Research Article

Assessment of the Effectiveness of e-Learning Versus Conventional Teaching as a teaching Method During the COVID-19 Pandemic Among Medical Students and Faculty in Teaching Institutions

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ABSTRACT

Introduction: E-learning is internet-aided learning which stands for electronic learning. E-learning uses a strategy that is pedagogical in concept. E-learning followed during the COVID-19 pandemic is considered a learning modality for emergency management. The usage of e-learning has increased considerably during COVID-19 but its actual effectiveness and satisfaction remain the big question from both the students as well as the faculty aspects. Hence there is a requirement for research involving faculty and students in e-learning experiences. **Aims and Objectives**: The aim of the study was to evaluate the effectiveness and satisfaction of e-learning among medical students and faculty. **Materials and Methods**: The online cross-sectional survey was conducted on medical students and faculty. A total of 302 students and 51 faculty responded to the questionnaire. The study was conducted after 2 months of online classes. Both sets of questionnaires based on a 5-point Likert scale were given to both the students and faculty respectively. All the students and faculty participated in the survey voluntarily. **Results**: The online survey for students agreed that e-learning was effective in 6 parameters and it was the same and less effective as classroom traditional teaching in the remaining parameters. But the faculty online survey revealed they agreed that e-learning was effective in almost 12 parameters and felt as same and less effective as traditional teaching in other parameters. **Conclusion**: We could come to an interpretation that though e-learning is equally effective in some parameters still it is less effective in other parameters too. Hence it is not at all taken as superior to traditional face-to-face teaching. Our research led us to draw the conclusion that while e-learning can support the current educational process, it cannot take the place of the current educational system as a whole.

Key Words: *e-learning, COVID-19, Faculty, Students, 5-point Likert scale, Questionnaires*

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INTRODUCTION:

E-learning is internet-aided learning which stands for electronic learning. Bernard Luskin, the pioneer of e-learning describes 'e' as "exciting, energetic, enthusiastic, emotional, extended and educational" [1]. E-learning is defined as "A learning system based on formalized teaching but with the help of electronic resources". While teaching can take place in or outside of classrooms, the main element of online learning is the use of computers and the Internet[2]. E-learning uses a method that is pedagogical in concept.

Online teaching differs from conventional teaching in the classroom not only in the medium by which the teaching is delivered but also in deviating from the methodologies followed in the teaching and learning process[3]. Some of the effective ways of e-learning found by Medical College administrators and teachers are through e-lectures, e-tutorials, e-case-based learning, e-teaching software, etc... The World Health Organization (WHO) considered e-learning as one of the useful tools for education in situations like the COVID-19 pandemic, especially in developing countries like India.

The WHO declared COVID-19 (Coronavirus disease) to be a highly infectious disease transmitted by human-to-human contact and patient succumbed due to respiratory illness if not treated immediately and promptly. The role of e-learning in the academic field has expanded since the shutdown of educational institutions all over the world due to the current pandemic situation. Therefore, the new coronavirus has altered the mode of physical teaching to online teaching.

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With online teaching mode, education can be continued and delivered to the students even during the quarantine period without any lag in academics [4].

E-learning followed during the COVID-19 pandemic is considered a learning modality for emergency management [5]. Hence all universities are encouraged to move into online teaching methods following the sudden outbreak of coronavirus in 2020. A study has shown that during COVID-19, the usage of online teaching mode has increased considerably, but its actual effectiveness and satisfaction remain the big question from both the students as well as the faculty aspect [6]. So, there is a requirement for additional research involving faculty and students in e-learning experiences.

In the literature, there are so many studies that have evaluated the student perception of e-learning but the studies related to the effectiveness of e-learning and also how much the students are satisfied with it are only a few[1,3,5,7,8,9]. In the study conducted by Kaur *et al.,* in 2020 determined the "Effectiveness of e-learning to conventional teaching in medical undergraduates amid the COVID-19 pandemic". To my knowledge, this is the only study where they have evaluated the satisfaction level of students in e-learning [1]. Another study conducted by Christine Frazer *et al.,* in 2017 evaluated the "Faculty perceptions of online teaching effectiveness" but only among nursing faculties [4].

