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Students' Perception and Satisfaction with Online Medical Education During the COVID-19 Pandemic

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ABSTRACT

Background: The COVID-19 pandemic caused countries worldwide to implement emergency lockdown strategies and caused disruption of medical education. The pandemic motivated the development of medical educational strategies. Objectives: The aim was to determine medical students' perception and satisfaction with online medical education during the pandemic. Materials and Methods: A cross sectional descriptive analytical study was conducted with structured self-administered questionnaire on the different domains of online education on 120 medical students. Data was analyzed by SPSS software. Results: Among the 120 students, 72 were females and 48 males. 70% had no prior experience with online education but 30% did. More than 79% agreed online training was essential. About 61% disagreed that online classes facilitated effective faculty-student interactions, and 60% were not satisfied with quality of online teaching learning sessions. About 84.2% agreed they had appropriate online devices and 56% had stable internet. About 70% were satisfied with teacher's knowledge and 70% felt they could ask questions and 43% were satisfied with teaching mode. About 45% felt they had feedback from teachers after assessments and 48.3% were satisfied with online exam performance. Conclusion: The findings have shown that students' perceptions and satisfaction

level serve as important indicators of online medical education. Continuous training and research in this field are essential for both faculty and students to enhance online teaching-learning skills.

Keywords: Online-education, learning-domains, pandemic.

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INTRODUCTION

The advent of the coronavirus pandemic in 2020 had caused countries worldwide to implement emergency lockdown strategies with disruption of medical student education in both university and clinical settings. Universities were obligated to cancel on-campus teaching and many hospital placements were suspended or restricted in an effort to halt the spread of COVID-19.[1] These dramatic circumstances resulted in face-to-face teaching and practical tutorials being replaced with online learning for medical students. The use of technology and online learning became a core component of medical teaching during the pandemic.[1,2] A study showed that 90% of medical schools in the USA abruptly ceased on-campus teaching and clinical placements and began online teaching in response to COVID-19.[3] In Africa, between March and July 2020, 44 out of 54 countries temporarily closed all universities including medical schools.[4] By Spring 2020, most medical schools in the U.S. stopped in-person learning and developed virtual lecture and small-group learning formats, halted research projects, and limited in-person clinical experiences.[5]

The urgency of the pandemic motivated the development of many innovative educational strategies in medical education across the world, the majority of which embraced the use of digital tools. Electronic (e) or online learning can be defined as "the use of electronic technology and media to deliver, support and enhance both learning and teaching and involves communication between learners and teachers utilizing online content".[6] The main benefits of online medical education during the pandemic have been epidemiological, increased convenience, access to resources regardless of location

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and time and reduction of cost and educational topics could be delivered to students via self-directed and instructor led approaches.[2]

Modernized and relevant medical curriculum is the backbone of effective medical education.[7,8,9] Healthy and efficient medical academic environment is crucial for effective implementation of any medical curriculum. It is imperative that every country focus on building and implementing curriculum and exam system that amplifies professional competence and social values, expands setting for sustainable medical education programs, trains the medical teachers as educators and encourages life-long self-learning practices.[10] The importance of shifting from traditional teacher-centered to a more student-centered, integrated approach with innovative teaching methods has been underpinned in numerous studies.[11,12] Distance learning refers to the provision of access to learning for those geographically distant. In recent times it implies the involvement of technology-supported (online) learning that could either be synchronous, asynchronous or both methods. Synchronous learning refers to all the types of learning that take place in real-time over a set class schedule. Asynchronous learning, however, does not require real-time faculty-learner interactions because the topic content is available for students to access at their own convenience.[13]

The inadequately planned courses offered during the pandemic at the beginning differed from well-thought-out distance learning experiences. The delivered courses could not be adjusted to accommodate with the optimal needs. Although technology provided the opportunity for a swift transition to online teaching but the online courses offered at the beginning were not well-planned.[13] During the pandemic novel virtual teaching methods such as online lectures, tutorials, webinars and courses replaced traditional teaching. Limited resources, poor infrastructure and technical difficulties have been significant barriers to virtual medical training. Furthermore, studies have shown that both teachers and students have expressed concerns regarding the efficacy of such methods in delivering holistic undergraduate medical education. Several authors have previously raised concerns regarding the efficacy of such novel virtual teaching methods in medical education.[14]

The replacement of in-person classes with online equivalents was an obvious necessity during the pandemic but created a shortfall of collaborative experiences posing as a significant detriment to education.[15] However, incorporating technology into medical education in a unique way encourages students to develop interactive and collaborative skills and improve adaptability to changing social circumstances such as in the corona pandemic and attain greater professional competence. Students who have been capable to adapt and learn from the COVID-19 situation with demonstrated proficiency in using both traditional and online educational techniques and think outside of the box can influence pre-conceived notions and meet all unanticipated challenges with greater knowledge and improved skill sets.

To ensure that the implementation of online education and learning remains effective and achieves inclusivity, various aspects of online learning need to be prioritized, including the relevant use of digital tools, blending learning, and

monitoring of learners' progress. It has been imperative to assess medical students' perception and satisfaction with the online medical education during the pandemic and also in the post pandemic period. Such studies and surveys can facilitate the development of newer and more effective curriculum and teaching-learning strategies. The strength and weakness in any ongoing online medical education system should be identified and addressed to introduce effective and timely transformations.

The aims and objectives of this study was to investigate and determine medical students' perception and satisfaction with the online system of medical education during the COVID-19 pandemic and its association with certain specific influencing factors of interest.

