10	434 (20.8)
10-20	159 (7.6)
>20	240 (11.6)
Number of COVID-related webinars attended	
<5	1619 (77.7)
5-10	305 (14.6)
10-20	92 (4.4)
>20	68 (3.3)
Source of information about webinar	
Friends	895 (42.9)
Faculty	1245 (59.7)
Organizers	458 (22)
Social media	236 (11.3)
All of the above	13 (0.6)

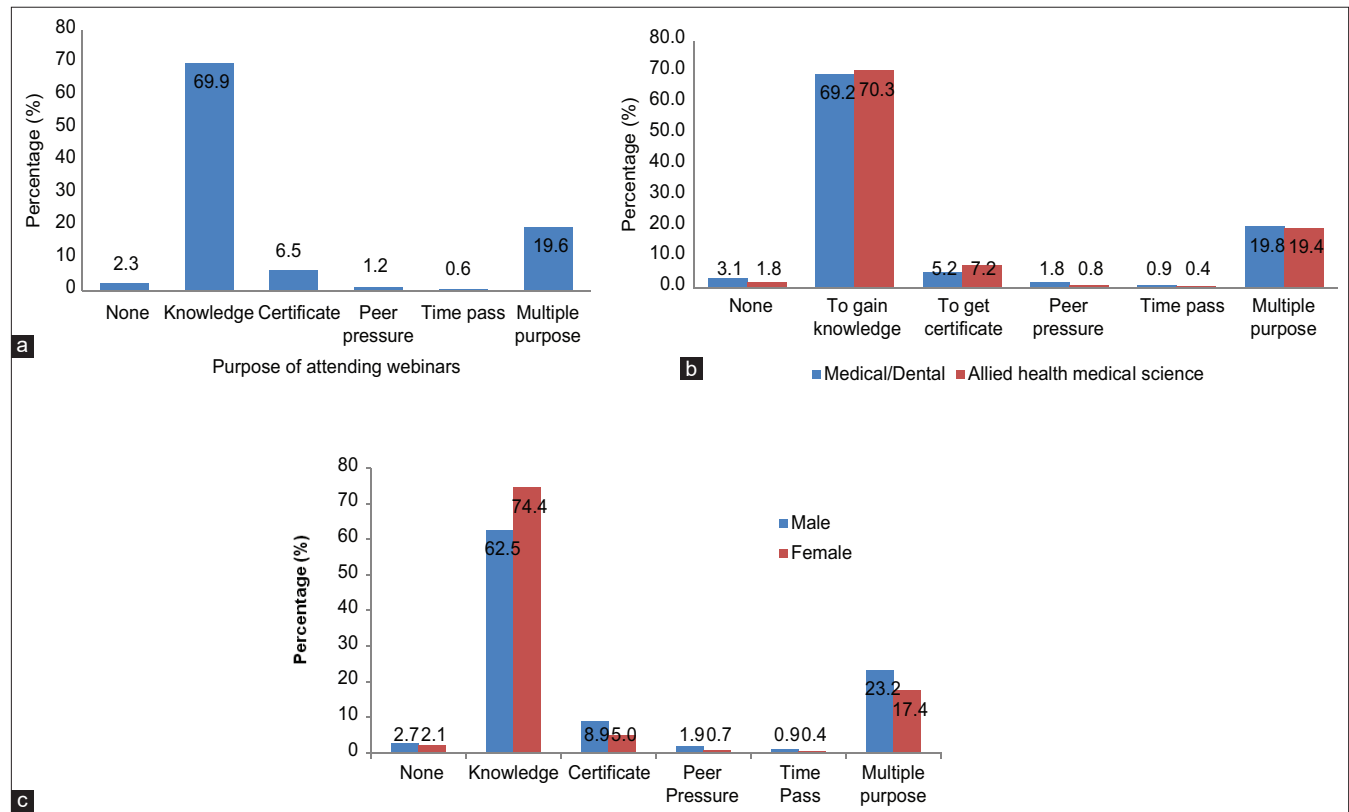
Table 2: Technology used for webinar

Variables	Total, n (%)
Device used for webinar	
Mobile/Tab	1672 (80.2)
Desktop	21 (1.0)
Laptop	60 (2.9)
Others	21 (1.0)
Combined use of devices	310 (14.9)
Applications used to attend webinar	
Zoom	609 (29.2)
Google Meet	396 (19)
WebEx	69 (3.3)
Go to webinar	98 (4.7)
Others	64 (3.1)
Combined use of applications	848 (40.7)
Type of participation in webinar	
Free webinar	1681 (80.6)
Paid webinar	62 (3)
Both	341 (16.4)

Table 3: Participant's perspective on effectiveness of webinar

Variables	Strongly disagree (1), n (%)	Disagree (2), n (%)	Neutral (3), n (%)	Agree (4), n (%)	Strongly agree (5), n (%)	Mean Likert score*	Total agree (4+5) (%)
Webinars are an effective way to obtain information	63 (3)	79 (3.8)	458 (22)	1145 (54.9)	339 (16.3)	3.77	71.2
The attended webinars conveyed the necessary information	55 (2.6)	96 (4.6)	557 (26.7)	1165 (55.9)	211 (10.1)	3.66	66
Coverage of the topic in webinar within the stipulated time	59 (2.8)	137 (6.6)	579 (27.8)	1113 (53.4)	196 (9.4)	3.60	62.8
Mean agreement						3.67	66.7

*Calculated by five-point Likert scale