And there were only a few studies in the literature about the perception of faculty on online teaching effectiveness that too with fewer questions not covering all aspects of e-learning[10,11]. More and more studies are still needed to evaluate the faculty's perception of online teaching and also to find out the effectiveness and satisfaction level of students in online learning. Hence, we have performed a questionnaire-based study among medical students to evaluate the effectiveness of e-learning and the satisfaction level of the students. In addition, faculty perceptions about online teaching were also evaluated.

MATERIALS AND METHODS:
A cross-sectional questionnaire-based observational study was conducted after getting the Institutional Human Ethics Committee approval. Medical students and teaching faculty from medical and dental colleges participated in the study. The information was anonymized to make sure delinking with any identity of the participant. The sample size was calculated by using the formula: $n = Z(1-\alpha)2\ pq/d2$ for medical students with the result of 384 medical students and Convenient sampling is considered for faculty. The study was conducted between December 2021 to July 2022 and employed a quantitative study design using the online survey method. Quantitative data were collected using a Google form questionnaire that was sent to educators of undergraduate medical students to evaluate the student perception. The questionnaire was sent via e-mail to the target faculty to evaluate their perception. Each e-mail was provided with instructions for giving informed consent and a web link to the survey questionnaire. All participants were sent 2 reminder e-mails (1 week apart) after the first request for the internet survey. A questionnaire taken from the literature was used to study the students' effectiveness and satisfaction level with e-learning[1]. A pre-validated questionnaire was used to evaluate the faculty's perception of e-learning effectiveness. The questionnaire covered fifteen and nineteen open-ended questions for student and faculty online surveys respectively **(Table 1&2)**. Both the sets of questionnaires for students and faculty were self-designed based on a 5-point Likert scale (5-Strongly Agree; 4-Agree; 3-Neutral; 2-Disagree; 1-Strongly Disagree).

Table 1: Questionnaire for the effectiveness and the satisfaction level of Students with e-learning

QUESTIONNAIRE FOR STUDENT PERCEPTION ABOUT E-LEARNING

SL. No.	PARAMETERS	1- Strongly Disagree	2- Disagree	3 – Neutral	4 – Agree	5 – Strongly Agree
1.	Is internet based learning offering convenience?					
2.	Does e-learning satisfy individual learning needs?					
3.	Does it contribute to effective communication with the faculty?					
4.	Does it effectively build skills and knowledge?					
5.	Offering better understanding through recorded class					
6.	Are you able to interact with the faculty conveniently?					
7.	Able to clear your doubts properly?					
8.	Do you think practical and theory experiences are properly balanced?					
9.	Grooming of the Professional career is achieved					
10.	Is the importance to assignment submission provided?					
11.	Satisfied with the class material provided to you?					
12.	Satisfied with the balance of practical and theoretical knowledge provided by these classes?					
13.	There is a professional development strategy towards online training?					
14.	The availability of e-resources is adequate?					
15.	There is no need for assistance					

Table 2: Questionnaire for Faculty perception of e-learning

FACULTY PERCEPTION AND EVALUATION OF ONLINE TEACHING

SL. No.	PARAMETERS	1-Strongly Disagree %	2- Disagree %	3 – Neutral %	4 – Agree %	5 – Strongly Agree %
1.	Online teaching offers flexibility and convenience					
2.	Saves time					
3.	Need of e-learning facility in the department					
4.	Interactive as classroom teaching					
5.	Poor internet connectivity hinder online teaching					
6.	Need assistance to operate for online class					
7.	Lack of response from the students to the questions during the online session					
8.	Lack of students interest during interaction disappoints me					
9.	Satisfied and confident in explaining the whole concept clearly as with classroom teaching					
10.	Difficult to guess whether students are attending class seriously					
11.	Inability to share subject based experiences with the student during online teaching					
12.	Lack of enthusiasm due to online interactions					
13.	Online teaching is more useful for theory class than for practical					
14.	Difficult to motivate students during the online session					
15.	Feel safe to use online teaching during COVID-19 pandemic.					
16.	Wish to continue online teaching as one of the teaching tools in the future after COVID-19 pandemic					
17.	Periodic sensitization and training needed for various portals available for online classes					
18.	Online classes can be used for evaluation of learner					
19.	Feedback on the performance of student can be given through online					