MATERIALS AND METHOD

Study Design and Sampling

A cross sectional descriptive analytical study was designed and conducted with a structured self-administered questionnaire to determine the perception and satisfaction level of medical students with online medical education during the COVID 19 pandemic. The questionnaire items focused on four domains of online education and they were: learning environment (domain 1); technological characteristics (domain 2); instructors/teachers and teaching (domain 3) and assessment characteristics (domain 4) during the online sessions. Data was collected by a non-probability convenience sampling technique. A total of n=120 medical students from 4 different medical colleges (SSMC, AKMMC, AMCJ, AMCCu) of different districts of the country voluntarily participated in the study, with 30 from each college. The inclusion criteria: 3rd year to 4th year medical students; those who have already undertaken term exams; have comprehension of medical curriculum and who had online courses during the COVID-19 pandemic The data was collected in the year 2021-2022. The study protocol and data collection were approved by the concerned authority of the respective academic institutes. The questionnaire was pretested and the validity and reliability of the questionnaire items were determined prior to the main data collection.

Questionnaire Design and Distribution

A structured self-administered with Likert type questions was developed consisting of a total of 28 items and subdivided into 4 domains. Each of the four domain questions were comprised of item questions that were scored on Likert scale 1 to 5 (1= strongly disagree, 2= disagree, 3= not known/no idea ,4= agree and 5 = strongly agree). For domain 1(question1) there were 8 items, for domain 2(question 2) there were 7 items, for domain 3(question 3) there were 8 items and for domain 4(question 4) (there were 5 items. For question 1 the lowest score 8 and the highest score 40. For question 2 the lowest score 7 and highest score 35. For question 3 the lowest score 8 and the highest score 40 and for question 4 the lowest score 5 and the highest score 25. The questionnaire also collected information on certain demographic variables: age, sex and previous exposure if any to online mode of education. Cronbach's alpha of 0.92 was estimated from reliability test that indicates high level of internal consistency in the questionnaire. After explaining the study objectives, informed consent was taken and questionnaire was distributed by data collector and then filled and submitted by the students.

Data Analysis

Data was entered and analyzed in SPSS software. The different statistical tests applied on the items were frequencies, percentages, cross-tabulations, comparison of means test, non-parametric tests, ANOVA tests as appropriate for the study objectives. Outcome measures were frequencies and percentages of disagreements and agreements on the different item statements of the survey and also the mean ± SD of the individual items for all the four domains. Statistically significant difference was accepted at p value of <0.05 or less.

RESULT

Cohort Demographics

There were 30 medical students (from 3rd and 4th year), from each of the four medical colleges (AMCCu, AMCJ, AKMC and SSMC) (Table 1). Among the 120 students who participated, 72 (60%) were female and 48(40%) were male. There were more students without prior exposure to online education 83(70%) than those with prior exposure 37(30%). The chi-square test reported no statistically significant association between gender and prior online education exposure among the medical colleges.

Table 1: Cohort demographics: Student distribution by gender and medical colleges

		AMCCu	AMCJ	AKMMC	SSMC	Total
Gender	Male	9	11	12	16	48
	Female	21	19	14	18	72
Prior online class experience	No	17	24	18	24	83
	Yes	13	6	12	6	37

Domain 1: Learning Environment

The analysis of the 8 scale items under domain 1 (Table-2) found that the percentage of combined agreed and strongly agreed respondents were 79.2% for item 1.1 and 44.2% for item 1.2. The percentage of combined strongly disagreed and disagreed respondents were 53.3% for item1.3, 55.8% for item1.4, 61.7% for item1.5, 58.3% for item 1.6, 60.0% for item 1.7 and 45% for item 1.8. The comparison of the mean scores of the 8 items in the learning domain (domain 1) showed that it was >3 for only the first two items and <3 for the rest of the 6 items.

Table 2: Distribution of respondents and mean ± SD of each item

Domain 1

Items	Mean ± SD	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)
1.1 I felt students needed to be trained/instructed before attending the online classes.	3.8 ± 1.05	9(7.5)	5(4.2)	11(9.2)	71(59.2)	24(20.0)
1.2 I felt online learning is a comfortable mode of learning.	3.08 ±1.35	16(13.3)	34(28.3)	17(14.2)	30(25.0)	23(19.2)
1.3 I believed online learning improved my learning process.	2.63± 1.25	25(20.8)	39(32.5%)	22(18.3)	24(20.0)	10(8.3)
1.4 I felt online classes helped me in understanding and improving my studies.	2.70± 1.24	18(15.0)	49(40.8)	17(14.2)	23(19.2)	13(10.8)

1.5 I felt online classes gave me chance to interact with teachers and classmates.	2.44±1.26	33(27.5)	41(34.2)	13(11.7)	24(20.0)	8(6.7)
1.6 I could effectively share thoughts and opinions with teacher and classmates	2.55±1.28	28(23.3)	42(35.0)	17(14.2)	22(18.3)	11(9.2)
1.7 I was satisfied with the quality of the entire online teaching-learning process.	2.53± 1.18	22(18.3)	50(41.7)	18(15.0)	22(18.3)	8(6.7)
1.8 I was satisfied with the number of online sessions on each taught topic.	2.86± 1.266	20(16.7)	34(28.3)	20(16.7)	35(29.2)	11(9.2)

Domain 2: Technological Issues

The analysis of the 7 scale items under domain 2 (domain on technological characteristics/dimension) (Table-3) found that the percentage of combined agreed and strongly agreed respondents were 56.6% for item 2.1, 84.2% for item 2.2, 50.6% for item 2.6, and 69.1% for item 2.7. The percentage of combined strongly disagreed and disagreed respondents were 45% for item 2.3, 62.5% for item 2.4 and 66.7% for 2.5. The comparison of the mean scores of the 7 items in the technological domain (domain2) showed that it was >4 for one item, >3 for 2 items and <3 for 3 items.