**Figure 2:** (a) Purpose of attending webinars. (b) Purpose of attending webinars among medical and allied health science students. (c) Purpose of attending webinars among males and females

and the source of information about webinar class during COVID-19 pandemic are given in Table 1.

Technology used to access webinar during the COVID-19 pandemic

The technical devices used for webinar participation were mobiles and tabs for 80.2% of the participants. Among various applications in electronic platforms, combined usage of the applications was noted in 40.7% of the study participants. 80.6% of the participants preferred to attend only free webinars than paid one [Table 2].

Participant's perspective on webinar effectiveness

The effectiveness of webinar with respect to satisfactory scale is listed in Table 3. The effectiveness of the webinar was evaluated by questioning participants on

their level of satisfaction with the webinar as a source of information, if the webinar delivered required information, and whether the webinar was completed on time. We observed a mean Likert score of 3.67. The mean agreement percentage for webinar effectiveness was observed to be 66.7%.

Webinar effectiveness with respect to technical glitches, question and answer session, speed of the presentation

The technical glitches are observed sometimes in 46.2% of the population, as given in Figure 3. Thirty percent of the participants confirmed that 50%–75% of the webinars were organized with question and answer sessions [Figure 4]. The speed of the presentation was suitable for 77.3% of the participants [Figure 5].