STATISTICAL ANALYSIS:

The data were collected and entered in Microsoft excel 2019. The data obtained from the student and faculty questionnaire were compiled and analyzed manually by Frequency analysis and stated in percentages.
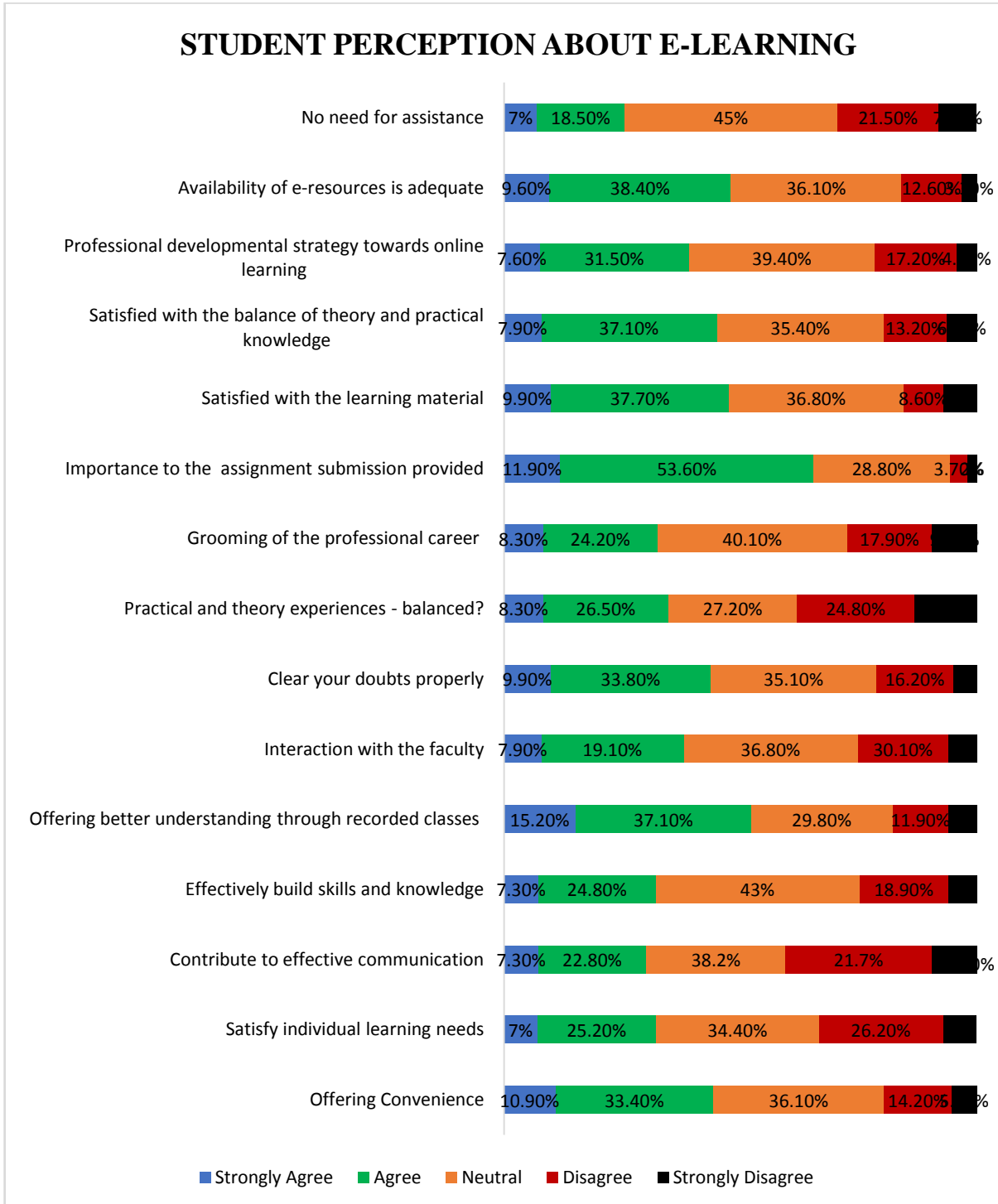
RESULTS:

For the convenience of the interpretation of the result, among the 5-point Likert scale; i). both strongly agree and agree are considered as agreed for the parameter studied ii). While strongly disagree and disagree are considered disagree and iii). the parameter neutral for not supporting either side in which they felt e-learning is the same as classroom teaching.