Table 3: Distribution of respondents and mean ± SD of each item

Domain 2

Items	Mean ± SD	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)
2.1 I had access to a stable internet connection at home.	3.28 ± 1.26	11(9.2)	31(25.8)	10(8.3)	49(40.8)	19(15.8)
2.2 I had the appropriate apps/software in my computer/laptop/smart phone.	4.0 ± 0.911	-	14(11.7)	5(4.2)	63(52.5)	38(31.7)
2.3 I had access to online academic help support system during the online classes.	2.88± 1.23	17(14.2)	37(30.8)	21(17.5)	34(28.3)	11(9.2)
2.4 I have been trained in technical skills needed to participate in the online classes	2.46± 1.15	23(19.2)	52(43.3)	21(17.5)	15(12.5)	9(7.5)
2.5 I had access to online library resources during the online classes.	2.32±1.23	36(30.0)	44(36.7)	13(10.8)	20(16.7)	7(5.8)
2.6 I was satisfied with the online email /texts messages on phone/social network for class announcements system.	3.11± 1.38	22(18.3)	24(20.0)	12(10.0)	43(35.8)	19(15.8)
2.7 I was able to successfully download teaching materials from online sites given by teachers.	3.5±1.17	12(10.0)	12(10.0)	13(10.8)	64(53.3)	19(15.8)

Domain 3: Teacher and Teaching Characteristics

The analysis of the 8 items under domain 3 (domain on teacher and teaching instructions**)** (Table-4) found that the

percentage of combined agreed and strongly agreed respondents were 70% for the item 3.1, 70% for item 3., 55% for item 3.3, 51.7% for item 3.4, 43.3% for item 3.5, 52.5% for item 3.7. The percentage of combined strongly disagreed and disagreed respondents were 30% for item 3.6 and 46.7% for item 3.8. The comparison of the mean scores of the 8 items in the teacher and teaching domain (domain 3) showed that it was >3 for 7 items and <3 for 1 item.

Table 4: Distribution of respondents and mean ± SD of each item
Domain 3

Items	Mean ± SD	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)
3.1 I felt that my instructor/teacher had good content knowledge.	3.6± 1.05	7(5.8)	13(10.8)	16(13.3)	66(55.0)	18(15.0)
3.2 I felt that my instructor/teacher provided opportunities to ask questions.	3.6± 1.02	5(4.2)	13(10.8)	18(15.0)	63(52.5)	21(17.5)
3.3 I felt that my instructor/teacher made the subject as interesting as possible	3.38 ± 1.15	10(8.3)	18(15.0)	26(21.7)	49(40.8)	17(14.2)
3.4 I was satisfied with instructor/teacher in providing clear instructions.	3.30± 1.11	5(4.2)	31(25.8)	22(18.3)	47(39.2)	15(12.5)
3.5 I was satisfied with teacher's delivery mode (based on voice, pronunciation, speed of talking).	3.13± 1.18	9(7.5)	34(28.3)	25(20.8)	36(30.0)	16(13.3)
3.6 I was satisfied with the instructor/teacher in reviewing the topics.	3.22±1.14	9(7.5)	27(22.5)	27(22.5)	43(35.8)	14(11.7)
3.7. I was satisfied with the instructor/teacher responsiveness towards my questions	3.38 ± 1.07	9(7.5)	13(10.8)	35(29.2)	49(40.8)	14(11.7)
3.8 I was satisfied with the quality of audio-visual aids (use of power-point presentation. etc.).	2.93± 1.30	17(14.2)	39(32.5)	14(11.7)	35(29.2)	15(12.5)

Domain 4: Assessment Characteristics

The analysis of the student responses in agreement with the 5 items under domain 4 (assessment)(Table-5) found that the percentage of combined agreed and strongly agreed respondents were 65.9% for item 4.1, 45% for item 4.3, 48.3% for item 4.5. The percentage of combined strongly disagreed and disagreed respondents were 46.7% for item 4.2 and 42.5% for item 4.4. The comparison of the mean scores of the 5 items in this assessment domain (domain 4) showed that it was >4 for one item, was 3 for each of two items but <3 for 2 items.

Table 5: Distribution of respondents and mean ± SD of each item
Domain 4

Items	Mean ± SD	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)

4.1 Had regular online item & term exams	4.03±0.91	1(0.8)	13(10.8)	3(2.5)	68(56.7)	35(9.2)
4.2 Comfortable with the online methods of assessment	2.85± 1.34	23(19.2)	33(27.5)	19(15.8)	29(24.2)	16(13.3)
4.3 Effective feedback from teachers after assessment	3.05± 1.19	14(11.7)	30(25.0)	22(18.3)	44(36.7)	10(8.3)
4.4 Satisfaction when giving the online exams	2.97± 1.40	24(20.0)	27(22.5)	18(15.0)	31(25.8)	20(16.7)
4.5 Satisfaction with the online exam performance	3.20± 1.28	16(13.3)	21(17.5)	25(20.8)	39(32.5)	19(15.8)