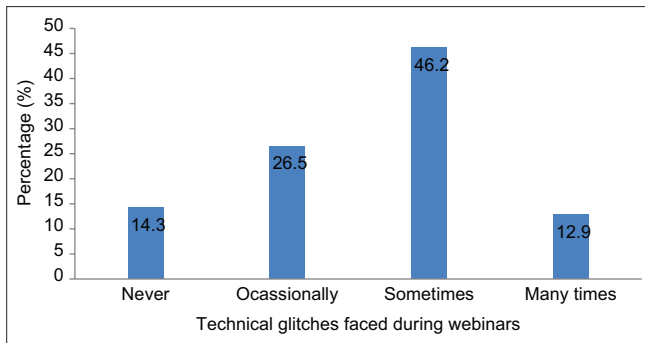


Figure 3: Technical glitches faced by participants

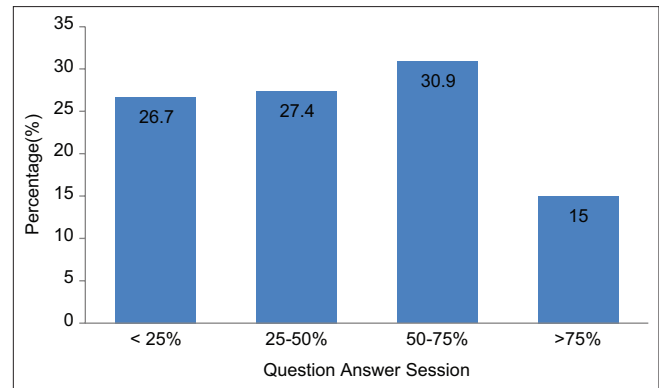


Figure 4: Webinars with Question and answer session

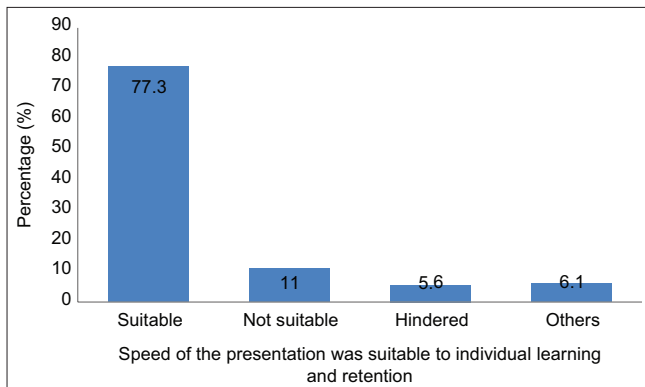


Figure 5: Suitability of the speed of the webinars with individual learning and retention

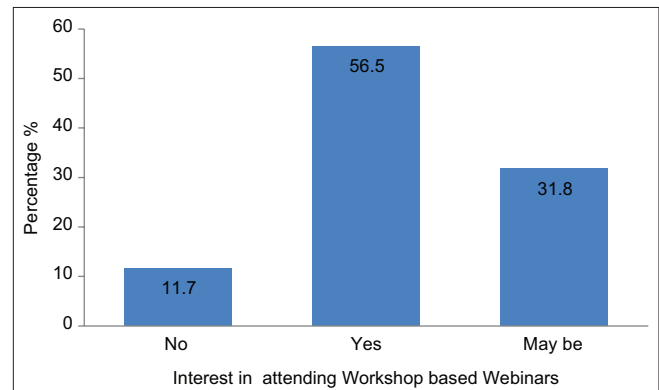


Figure 6: Response breakdown of interest in future webinar cum workshops

Content of the webinar

The participants were asked for content quality based on the SLOs informed in the beginning and whether it was covered at the end of the session. Twenty-three percent of the participants stated that the content coverage of the mentioned SLO throughout the session was seen in <25% of the webinars ($P < 0.05$). Majority (32.2%) of the participants responded that 50%–75% of the webinars had SLO coverage throughout the webinar with OR of 0.97 (0.79–1.19) [Table 4].

Post webinar perception

When we assessed the post webinar perception of the participants, we observed 74.2% of the participants agreed that the webinar was effective and they gained knowledge from webinars they attended. Likewise, 68.7% of the participants responded that they were planning to apply the knowledge gained from webinars in their respective fields. Sixty-two percent of the participants responded that they would like to continue webinar in future also. Furthermore, 74.7% conveyed that they were ready for recommending to others in future. The mean agreement percentage was observed to be 69.9% [Table 5].

Future plan about webinar

When the participants were asked for interest in a future webinar cum workshop, only 56.5% were interested

for the workshop to be conducted along with the webinar [Figure 6].

Association of webinar as a source of new information with gain of information in post webinar assessment

We checked for the association of participant's attitude before attending webinars with the post webinar assessment. We looked at participants who agreed to use webinars as a method of gaining information with webinar users and those who got new information as a result of the webinars. Among those who suggested webinar as source of information, a total of 74.2% of participants were in agreement to gain information with $P = 0.00$. [Table 6].