Out of 302 students, a maximum number of students agreed that e-learning is as effective as classroom teaching for the parameter importance to the assignment submission provided (66%) followed by offering better understanding through recorded classes (52.3%), satisfied with the learning materials provided (47.6%), in providing adequate e-resources (48%), able to clear doubts properly (45%) and in offering convenience (44.4%) respectively. The maximum number of students disagreed with the parameters satisfied with the balance of practical and theoretical knowledge provided by these classes (50%), followed by contributes to effective communication (40.6%), the balance of theory and practical experiences (39.4%), and interaction with the faculty (39%) respectively.

The student's response was neutral in the parameters of no need for assistance (45%), building skills and knowledge effectively (43%), grooming of the professional career (40.1%), professional development strategy towards online learning (39.4%), and satisfying the individual learning needs (34.4%) respectively. **(CHART: I)**

CHART – I

STUDENT PERCEPTION ABOUT E-LEARNING

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
No need for assistance	7%	18.50%	45%	21.50%	7%
Availability of e-resources is adequate	9.60%	38.40%	36.10%	12.60%	
Professional developmental strategy towards online learning	7.60%	31.50%	39.40%	17.20%	4%
Satisfied with the balance of theory and practical knowledge	7.90%	37.10%	35.40%	13.20%	
Satisfied with the learning material	9.90%	37.70%	36.80%	8.60%	
Importance to the assignment submission provided	11.90%	53.60%	28.80%	3.70%	
Grooming of the professional career	8.30%	24.20%	40.10%	17.90%	
Practical and theory experiences - balanced?	8.30%	26.50%	27.20%	24.80%	
Clear your doubts properly	9.90%	33.80%	35.10%	16.20%	
Interaction with the faculty	7.90%	19.10%	36.80%	30.10%	
Offering better understanding through recorded classes	15.20%	37.10%	29.80%	11.90%	
Effectively build skills and knowledge	7.30%	24.80%	43%	18.90%	
Contribute to effective communication	7.30%	22.80%	38.2%	21.7%	
Satisfy individual learning needs	7%	25.20%	34.40%	26.20%	
Offering Convenience	10.90%	33.40%	36.10%	14.20%	

■ Strongly Agree ■ Agree ■ Neutral ■ Disagree ■ Strongly Disagree

Out of 51 faculty, the maximum percentage of faculty agreed that e-learning is as effective as classroom teaching in most parameters such as feeling safe to use online teaching during COVID-19 (82.3%), followed by poor internet connectivity hindering online teaching (81.3%), difficult to guess whether students are attending classes sincerely (80.4%), periodic sensitization and training needed for various portals used during online classes (77%), difficult to motivate the students during online teaching (75%), need of e-learning facility in the department (74.5%), lack of students response and lack of interaction disappoints me during an online session (72%), online teaching is more useful for theory classes than for practical (69.1%), offers flexibility and convenience (60%), lack of enthusiasms due to online interactions (59.2%), wish to continue e-learning in the future after COVID-19 pandemic (57.2%) and e-learning saves time (45.3%) respectively.

A percentage of faculty disagreed with the parameters like e-learning is as interactive as classroom teaching and an inability to share subject-based experiences with online teaching (both 49%) followed by the need for assistance to operate online classes (43.5%).Faculty gave neutral responses to the parameters such as online classes can be used for the evaluation of a learner (59.4%) followed by feedback on the performance of the student can be given online (51%) and satisfied and confident in explaining the whole concept clearly as with classroom teaching (49.4%) respectively. **(CHART: II)**