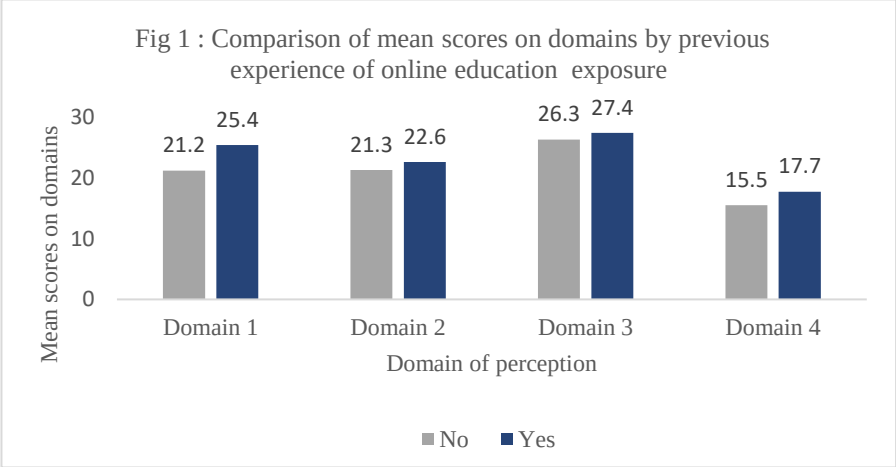

Fig-1: There was statistically significant difference on domain 1 with an F=10.15, df =1 and p value of 0.002 and on domain 4 with an F=5.78 and df-=1 and p=0.018.

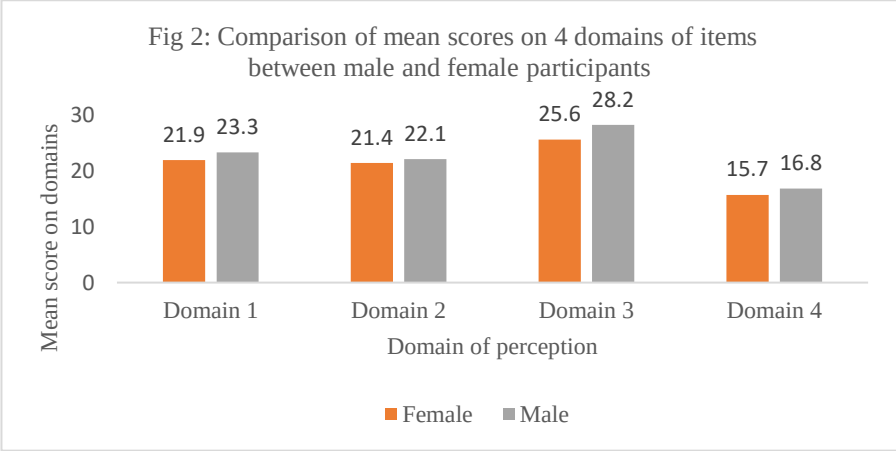

Fig-2: There was statistically significant difference on domain 3 with an F=4.29, df=1 and p value of 0.040.

DISCUSSION

During the pandemic, medical universities across the globe have been compelled to adapt their medical curriculum and examinations to embrace social distancing measures. Medical education faculties of high income (HIC) and low to middle income (LMIC) were subjected to enormous pressure to deliver education on

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online teaching platforms during the pandemic. LMICs had encountered significantly more demanding challenges in their medical colleges/ schools in response to the pandemic compared to HICs.[1] Some of these challenges included lack of infrastructure, limited financial and logistic resources, lack of trained personnel and lack of knowledge and skills of students to navigate on the online platform. Thus, designing technology-facilitated learning environments for online education and for blended learning that are congruent with learning expectations and learning necessities require that both teachers and students have thorough perception and comprehension of effective in-person and online teaching-learning strategies and approaches.

In our study (Table-1), the gender distribution of medical students' participation showed that 60% were female and 40% were male students. Similar studies conducted by others have shown more female than male participants. In the study of Michal et al, 71% were female and 29% were male, in that of Dost et al 68% were female, in that of Dergham et al, 64% were female and in that of Muflih et al, 80.5% were female and 19.5% were male, in that of Swapnali et al, 61.6% were female and 38.4% were male, in that of Dev D et al, 51.4% were female and 48.6% were male, in that of Anita et al, 53.8% were female and 46.1% were male. [2,16,17,18,19,20,21] In contrast, predominance of male participants was reported in some studies such as the study of Alqhtani et al with 86.4% male, that of Mousumi et al, with 82.6% male and that of Hina et al, with 57% male participants.[22,23,24]

The exploration of prior online education exposure among the students in the study (Table-1) found that 70% had no prior exposure but 30% did. In the study of Michal et al 60% had never before experienced any form of e-learning which was considered a technical issue problem and in study of Muflih et al only 37.7% had prior exposure .[2,18] Similarly, in another online cross-sectional survey on 512 medical students, 71.6% had none, but only 28.4% had taken prior online classes.[20] Our finding is also similar to the study of Alqhtani et al on 376 medical students where 75% had no prior experience compared to 25% who did.[22] Regression analysis study in China on medical students on the impact of perception of usefulness and familiarity with online education have shown significant association between high familiarity and the positive evaluation of ongoing online education. In other words, the more prior online learning experiences students have, the higher evaluation they have on online learning [25] Prior online learning experience and user satisfaction may aid in lowering uncertainty and increasing students' intention to use e-learning.