Association of knowledge gained from webinar and applying it in their respective field

The ultimate effectiveness of webinar was determined by checking the association of the gained knowledge from webinar with those who intended to apply the knowledge gained from webinar to their respective fields. On the whole, of the 2084 participants, 68.7% of the students agreed that they would apply the knowledge gained from the webinar in their respective field ($P = 0.000$) [Table 7].

Table 4: Comparison of specific learning objective in the beginning and at the end of the session

Webinars with SLO	Were SLO stated in the beginning of each webinar, <i>n</i> (%)	Were SLO covered in the end of the session, <i>n</i> (%)	<i>P</i>	OR (95% CI)
<25%	589 (28.2)	482 (23)	0.0045*	1.35 (1.09-1.66)
25%-50%	651 (31.3)	654 (31.3)	0.34	1.10 (0.90-1.34)
50%-75%	589 (28.3)	666 (32.2)	0.82	0.97 (0.79-1.19)
>75%	255 (12.2)	282 (13.5)	-	-

**P*=0.00 and *P*<0.05, considered statistically significant, calculated by Chi-square test. SLO=Specific learning objective, CI=Confidence interval, OR=Odds ratio

Table 5: Post webinar assessment

Variables	Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5), Mean Likert Total agree (4+5) (%)					score*	Total agree (4+5) (%)
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Gained knowledge by attending webinars	70 (3.4)	66 (3.2)	403 (19.3)	1154 (55.4)	391 (18.8)	3.83	74.2
Planned to apply the knowledge gained from webinar	50 (2.4)	74 (3.6)	528 (25.3)	1183 (56.8)	249 (11.9)	3.72	68.7
Wish to attend webinar even after lockdown period:	122 (5.9)	212 (10.2)	458 (21.9)	984 (47.2)	308 (14.8)	3.54	62
Recommend my friends to attend webinars in future:	49 (2.4)	98 (4.7)	379 (18.2)	1193 (57.2)	365 (17.5)	3.83	74.7
Mean agreement						3.73	69.9

*Calculated by five-point Likert scale

Table 6: Association of webinar as a source of new information with gain of information in post webinar assessment

	Gained new information by attending webinars					Total
	Strongly Disagree	Disagree	Neutral	Agree*	Strongly Agree*	
Webinars are an effective way to obtain information						
Strongly Disagree						
<i>n</i> (%)	7 (2.1)	3 (0.9)	16 (4.7)	128 (37.8)	185 (54.6)	339 (100)
Disagree						
<i>n</i> (%)	4 (5.1)	19 (24.1)	28 (35.4)	28 (35.4)	0 (0)	79 (100)
Neutral						
<i>n</i> (%)	15 (3.3)	31 (6.8)	202 (44.1)	181 (39.5)	29 (6.3)	458 (100)
Agree						
<i>n</i> (%)	14 (1.2)	9 (0.8)	149 (13.0)	801 (70)	172 (15)	1145 (100)
Strongly Agree						
<i>n</i> (%)	30 (47.6)	4 (6.3)	8 (12.7)	16 (25.4)	5 (7.9)	63 (100)
Total						
<i>n</i> (%)	70 (3.4)	66 (3.2)	403 (19.3)	1154 (55.4)	391 (18.8)	2084 (100)

Percentage is calculated within webinars are an effective way to obtain information, **P*=0.00 was calculated by Chi-square test, *P*<0.05, considered statistically significant

Discussion

COVID pandemic had altered the regular teaching modalities in the field of education from offline to online. E-learning was made mandatory for teaching and learning in all professional courses, especially medical and allied health sciences. In this study, we evaluated the effect of webinars on the teaching and learning process among the medical and allied health science students during the pandemic lockdown in India. The effect of webinars on the teaching-learning process was assessed based on participant characteristics, webinar topics, webinar source of information, webinar technology, participants' perceptions on the webinar, and post-webinar knowledge. The participants were

students from medical and allied health science stream, and the sample included 2084 students from all over the country. The results revealed a reasonable agreement on gain of knowledge, with the webinar content and practices about webinar classes. The findings also predicted the use of webinars in further curfew or lockdown periods.