CHART – I I

FACULTY PERCEPTION & EVALUATION OF ONLINE TEACHING

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Feedback on the performance of student can be given through online	20%	24%	51.00%	5%	0%
Online classes can be used for evaluation of learner	9.80%	13.10%	59.40%	13.70%	3.90%
Periodic sensitization and training needed for various portals	26%	51%	23.50%	0%	
Wish to continue online teaching as one of the teaching tools	18%	39.20%	21.60%	19.60%	2%
Feel safe to use online teaching during COVID-19 pandemic.	49%	33.30%	9.80%	3%	0%
Difficult to motivate students during the online session	26%	49%	13.70%	11.80%	0%
Online teaching is more useful for theory class than for practical	24%	45.10%	17.60%	11.80%	2%
Lack of enthusiasm due to online interactions	20%	39.20%	25.50%	13.70%	2%
Inability to share subject based experiences	15.70%	31.40%	3.90%	17.60%	31.40%
Difficult to guess whether students are attending class sincerely	49.00%	31.40%	9.80%	5.90%	
Satisfied & confident in explaining the whole concept	18%	13.50%	49.40%	17.60%	2%
Lack of students interest during interaction disappoints me	31%	41.20%	17.60%	9.80%	0%
Lack of response from the students	29%	43.10%	17.60%	9.80%	0%
Need assistance to operate for online classess	0%	39.20%	17.60%	23.50%	20%
Poor internet connectivity hinder online teaching	51%	33.30%	9.80%	2%	
Interactive as classroom teaching	15.70%	19.60%	15.70%	35.30%	13.70%
Need of e-learning facility in the dept.	21.60%	52.90%	15.70%	5%	3.90%
Saves time	12%	33.30%	29.40%	23.50%	2%
Online teachimg offers flexibility & convenience	9.80%	49%	15.70%	11.80%	13.70%

DISCUSSION:

During Pandemics sometimes it is required to take online teaching but there is a paucity of research on the effectiveness of e-learning in educational Institutions. It is crucial to have a clear knowledge about the perception of faculty and students for online classes as both are involved in the process of teaching and learning. This will help how much effort is put into the course, how well students learn, and how satisfied students are with the experience[8]. It was

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discovered that perceptions had an impact on student performance; negative perceptions resulted in poor efficiency, whereas perceptions that are positive resulted in outstanding performance[12]. From this, it follows that perceptions are interpretations that can be formed and molded by personal experiences and they do influence their behaviour[8].

Though conventional teaching modalities possess a vital role in the growth of cognitive skills of higher order, e-learning will also undertake a chief role in the teaching of medical students in situations like the COVID-19 pandemic and in the future[13]. Lot of effort, commitment, development of skills and a self-directed learning mindset is required for students who wish to pursue a career in medicine since it is a challenging profession. The COVID-19 pandemic has hastened the adoption of e-learning and regardless of their preparation, the majority of medical institutions used it[14]. Hence it became necessary for us to look at whether this e-learning was really effective for the students and faculty.

This study was carried out in a tertiary care teaching institute with the objective to understand the pros and cons of e-learning rather than offering solid empirical data to support theoretical claims[9].

Out of 484 medical students 302 and out of 116 faculty members 51 responded to the questionnaire used in this study. The study was conducted after 2 months of online classes. In our questionnaire for student perception, the first 10 questions were framed for evaluating the effectiveness of e-learning and the last 5 questions were framed for evaluating the satisfaction level of the students regarding e-learning.

In our study, we found that for most of the parameters online teaching was more effective than classroom teaching. The percentage of most of the parameters considered in the assessment are in support of online teaching than traditional classroom teaching. But on the other side, it was found to be less effective or neutral in a few parameters too. Our research is consistent with that of the study conducted by the authors Kaur *et, al.,*(2020) and Subramanian *et al.,* (2012)except for the finding that our study results were applicable to both student and faculty perceptions[1,15].

About 50% of the students and nearly 50% to 70% of the faculty agreed that e-learning is offering convenience, flexibility and saves time along with the use of fewer resources in our study. This result correlates with the findings of the study conducted by Mukhtar *et al.,* (2020), Peng *et al.,* (2006) and Felege *et al.,*(2005) where the majority of the teachers and students believed that online learning is a flexible and convenient method of teaching and learning since it facilitates distance learning with simple administration, accessibility and minimal use of time and resources[16,17,18].