About 79.2% students in our study (Table-2) supported the statement that it is important to undertake online/ IT training for development of competency. It was similar to the study of Swapnali et al where 92.8% stated the need for online training.[19] Pedagogical understanding can be important barriers to effectiveness of online learning, hence training is required for development of instructional strategies of teachers and self-management skills of students.[19] Similarly also, in the study of Hulke et al, 76.7% of faculty and 62.8% of students recommended the need for e-learning training.[26] In a cross-sectional study on 200 basic medical science and clinical skills students, insufficient IT skills was reported among 59% and 48% respectively.[18] The need for training on

techniques and strategies of using online methods (multimedia tools, scheduling tools, communication tools, learning management systems) have been emphasized in various studies.[27,28]

The determination of feeling comfortable with online learning found (Table-2), only 44.2% students agreed that it was comfortable. The issue of comfort refers to not having to commute, flexibility, learning at own pace, cost reduction of studies etc. In the study of Dost et al 15.8% students opined that online education was comfortable and 19.8% considered no need to travel as an advatage.[16] In the study of Mortagy et al on 2140 medical students, 21% agreed it was comfortable, and 18% stated time was saved from commuting during the pandemic.[29] In our study (Table 2) the percentage of respondents who disagreed that online education improves learning process, or improves understanding of topics taught, or allows to effectively share ideas and opinions with teachers and peers were 53.3%, 55.8%, and 58.3% respectively. In the study of Dergham et al more than 50% of students agreed that the level of understanding was poor when practical/clinical lectures were delivered online compared to actual classroom.[17] Similarly, in the study of Wang et al 69.7% were not satisfied with the effectiveness of the online learning. Students' perception of usefulness of online learning process is more associated with their familiarity with online learning modules[25]

Determination of the students' perception about facilitated teacher-student interaction (Table 2) revealed that only 26.7% agreed but 61.7% disagreed. In the study of Arian et al 35% students agreed, 33% disagreed and 32% were neutral response and in that of Muflih et al 59.6% disagreed.[13,18] Other studies have reported similar opinion on teacher-student interaction of 58% and 66% respectively by medical students of basic and clinical courses.[24] In the study of Dergham et al, 50% proposed that online classes should be more interactive.[17] A similar finding was reported in a descriptive cross-sectional study on 200 medical students where only 10.4% opined the teacher-student interaction was effective.[23] In contrast Dost et al reported 59.73% students found the online teaching sessions to be interactive with scope for using chat box or direct conversation with the teachers.[16] Traditional teaching methods play important role in the development of higher-order cognitive skills and interactions are crucial to build such skills. In the study of Alqhtani et al. students perceived much less effectiveness (21.8%) and somewhat less effectiveness (41%) of online interaction compared to regular classroom education.[22] In the study of Mortagy et al more than 50% of students wanted more interactive online sessions.[29] Online teaching has its limitations but the drawbacks can be overcome with more interactive online discussions and with sufficient time for brainstorming and answer-searching.[30] In this study (Table 2), 60% students were dissatisfied with the quality of online courses delivered but only 25% were satisfied, similar to the study of Abbasi et al where only 31% were satisfied.[31] Also we found (Table 2) only 38.4% were satisfied with the number of online sessions on each topic but 45% were dissatisfied. A cross-sectional study on 500 medical students found that among the total participants, 20.15% were very satisfied, 29.94% were somewhat satisfied, 22.95% were neither satisfied nor dissatisfied, and 26.94% were dissatisfied with the frequency of classes.[21]

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The use of technology and online learning platforms have been of paramount importance in delivering medical education during the pandemic. Both high income and low to middle income countries have confronted problems in access to digital resources and infrastructure.[1] Online learning can increase the efficiency and effectiveness of higher educational institutions, but requires faculty and student training with robust infrastructure (high-speed internet, hardware, and other logistics).

When ascertaining students' access to stable internet connectivity, we found that (Table-3), 56.6% students agreed but 35% disagreed. This is similar to another study where 61.8 % had good and very good internet connection.[20] To the contrary, in the study of Anita et al 53.8 had reported network problems.[21] Similarly, in a study from Punjab, India, around 40% of respondents reported frequent technology failures and limited access to the internet.[23] Also in an observational study on 465 medical students, 63.4% reported having faced internet connectivity issues and 52.5% perceived slow and interrupted internet connectivity.[32] About 84.2% (Table-3)of students stated that they had proper apps/software available for use on their laptop/smart phone/computer which is a reflection of the technological devices at their disposal and their overall technological proficiency. In the study of Albalas et al on 538 students, 35.9% used single device like smartphone, 14.5% used laptop or desktop, and 49.6% used multiple devices for accessing their learning sessions.[33] To the contrary, a cross-sectional survey reported non-availability of software and of hard-ware by 11.5% and 16.6% students respectively and by 18.6% and 11.6% of teachers respectively.[26] In that same study, 55% of teachers and 88% of students reported difficulty of handling software during the online sessions.[26] We found that (Table-3) only 20% students agreed they were trained and proficient to engage in online courses and to use online methods but 62.5% disagreed. In contrast, in an online survey on more than 7000 medical students of 49 medical schools, the technological proficiency was at an advanced level for 25.5% of students and at an intermediate level for 58.7% of them.[34] We also found that (Table-3), 62.5% students disagreed that they were appropriately trained for engagement in the online classes and only 20% agreed while 17% were neutral in response. In the study of Swapnali et al students expressed the need for inclusion of training courses on how to use computer and internet in medicine curriculum.[19] To the contrary, in an online survey on 804 medical students it was found that 56% students had good and 42% had moderate IT skills necessary for effective online lesson participation.[2]

In this study (Table-3) only 37.5% agreed they had access to online academic support and services during the online classes. This is similar to the study of Mousumi et al where the student agreement was only 34.8%.[23] A survey in Nigeria demonstrated that both the faculties and students encountered serious technological burdens during the pandemic with only 45% of the medical schools being able to continue online education sessions. Universities encountered challenges in the form of lack of online learning facilities and inadequate technical support while students had difficulties for not owning digital devices, in addition to the high cost of internet services and lack of power supply.[1] About 66% students (Table-3) disagreed and 37.5% agreed that they had access to online library resources during the classes.