With respect to participant's characteristics, the students served a diverse range of Indian states and union territories with different ethnicities. Regarding the gender participation, greater difference was observed in characteristics of male and female respondents and females were higher than males in participating in the study which might be due to the fact of female

Table 7: Association of knowledge gained from webinar and applying it in their respective field

	Plan to apply in respective field					Total
	Strongly Disagree	Disagree	Neutral	Agree*	Strongly Agree*	
Gained new information by attending webinars						
Strongly Disagree						
<i>n</i> (%)	33 (47.1)	6 (8.6)	11 (15.7)	16 (22.9)	4 (5.7)	7 (100)
Disagree						
<i>n</i> (%)	8 (12.1)	26 (39.4)	20 (30.3)	8 (12.1)	4 (6.1)	66 (100)
Neutral						
<i>n</i> (%)	4 (1.0)	26 (6.5)	254 (63.0)	107 (26.6)	12 (3.0)	403 (100)
Agree						
<i>n</i> (%)	4 (0.3)	14 (1.2)	213 (18.5)	872 (75.6)	51 (4.4)	1154 (100)
Strongly Agree						
<i>n</i> (%)	1 (0.3)	2 (0.5)	30 (7.7)	180 (46.0)	178 (45.5)	391 (100)
Total						
<i>n</i> (%)	50 (2.4)	74 (3.6)	528 (25.3)	1183 (56.8)	249 (11.9)	2084 (100)

Percentage is calculated within gained new information by attending webinars * $P=0.00$ was calculated by Chi-square test, $P<0.05$, considered statistically significant

preponderance in medical and allied health science disciplines. Gender-wise analysis on the purpose of attending webinars showed that females were more interested in webinars for gaining knowledge. Concurrent to this, Kang *et al.* and McDonald *et al.* reported similar findings that female students are more likely to participate in science, research, and volunteering activities than the male students.^[18,19]

Interest on webinar topic assessment showed that 40% of the survey participants attended more than 5 course-related webinars and 60% attended <5 numbers of webinars during lockdown in course-related topics. However, in COVID-19 topics, only 22.3% attended more than 5 webinars while 77.7% attended <5 COVID-related topics. On comparing the general topic with COVID topic webinars, increased curriculum coverage through webinar would be of priority and so less interest toward COVID-related webinars. The information about the webinar was given mostly by their teachers which could be because of the added academic curriculum.

The impact of the webinars can be evaluated based on the technological characteristics and content quality as suggested by Ruiz *et al.*^[20] On analyzing the technological aspects of webinar from participant's perspectives, of the total participants, 80.2% used mobiles to participate in webinars that credits the mobile phones for an easier access to e-learning. Among various applications used for attending webinars, Zoom and Google Meet were used predominantly, and of course, multiple applications were preferred too. Biradar, in his study, reported that during COVID pandemic, webinar is the new way of conducting continued medical education for the health science researchers and teachers. He had reported that the efficiency of two-way discussion in real-time scenario concurrent to a virtual classroom atmosphere is

possible by Google Meet and Zoom platforms effectively compared to the other applications.^[21]

In this survey, with respect to types of webinar chosen, free webinar attendees were more than the paid attendees which showed that the webinar teaching was a cost-effective method for spreading the knowledge, however, 16.4% of the students were interested in both paid and free webinar. An earlier study by Gibbons and Fairweather showed that e-learning can result in significant cost savings, sometimes as much as 50% compared with traditional instructor-led learning related to reduced mentor training time, travel costs, and labor costs, minimal institutional infrastructure, and the possibility of expanding programs with new educational technologies.^[22]

The effectiveness of webinar was assessed by participant's agreement with the webinar as an information source, and whether the webinar they attended conveyed necessary information, coverage on stipulated time from the participant's attitude. The effectiveness of webinar as a suitable information sharing platform during pandemics was demonstrated by a satisfying scale of 3.67, with a propensity toward the agreement score of 4.