Based on satisfaction parameters, the majority of the students (60% to 75%) are satisfied with their individual learning needs, the learning material provided and the balance of theory and practical knowledge. This finding is on par with the findings of the study conducted by Johnson *et al*., (2000) and Johnson *et al*., (2008)[19,20]. But our study results were contradicting the study conducted by Kaur *et al.,* (2020) where the balance of theory and practical knowledge, and satisfaction with the learning material provided are found to be less effective[1].

Socialization is greatly aided by traditional classroom teaching when students and faculty meet face-to-face. Learning in the traditional classroom is facilitated by social factors including group work, helping one another with homework and seeing lecturers' facial expressions as they teach a concept. When students participate in e-learning, these issues are minimal[6]. This concept was made true in our study also where maximum students felt that e-learningis neutral with the fact that it contributes to effective communication and interaction with the faculty as with classroom teaching. Since the students and faculty felt that interaction during the online session was the same as classroom teaching, students agreed that they were able to clear their doubts properly in e-learning. This parameter was supported by the study by Selvaraj *et al.,*(2021) where they also found that using proper lines of communication between students and faculty helped them to clear their doubts in online classes[21].

In addition to many student-related benefits, there is evidence that online learning can help in building up skills and knowledge as traditional classroom teaching. These benefits also help in the development of direct skills such as professional development strategy towards online learning as well as grooming of the professional career[22]. These findings were correlated with our study in which we came out with the finding that e-learning is as effective as traditional classroom teaching in building up skills and knowledge and in professional development strategy.

Apart from all this, e-learning offers better understanding through recorded classes was agreed by almost half of the students (52.3%) which is on the favourable side for online teaching. This concept was also agreed upon by the students in the study conducted by Muthuprasad *et al*., (2021)[23]. A maximum of students (66%) felt that e-learning provides importance to assignment submission which coincides with the result of the study conducted by AlQhtani*et al.,*(2021) in which online assignment submission was deemed to be more effective by 52% of respondents[14]. Hence this could be feedback on the positive side which can be used in the future for submission of the assignments as e-learning activity.

Faculty disagreed but students were neutral on the need of assistance to operate online classes. This variation may be because the students who were exposed to online classes were fresher's to it whereas the faculty might have experienced it in their lifetime in one way or another. These findings were correlated with the result of the study conducted by Brindley *et al*., (2014)[24]. Moreover, regarding the students' attentiveness from the faculty's point of view, almost 70% to 80% of faculty responded that it's difficult to assess whether students are attending online lectures sincerely and there is lack of response from them during the online session which makes them feel disappointed in our study. The same finding has been noted in the study conducted by Mukhtar *et al.*,(2020) and Wang *et al*., (2008)[16,25].

Among the parameters used to assess the faculty perception, poor internet connectivity hinder online teaching was agreed upon by a maximum number of participants (83%). The same result was obtained in the studies by Siddiquah *et al.*,(2017) and Asio *et al.*,(2021) that e-learning could be hindered by issues with the internet signal[26,27]. And regarding the periodic sensitization and training of faculty for various portals in e-learning, approximately 3/4th of the faculty members (77%) agreed. The same point was accepted by the participants in the study conducted by Hinson *et al*., (2005), McQuiggan *et al.,* (2012) and Barker *et al*., (2003)[28,29,30].

In our study, more than 50% of Faculty wish to continue online teaching as one of the teaching methods in the future. This result was found to be varied in different studies. Rapanta *et al*., [3], Stein [31], Vaghaun *et al*., [32] and Lockee BB [33] involving faculty perception came with the result that e-learning can be one of the teaching modalities in the future along with traditional classroom teaching as blended learning[3,31,32,33]. But a study came up with the fact that online learning is loaded with so many challenges which have to be watched for if we try to implement it[34].

Our research demonstrates that e-learning is beneficial in some parameters, while it falls short in others from both students as well as faculty's points of view**(Chart: I&II)**. Thereby it should be desirable to combine the benefits of online teachings and classroom teachings, known as blended learning, to overcome the potential limitation of online learning in undergraduate medical education which was also supported in the studies by Dodiya *et al*.,(2019) and Garrison *et al*., (2007)[35,36]. From our research, we could draw the conclusion that while e-learning can support the educational process, it cannot replace conventional teaching, learning and evaluation in the education system.

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