Similarly, in the study of Mousumi et al only 45.2% stated online resources were sufficiently provided.[23] On the contrary, another study reported 69% students agreed they had access to online learning materials.[2] Provision of online educational materials (lectures, textbooks and tutorials, video clips, pre-recorded videos etc.) have expanded and online tools for learning are increasingly accessible but not homogeneously available across the globe.

In the present study (Table -3), 69.1% were satisfied with the ability to download educational materials from on-line sites and 51.6% were satisfied with the use of technological means of obtaining information regarding online class course schedules (such as via emails, text messages and social networks). The study of Yuda et al reported that 84.7% students used the internet regularly to download educational materials.[34] However, studies have shown that there are many significant barriers to the implementation of e-learning by medical schools.[22]

Normally majority of teachers favor face-to-face teaching because it provides better interaction with students and feedback from students. During the pandemic with the sudden switch to online education, teachers had to use synchronous and asynchronous modes. This requires faculty development training in delivering the content through online mode and also sensitizing the students regarding the use of various platforms.

We found in the present study (Table 4) 70% students agreed and were satisfied that teacher had good knowledge, 70% were satisfied/agreed that teacher allowed to ask questions, 55% felt teacher made class interesting, 51% agreed that teacher provided clear instructions, 47.5% satisfied with teacher reviewing taught topics and 43% was satisfied with teacher's delivery mode. In the study of Rajiv et al 67.7% of students agreed teachers adequately explained the topics.[35] In the study of Anita et al, 17.16% were very satisfied,31.13% were somewhat satisfied, 25.14% were neither satisfied nor dissatisfied, and 27.54% were somewhat dissatisfied with the preparedness of the class. In that same study also 30.74% were very satisfied, 19.96% somewhat satisfied, 4.50% were neither satisfied nor dissatisfied, and 34.73% were somewhat dissatisfied with the content of classes.[21] Students in online surveys have expressed that teachers are not sometimes well prepared and the online teaching was not sufficient for brainstorming and critical thinking and even felt it was not as effective as face-to-face teaching-learning.[29]

Whether teachers responded adequately to students' queries found (Table 4), only 52.5% students agreed. Similarly, in a cross-sectional study on 209 students and 13 faculty members it was reported that 54% agreed that the faculty responded adequately to their queries.[13] Similarly, in the study of Rajiv et al, more than 62% students agreed that they could clear their queries with teacher. [35] In contrast, in the study of Muflih et al 48.4% disagreed.[18] In our study (Table-4), 46.7% students disagreed with the quality of audiovisual aid used by the teachers. In the study of Mousumi et al the students' agreement on appropriateness of teaching-learning aids was only 30%.[23]

To ensure that the implementation of distance learning remains effective and achieves inclusivity during pandemic and post-pandemic phase, various aspects of online education needed to be prioritized,

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including the use of digital tools and platforms. Surveys documenting medical students' satisfaction with online educations can serve as indicators of the quality, hence also serve as a channel for delivery of constructive feedback for betterment.

In this study (Table -5), 65.9% agreed that they had regular online assessments (item exams and term exams), only 37.5 % were comfortable with online assessments, and 42.5% satisfied when giving the exam. In the study of Mortagy et al, 34% reported lower grades in exams and 32% got better grades in online assessments.[29] A similar study conducted on 212 medical students by Anuradha et al reported about 40% agreed, 31% disagreed and 29% had neutral opinion with the effectiveness of the online assessment methods.[36] The occurrence of internet connectivity problem during online assessments can be a significant impediment to effective learning.

Lack of comfort with an online mode of assessment can lead to alternate solution-seeking approach or even to rejection of the online system. In the study of Hina et al 31% of basic science and 34% of clinical science students agreed there were difficulties with online assessments.[24] In our study (Table-5) 48.3% was satisfied with their online academic exam performance and 45% students agreed they had effective feedback from teachers but 36.7% disagreed. In contrast, in the study of Hina et al 37% of basic and 51% of clinical science agreed online assessments can affect student performance and also documented that 56% of basic science and 76% of clinical courses students felt there was lack of proper feedback from the faculty after online assessment.[24]