In this survey, the effectiveness was also weighed based on the quality conveyance of the webinar. The technical glitches were reported by 26.5% and 46.2% occasionally and sometimes, respectively [Figure 3]. Likewise, discussion session was presented to the participants as a question and answer session which was followed 50%–75% of the webinars attended by 30.9% of the participants [Figure 4] and the speed of learning was suitable for 77.3% of the participants in the study [Figure 5]. In spite of certain parameters like technical glitches, how well the webinar was perceived by the students was taken as the impact of these hindering

parameters in affecting the effectiveness of webinar. The effectiveness of the webinar is also evaluated based on the topic coverage in terms of SLO. Learning objectives help the participants to update their knowledge and skills and help in a better understanding of the subject.^[23] Cunningham *et al.* (2021) showed that clear learning objectives are expected to be defined for a content preparation in a webinar with a usual recommendation of 3–5 objectives for a webinar session.^[24] In our report, 23% of the participants stated that the coverage of the content mentioned in the webinar was only in 25% of the attended webinars ($P < 0.05$) compared to 32.2% of the participants who mentioned that 50%–75% of the webinars had SLO coverage throughout the webinar with an OR of 0.97 (0.79–1.19) [Table 5]. Therefore, the study showed effective learning objectives for the effective learning process.

On analyzing the post webinar perception, 74.2% of the participants agreed that the webinar was an effective tool to gain knowledge. 68.7% of the participants planned to apply the knowledge gained from webinars in their respective fields, which would be a great help for the medical and allied health students to serve public during pandemic time. The mean agreement percentage for the post webinar assessment was 69.9%. They were also willing to attend webinar in post lockdown period and would recommend to others [Table 5]. By doing an association assessment of webinars as a source of information vs getting new information after attending webinars, it was shown that 74.2% gained new information with $P < 0.05$ [Table 6]. A Jordanian study assessment reported that only 26.8% were satisfactory in distance learning in medical education. They suggested that distance e-learning aids in theoretical knowledge but not in clinical skill development. A combination approach of traditional and e-learning would help in better training of the medical students in future.^[25] Another Libyan study showed that only 21.1% agreed that e-learning might be used as a tool for clinical education, compared to 54.8% who opposed and 24% who were indifferent.^[26]

In a similar study by medical teachers on peer mentoring, they proved that over 71% of the junior students found e-learning helped them to adjust faster to sudden changing environments but considerable obstacle of how to apply the gained information within their personal environment instead of live practical environment.^[27] Studies done in nonmedical environment have proved that e-learning is way better and convenient than the classroom-based lectures.^[22,28] In concordance to the review by Gegenfurtner and Ebner, in their meta-analysis and systematic review of 15 data sources comparing 716 webinar participants with 698 control participants under 12 moderating conditions,^[11] where the webinars were positively associated with gaining knowledge and skills, our study also had a good effect of webinars in teaching

and learning process among medical and allied health science students.

Recently, Cunningham *et al.* have provided a guide for webinar teaching to be integrated into curriculum development. They showed that research studies were done to classify the exact components or feature of webinars that make them have a high impact for participants. Furthermore, a set of ten simple points for improving the webinar series teaching suggested by Fadlelmola *et al.*^[29] was recommended by them.^[24] In concordance with these guidelines, our survey assessed the effects of the webinar in teaching and learning process among the medical and allied health science students in India and we observed a good impact of e-learning through webinars during pandemic lockdown.

Limitations of the study

Since this study was an online assessment, the responses were taken as quantitative measure only. The qualitative assessment of each webinar would be getting in depth information when the assessment were done by pre and post test score. The assessment of the pre and post test score was not possible due to time constraints after each webinar.

Conclusion

The survey suggested that perceived knowledge from webinars among undergraduates gives a constructive effect in the teaching and learning process. Upon rectification of technical glitches and provision of accessible technology, webinar could prove to be a satisfactory aid during the pandemic era. Thus, webinars have become an inevitable tool in the teaching-learning process among medical and allied health science students for further curriculum development and career enhancement.

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Conflicts of interest

There are no conflicts of interest.

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