We found (Fig-1) a statistically significant difference between status of previous exposure or non-exposure to online education with domain 1 (p= 0.002) and domain 4 (p=0.018) items respectively. The mean ± sd score was 25.4 ± 7.24 and of 21.2 ± 6.24 in domain 1 (learning dimension) respectively for students with prior experience of online education than those without it. The mean ± sd score were 17.7± 3.9 and of 15.5 ± 4.8 in domain 4 (assessment) respectively for students with prior experience of online education than those without it. During the pandemic, there was a dramatic decision to lockdown all academic in-person activities and transfer to an online platform. Internationally, some institutions during the pandemic already had robust learning management systems, internet capabilities, and trained faculty that enabled seamless transitioning to an online environment. To the contrary, medical schools of some countries struggled to create digital contents, train faculty, and develop infrastructure for online learning. Prior learning experiences are positively associated with students' evaluation of and satisfaction with current online education.[25] Accordingly, students' former experiences can define their familiarity with online learning modes, including the tools or platforms used for information transmission and interpersonal interaction.[25] In other words, the more online learning experiences students have, the higher evaluation they have on online learning.[25] We also found (Fig-2) a statistically significant difference between male and female students and domain 3 items (teacher and teaching characteristics). The mean ± sd score was 28.2 ± 7.1 for male and 25.6 ± 6.1 for female respectively with p=0.04. In the study of Alqhtani et al a linear regression analysis reported an average higher score of satisfaction for male than female

students.[22]

LIMITATION OF STUDY

This study was based on data collected from a few medical colleges due to time and other resource constraints. It was conducted when online courses were offered due to abrupt transition during the pandemic and not according to a well-planned course delivery plan. However, the obligated use of online technologies gave an opportunity to learn about the future issues. All the interpretations were based exclusively on students' perceptions. Therefore, to build on the results of our study, in future, thorough quantitative studies must focus on the impact of online medical education in our country.

CONCLUSION

Online medical education was not a regular practice before the pandemic. However, similar to many medical schools/colleges across the globe, our country had to drastically implement an online teaching and assessment course during the lockdown without proper infrastructure, adequate preparation and capacity to deliver online courses and also without sufficient learning tools and materials for both faculty and students. The majority of the study participants in our study emphasized on need for training on online techniques and methods. Also, in our study, more than half the participants disagreed that the online courses improved understanding of taught topics and the majority did not agree that online courses facilitated teacher-student effective interaction. The majority felt they did not receive quality online education. The majority in our study did not agree that they were skilled to engage in online courses. Less than fifty percent were satisfied with online method of assessments and also with online academic performances. Students' perceptions and satisfaction serve as important quality indicators of online medical education. Continuous training is essential for both faculty and students in our country to enhance online teaching-learning skills and to obtain the benefits of online education. In near future further research is needed to evaluate the perceptions and satisfaction of students with online learning and the effective online teaching skills of faculty in order to assess the impact, sustainability and long-term outcomes of online medical education in our country.

Footnotes

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References

1. Connolly N and Abdalla ME. Impact of COVID-19 on medical education in different income countries: a scoping review of the literature. Med Educ Online. 2022; 27(1): e2040192. doi:10.1080/10872981.2022.2040192

2. Bączek M, Zagańczyk-Bączek M, Szpringer M, Jaroszyński A, Wożakowska-Kapłon Beata. Students' perception of online learning

during the COVID-19 pandemic: A survey study of Polish medical students. Medicine. 2021; 100(7): p e24821. doi:10.1097/MD.0000000000024821

3. Binks A, LeClair R, Willey J et al. Changing medical education, overnight: the curricular response to COVID-19 of nine medical schools. Teach Learn Med. 2021; 33(3):334–42.

4. Ossai EN and Ogbuoji O. Redressing the impact of COVID-19 on medical education in Africa: the need for collective action. BMJ Glob Health. 2021; 6(3): e005067.

5. Chakladar J, Diomino A, Li WT et al. Medical Student's Perception of the COVID-19 Pandemic Effect on Their Education and Well-being: a

Cross-sectional Survey in the United States. BMC Med Educ. 2022; 22 (01):149. doi: 10.1186/s12909-022-03197-x

6. Howlett D, Vincent T, Gainsborough N et al. Integration of a Case-Based Online Module into an Undergraduate Curriculum: What is Involved and is it Effective? E-Learning and Digital Media. 2009; 6(4): 372-84. doi:10.2304/elea.2009.6.4.372

7. Harden RM, Sowden S, Dunn WR. Educational strategies in curriculum development: the SPICES model. Med Educ. 1984 Jul; 18(4):284-97. doi: 10.1111/j.1365-2923. 1984.tb01024. x.

8. Thomas PA, Kern DE, Hughes MT, Chen BY (2015). *Curriculum Development for Medical Education: A Six-Step Approach, Third Edition*, pp. 1-300.

9. Carberry C, McCombe G, Tobin H et al. Curriculum initiatives to enhance research skills acquisition by medical students: a scoping review. BMC Med Educ. 2021; 21:312. doi:10.1186/s12909-021-02754-0

10. Ahmed TS, Rashid TJ, Huda S, Sultana N, Billah AM. Perception of Medical Students on Current Medical Education in Bangladesh. BJME. **2022**; 13(02): 13-25. doi:10.3329/bjme. v13i2.60941

11. Matsuyama Y, Nakaya M, Okazaki H et al. Does changing from a teacher-centered to a learner-centered context promote self-regulated learning: a qualitative study in a Japanese undergraduate setting. BMC Med Educ. 2019; 19:152. doi:10.1186/s12909-019-1550-x

12. Hasan T and Ageely H. The Scope of Student-Centered Learning in Medicine. J Basic Appl Sci Res. 2011; 1(7):638-43.

13. Arain SA, Ali M, Arbili L, Ikram MF, Kashir J, Omair A, Meo SA. Medical Students and Faculty Perceptions About Online Learning During COVID-19 Pandemic: Alfaisal University Experience. Front Public Health. 2022; 10:880835. doi: 10.3389/fpubh.2022.880835.

14. TMS Collaborative. The perceived impact of the Covid-19 pandemic on medical student education and training – an international survey. BMC Med Educ. 2021; 21:566. DOI: 10.1186/s12909-021-02983-3.

15. Ferrel MN, Ryan JJ. The Impact of COVID-19 on Medical Education. Cureus. 2020; 12(03): e7492. DOI: 10.7759/cureus.7492.

16. Dost S, Hossain A, Shehab M, et al. Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross-sectional survey of 2721 UK medical students. BMJ Open 2020;10: e042378. doi:10.1136/ bmjopen-2020-042378

17. Dergham P, Saudagar FNI, Jones-Nazar CC et al. Medical Students' Perceptions Towards Online Teaching During the Covid-19 Pandemic: A Cross-Sectional Study from Saudi Arabia. Adv Med Educ Pract. 2023 Apr 23:14:407-419. doi: 10.2147/AMEP.S396912. eCollection 2023.

18. Muflih S, Abuhammad S, Al-Azzam S et al. Online learning for undergraduate health professional education during COVID-19: Jordanian medical students' attitudes and perceptions. Heliyon. 2021 Sep;7(9): e08031. doi: 10.1016/j.heliyon. 2021.e08031.

19. Kadam SS, Bagle TR and Baviskar PA. Utilization of internet by undergraduate medical students. NJPPP 2018; 8(1):1-6

20. Dev D, Kumari M, Sharma J, Arora S and Sharma Y. Impact of online education on medical students. Int J Health Sci. 2022; 6(S2):13355-65.

21. Kumari A, Rani S and Bara MP. A Study on the perception of medical students using online teaching during the COVID-19 pandemic. J Family Med Prim Care. 2022; 11(6):2552-6. doi: 10.4103/jfmpc.jfmpc_2074_21

22. AlQhtani A, AlSwedan N, Almulhim A et al. Online versus classroom teaching for medical students during COVID-19: measuring effectiveness and satisfaction. BMC Med Educ. 2021; 21(01): 452. doi: 10.1186/s12909-021-02888-1.

23. Datta M and Bhattacharya S. Factors Affecting Undergraduate Medical Students' Perception of

Online Education During the COVID Pandemic at a Teaching Hospital in Eastern India. J Med Educ. 2022; 21(01): e122541. doi:10.5812/jme-122541.

24. Khan H, Zulfiqar B, Qazi AM et al. Pros and Cons of Online Course from Medical student's standpoint. The Professional Med J. 2021; 28(03):387-91. doi: 10.29309/TPMJ/2021.28.03.6158
25. Wang C, Xie A, Wang W et al. Association between medical students' prior experiences and perceptions of formal online education developed in response to COVID-19: a cross-sectional study in China. BMJ Open 2020;10: e041886. doi:10.1136/ bmjopen-2020-041886.
26. Hulke SM, Wakode SL, Thakare AE et al. Perception of e-learning in medical students and faculty during COVID time: A study based on a questionnaire-based survey. J Educ Health Promot. 2022; 11:139. doi: 10.4103/jehp.jehp_655_21
27. Han H, Nelson E, Wetter N. Medical students' online learning technology needs. Clin Teach. 2014 Feb;11(1):15-9. doi: 10.1111/tct.12092.
28. Guze PA. Using Technology to Meet the Challenges of Medical Education. Trans Am Clin Climatol Assoc. 2015; 126:260-70. PMID: 26330687
29. Mortagy M, Abdelhameed A, Sexton P et al. Online medical education in Egypt during the COVID-19 pandemic: a nationwide assessment of medical students' usage and perceptions. BMC Med Educ. 2022; 22: 218. doi: 10.1186/s12909-022-03249-2
30. Wu S, Fan Y, Sun S, Chien C and Wu Y. Perceptions of medical students towards and effectiveness of online surgical curriculum: a systematic review. BMC Med Educ. 2021; 21: 571. doi:10.1186/s12909-021-03014-x
31. Abbasi S, Ayoob T, Malik A, Memon SI. Perceptions of students regarding E-learning during Covid-19 at a private medical college. Pak J Med Sci. 2020 May;36(COVID19-S4): S57-S61. doi: 10.12669/pjms.36. COVID19-S4.2766.
32. Vishwanathan K, Patel GM, Patel DJ. Impact and perception about distant online medical education (tele-education) on the educational environment during the COVID-19 pandemic: Experiences of medical undergraduate students from India. J Family Med Prim Care. 2021; 10 (6):2216-24. doi: 10.4103/jfmpc.jfmpc_2306_20.
33. Al-Balas M, Al-Balas HI, Jaber HM et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. BMC Med Educ. 2020; 20(1):341. doi: 10.1186/s12909-020-02257-4
34. Turana Y, Primatanti PA, Sukarya WS et al. Impact on Medical Educationand the Medical Student's Attitude, Practice, Mental Health, After One Year of the Covid-19 Pandemic in Indonesia. Front Educ. 2022 ; 7 : e843998. Doi : 10.3389/feduc.2022.843998
35. Arora R, Moudgil T, Cheema HK and Sharma M. Satisfaction levels of students toward online teaching and assessment in a medical college in North India during COVID-19 related lockdown. NJPPP. 2022; 12(03): 1-8.
36. Yadav A, Sankhla M and Yadav K. A Snapshot of Medical Students' Perceptions about Online Assessment and Its Comparison with Online Teaching Experience during COVID-19 Pandemic. IAR J Med Sci. 2022; 03(01): 87-91.